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Entrepreneurship, Innovation and Industrial Development: Geography and the Creative Field Revisited[1]

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ABSTRACT. Creative destruction is a central element of the competitive dynamic of capitalism. This phenomenon assumes concrete form in relation to specific geographical and historical conditions. One such set of conditions is investigated here under the rubric of the creative field, i.e. the locationally-differentiated web of production activities and associated social relationships that shapes patterns of entrepreneurship and innovation in the new economy. The creative field operates at many different levels of scale, but I argue that the urban and regional scale is of special interest and significance. Accordingly, I go on to describe how the creative field functions as a site of (a) entrepreneurial behavior and new firm formation, (b) technical and organizational change, and (c) the symbolic elaboration and re-elaboration of cultural products. All of these activities are deeply structured by relations of spatial-*cum*-organizational proximity and separation in the system of production. The creative field, however, is far from being a fully self-organizing entity, and it is susceptible to various kinds of breakdowns and distortions. Several policy issues raised by these problems are examined. The paper ends by addressing the question as to whether industrial agglomeration is an effect of producers' search for creative synergies, or whether such synergies are themselves simply a contingent outcome of agglomeration.

1. Introductory Remarks

Throughout his voluminous writings, Marx insisted on the notion of capitalism as a turbulent scene of production and exchange, gripped by the forces of competition in an endless process of self-transformation. In these circumstances, every firm faces a stark choice between the continual need to upgrade its process and product configurations or eventually going out of business. The result is what Schumpeter (1942), in an explicit invocation of Marx, called "creative destruction," i.e. the periodic abandonment of old equipment, production methods, and product designs in favor of newer and more economically performative assets. At the same time, as both Marx and Schumpeter recognized, creative destruction is inscribed within an ever-expanding sphere of economic activity due to the growth of existing firms, the extension of entrepreneurship, and the appearance of new products on final markets. Capitalism, in brief, is a complex field of forces spurring constant qualitative and quantitative readjustments across all its multiple dimensions of operation (see also Baumol, 2002). Sometimes these readjustments are of cataclysmic proportions, as when steam replaced water-power in the nineteenth century; more often than not, as Rosenberg (1982) points out, they take the form of small, incremental steps, many of which may be minuscule, but which collectively produce the incessant turbulence descried by Marx.

Of late years, there has been a considerable outpouring of literature devoted to these matters, much of it partaking of institutionalist and evolutionary economic theory (e.g. Archibugi et al., 1999; Arthur, 1990; David, 1985; Edquist, 1997; Foray and Lundvall, 1996; Freeman, 1995; Lundvall and Johnson, 1994; Nelson, 1993; Von Hippel, 1988). An important aspect of this literature is the emphasis that much of it

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assigns to geography – and above all to the *region* – as an active force in molding industrial performance *qua* new firm formation, learning, invention, and growth (cf. Acs, et al., 2002; Antonelli, 2003; Audretsch and Feldman, 1996; Cooke and Morgan, 1994; Feldman, 1994; Howells, 1999; Maskell and Malmberg, 1999; Oinas and Malecki, 1999; Simmie, 2003; Storper, 1995). This expanding interest in the geographic foundations of industrial performance can no doubt in large degree be ascribed to the emergence of a dominant post-fordist (or more simply "new") economy since the late 1970s and early 1980s, and to the concomitant transformations, often quite radical, of the industrial landscape that have ensued.

For the first three-quarters of the 20th century, the leading edges of economic expansion in the advanced capitalist societies were constituted mainly by fordist mass-production sectors (steel, cars, petroleum products, food processing, and so on). Schumpeter himself, or more accurately, the later Schumpeter, identified sectors like these, with their substantial research budgets and central R&D laboratories, as the principal foci of innovative activity and technical change in the capitalism of that period. Observers of technological change in the post-War decades, such as Mansfield (1968), made much of the distinction between basic and applied research, almost always with the further observation that the latter is in important ways pulled along by the former as engineers and other technical workers translate theoretical ideas into practical blueprints for industrial application.

A complementary view of processes of innovation and change in this period of economic history is encapsulated in the so-called product-cycle model (Vernon, 1966). Here, the analysis turns on the notion that sectors of production and/or systems of applied technology go through a predictable series of evolutionary changes from their moment of inception to their final expression in the form of mature mass production. The model recognizes three main stages of development in any sector, i.e. (a) a period of infancy and experimentation as new technologies and products make their appearance and as small entrepreneurial firms spring into existence in order to exploit them; (b) a period of growth, based on research-intensive process and product development, accompanied by the shakeout of underperforming assets; (c) a period of maturity or oligopoly in which just a few very large firms making standardized products dominate the entire sector, and in which technological change has radically slowed down. Several attempts were made to incorporate a theory of industrial location into the product cycle model, as expressed in a composite story to the effect that new industries originate in agglomerated "incubators" and then steadily disperse outward as they develop, until in the final stages of maturity, virtually all production has decentralized to cheap-labor locations (Norton and Rees, 1979; Struyk and James, 1975).

In spite of its many over-simplifications and oversights, this vision of technological change and entrepreneurship can be taken as an approximate description as to how at least some mass-production sectors evolved in the post-War decades. Even in the context of fordist mass-production, however, the product-cycle model fails to provide a really adequate account of technological trajectories and the evolution of the firm (Storper, 1985). As the new leading edges of capitalist development today – such as high-technology manufacturing, neo-artisanal industry, business and financial services, the media, and so on – have come to the fore, the deficiencies of the theory have grown yet more apparent, above all in view of the circumstance that one of the defining features of the so-called new economy is its persistent postponement of anything like the stage of maturity. New-economy sectors are endemically given to continuous learning and hyper-innovation in all phases of their growth, not only in so far as tangible technologies are concerned but intangible capital of all kinds as well (Amable et al., 1997; David and Foray, 2002).

Thanks to the great surge of published research on these matters in recent years, a very much more elaborate and forthright theory of the spatial foundations of creative activity in contemporary capitalism can now be articulated. I have already attempted a preliminary synthesis in this direction with my exploration of the notion of the *creative field* as a critical underpinning of the modern cultural economy (Scott, 1999a). The present essay is an attempt to broaden the terms of reference of this earlier

work, and to encompass the new economy as a whole, from technology-intensive manufacturing on the one hand to producers of purely symbolic outputs on the other.

2. The concept of the creative field

The notion of a field of creative forces can be used to describe any system of social relationships that shapes or influences human ingenuity and inventiveness and that is the site of concomitant innovations. An adjunct idea is that this field will rarely be frozen in time and space, but that the very innovations it triggers will also act back upon it, thereby causing changes in its organization and operational logic. In the sphere of the economy, such a field might correspond with any number of different organizational arrangements. It might be represented by a system of labor-management relations, a particular type of corporate structure, a certain group of sectors (such as high-technology industry), or as Leydesdorff and Etzkowitz (1997) have suggested, a "triple helix" of academic, business, and governmental interests. Freeman (1987) and Nelson (1993) have identified the national economy and its institutional foundations (or the national innovation system) as yet another kind of creative field.

A more specific identification of the creative field pertinent to the present investigation is that it comprises all those instances of economic effort and organization whose *spatial and locational* attributes, at whatever scale they may occur, promote development- and growth-inducing change. To narrow the focus yet more, the creative field in this discussion is represented by sets of industrial activities and related social phenomena forming geographically-differentiated webs of interaction giving rise to diverse entrepreneurial and innovative outcomes. An intrinsic element of this definition is that both the field on the one side and its effects on entrepreneurship and innovation on the other are reflexively intertwined with one another.

This broad idea is in fact far from new, and aspects of it can be found in different formulations in the literature on such topics as the innovative milieu (Aydalot, 1986; Camagni, 1995; Maillat and Vasserot, 1986), the learning region (Florida, 1995; Morgan, 1997; Storper, 1996), regional innovation systems (Cooke and Morgan, 1994; Oinas and Malecki, 2002), and the like.[2] My present objective is to resynthesize this literature in a way that tries to broaden its theoretical bases and that carries some of its hitherto unexamined implications forward onto new terrain. In practice, the overwhelming – though not exclusive – emphasis of the following discussion is on agglomerated economic structures such as industrial districts, regional productive complexes, and urban economic systems. Phenomena like these are almost always characterized by dense networks of firms and multifaceted local labor markets, and as a wealth of published research has shown, these are the settings within which entrepreneurial and innovative energies flourish *par excellence* in the new economy (Acs, 2002; de la Mothe and Paquet, 1998; Domanski, 2001; Fischer et al., 2001; Hall, 1998; ÓhUallacháin, 1999). Notwithstanding this emphasis on agglomeration, more than passing attention is also paid to much wider spatial frameworks of industrial activity and their implications for entrepreneurship and innovation, including, in the limit, the global.

At the same time, the idea of the creative field goes far beyond specific applications in the domain of the economy. Developments in the spheres of culture and science, too, can in part be understood in terms of arguments that are essentially variations of the notion of the creative field. Thus, the social conditions of creativity in art and scientific research, have been examined by commentators such as Becker (1982), Crane (1992), Hennion (1981), Livingstone (1995), and White and White (1965), among many others. Authors like these argue that aesthetic and epistemic communities, and the forms of inspiration and inventiveness that they display, all bear mediated relationships to wider social forces and the specific forms of expression that they foster. This is the message of social epistemology more generally, with its emphasis on the essential immanence of all forms of knowledge (Barnes et al., 1996; Latour and Woolgar, 1979; Mulkay, 1972).

In these senses, the broad concept of the creative field has affinities with the theory of practice as articulated by Bourdieu (1972) and the structure-agency theory of Giddens (1984). For

both of these analysts, human societies consist of a reflexive duality whose basic features entail (a) sets of existing social relations that channel the expectations and behavior of individual agents in various ways, while (b) individual expectations and behavior in turn actualize and reproduce social relations. Neither the relations nor the connections that run reflexively between them and individual agents are hard-wired, as it were, but are negotiated out in exceedingly complex processes of human choice and social change. This is not the place to indulge in extended commentary on these theoretical problems. For present purposes, it suffices to observe that in a world that operates in these ways, human practices (e.g. entrepreneurship or innovation) will in certain important respects be explicable in terms of the concrete social relations within which they are embedded, and vice versa, in recursive relationship over time.[3] As a corollary, we can also say that social and economic change in this world will often be wayward but rarely purely adventitious in relation to previous states of order; that is, it will tend to be path-dependent, an issue to which we shall return later.

3. The entrepreneur in spatial context

A fairly common view of the entrepreneur turns on the notion of the risk-taking individual, imbued with animal spirits, in pursuit of self-realization, independence, and prosperity.[4] An allied proposition is that the entrepreneur must also display remarkable skills and cognitive capacity, especially in the early stages of firm formation when the probability of failure is invariably high (Casson, 1982). These notions are often deployed in behavioral investigations of the individual's decision to become an entrepreneur. A strong finding in the literature is that this decision is frequently triggered by some unforeseen contingency, such as the loss of a job due to layoff or plant closure (Nijkamp, 2003).

Another, and not incompatible view of entrepreneurship is found in the product-cycle and incubator concepts mentioned earlier. Thus, when a new industrial sector emerges (the stage of infancy in product-cycle terms), the pioneering entrepreneurs within the sector are said to depend vitally on certain critical incubation processes. This is a time when the first firms to make their historical appearance normally face highly unstable conditions in regard to technologies, product designs, management practices, and so on. Location in an "incubator," so the theory goes, helps these firms to survive at a critical stage in their development, and ideal incubators consist of environments offering many different positive externalities (Struyk and James, 1975). These types of environment, it is claimed, occur most often in the core areas of large urban regions with their dense infrastructures, their abundant supplies of rental premises for commercial use, and their diverse services. Hence, in this view of things, it is in these core areas above all that new entrepreneurial ventures will be most likely to flourish.

Neither of these perspectives on the entrepreneur can be said to be plainly wrong, though each leaves much to be desired in terms of analytical penetration and closure, on the one side because the central issues of social context are largely evacuated, and on the other because a rather misleading biological metaphor stands in the way of a more resolute grasp of the social and spatial forces at work. More recent research has greatly improved upon both perspectives by emphasizing notions of socio-spatial embeddedness and by more ruthlessly pursuing the details of the economic logic of entrepreneurship in relation to the dynamics of industrial development. The central hypotheses at work in this new research revolve around the twin notions of networks and social capital (Cooke, 2002; Elfring and Hulsink, 2003; Noteboom, 1999; Westlund and Bolton, 2003). Thus, the entrepreneur is not just a lonely individual pursuing a personal vision, but also a social agent situated within a wider system of production that can be represented as an actual and latent grid of interactions and opportunities in organizational and geographical space. The grid is composed of more or less densely developed backward, forward, and lateral commercial linkages together with social relationships through which critical information flows continually about business opportunities, resource availability, labor market conditions, and so on. As such, the grid as a whole is also a

unit of social capital, i.e. a source of benefits to all entrepreneurs or would-be entrepreneurs collectively.

In some accounts, these ideas are further qualified by appeal to the concept of weak and strong ties formulated by Granovetter (1973). An entrepreneur caught up in a network of strong ties is likely to enjoy high levels of supportive interaction with other individuals belonging to the same network. However, the content of the interaction will be apt to cover only a relatively narrow range of information, because strong ties between the individuals of a group lead to constant mutual reinforcement of existing ideas. An entrepreneur with weak ties will receive fainter and less consistent signals, but these will tend to cover a much wider array of information. The ideal network environment for the entrepreneur, or any other type of innovator, as Elfring and Hulsink (2003) point out, is one that involves some balanced mix of strong and weak ties so that individuals on the reception side are likely to pick up an extremely varied mix of stimuli.

So far so good. The network idea facilitates the task of conceptualizing entrepreneurial effort as a socially- and spatially-embedded phenomenon, but also raises new substantive questions. What is it in particular that defines the order and character of any given network? And how do networks of entrepreneurs evolve over time? These questions lead immediately to some basic issues of industrial organization.

Consider Figure 1, which is meant to represent the evolution of a network of inter-firm transactions or linkages and corresponding information flows. I should stress that the figure itself is entirely hypothetical and schematic. It should be viewed only as a simplified abstraction, one possible developmental path out of a very large family of alternative paths. The initiating event of the evolutionary sequence shown in Figure 1 is the establishment of a new entrepreneurial venture. If demand for the products of this venture is stagnant or limited, it remains an isolated event. If demand is growing, however, a series of derivative entrepreneurial ventures may be set in motion. One possible consequence of growing demand, of course, is that the original firm will simply expand in size to keep up with consumption. A second possibility (given limited internal economies of scale) is that other entrepreneurial ventures will be founded to take advantage of widening production opportunities in the horizontal dimension. A third possibility (given limited internal economies of scope) is that yet other ventures will spring forth by vertical disintegration as opportunities in the social division of labor expand. With continued growth in demand, further and further expansion in the horizontal and vertical dimensions of the network will tend to occur (see Scott, 1983). We will assume that as this happens all ventures remain directly and indirectly linked together within a single network. Accordingly, as shown in Figure 1, the network will evolve through a series of stylized stages in which each generation is marked by (a) an expansion in the number of establishments in pre-existing sectors, and (b) the formation of a new vertically-disintegrated sector or subsector. This evolving network – irrespective of its locational coordinates – will tend to be a locus of expanding external economies of scale and scope, together with pecuniary externalities *à la* Krugman (1991) and Scitovsky (1954), giving rise to system-wide competitive advantages. It also constitutes a structure or field of entrepreneurial possibilities, meaning that its changing internal order provides a sort of template onto which actual patterns of new firm formation can be (approximately) mapped, providing that there are no deficits of individual entrepreneurial effort and initiative. This mapping is expressed in the form of both churning (the refilling of old organizational positions as failed firms are replaced) and developmental change (quantitative and qualitative transformation of the network). In this formulation, entrepreneurship begets entrepreneurship via the latent structure of evolving industrial systems.

As things now stand, Figure 1 represents a purely organizational entity lacking any geographical specificity. The firms within the network, whatever its stage of development, may be widely dispersed, strongly clustered, or some combination of the two. The case of clustered development, however, is of particular interest and significance because agglomeration is highly characteristic of transactions-intensive production systems like the one shown in Figure 1, and is especially prone to occur in many of the sectors

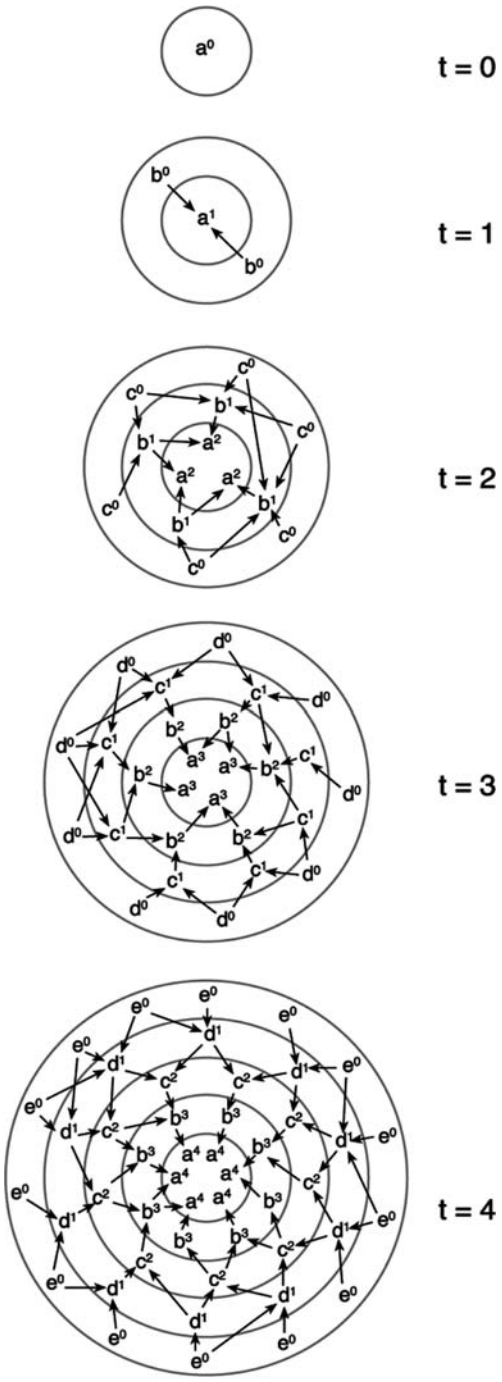

Figure 1. Schematic representation of the vertical and horizontal development of a network of inter-establishment transactions. The symbols a^{τ}, b^{τ}, c^{τ}, d^{τ}, and e^{τ} represent establishments differentiated by sector and evolutionary generation, τ, where τ for any given sector is equated to zero at the time of the first appearance of a new establishment in that sector. The symbol t refers to time in general. It is understood that the changing structure of production from t to $t+1$ is associated with qualitative internal changes in establishments as they evolve from generation τ to generation $\tau+1$. The arrows represent inter-firm linkages, but these should be understood as being multidimensional sites of product flow, interpersonal contact, and information exchange. Linkages will usually be highly variable over space and time.

that constitute the new economy. In more specific terms, producers in such systems frequently have strong incentives to cluster together in geographic space so as to transform actual and latent external economies of scale and scope into the more intensified form of agglomeration economies. By the same token, the locational choice of the first entrepreneur, even if it is perfectly random, is liable to turn into a self-fulfilling prophecy by reason of the developmental dynamic that is now set in motion (Krugman, 1991). By this I mean that the initial seed that is planted sets off a train of subsequent events in which an organized production network comes gradually into being and is increasingly locked into the initial location by its own expanding stock of agglomeration economies. Moreover, as agglomeration intensifies, individuals already working in establishments within the network are especially well positioned to observe emerging entrepreneurial opportunities as and when they loom onto the horizon, thus pushing development yet further ahead. If this argument is correct, we can expect that a significant proportion of new entrepreneurs in the agglomeration will be established residents of the local area (Romanelli and Schoonhaven, 2001).

In line with these remarks, it might be contended that William Shockley's choice of location for his Shockley Semiconductor factory in 1955 in the then backwater of Santa Clara County was random in the sense suggested.[5] But once Silicon Valley started to develop as an agglomeration of innovative semiconductor producers, success for subsequent entrepreneurs in the same field became increasingly and powerfully keyed in to that same location. This broad analysis, moreover, is consistent with (which is not the same thing as being proven by) two recurrent sets of observations about entrepreneurial activity in regional contexts. First, firm spin-offs in both the horizontal and vertical dimensions are a

commonly observed phenomenon in expanding regional economic systems, as exemplified by the generational trees of firms that have been traced out for the semiconductor industry in Silicon Valley (Assimakopoulos et al., 2003) or the medical device industry in Orange County (de Vet and Scott, 1992). Second, the empirical evidence suggests that entrepreneurs do indeed have a distinct propensity to establish firms in regions where they already live, and that rates of new firm start-up are especially high in regions already endowed with dense agglomerations of producers (Almeida and Kogut, 1997; Cooper and Folta, 2000; Sorenson and Audia, 2000).

Consolidation of any given industrial agglomeration is reinforced by the formation of what Florida and Kenney (1988) refer to as social structures of innovation, i.e. specialized service suppliers (such as venture capitalists, investment bankers, law firms, management and technology consultants, and so on) that help to maintain high local levels of entrepreneurial effort (see also Malecki, 1991). Local educational and training facilities, too, are increasingly caught up in the developmental process, and often play a major role in supporting new firms. Thus, Zucker et al. (1998a) have shown, for the case of the Californian biotechnology industry, that entrepreneurs and leading researchers in nearby university laboratories often join forces in order to establish knowledge-intensive start-ups. A further advantage of agglomeration, according to Cooper (2000), is that it facilitates the formation of well-matched founding teams of entrepreneurs; and Fornahl (2003) has pointed out that agglomeration enhances each entrepreneur's ability to observe, assess, and learn from the successes and failures of others.

The argument thus far brings us in some respects full circle back to the notion of the incubator. However, this largely metaphorical idea can now be much improved upon by a more explicit account of the endogenous structure of production networks and the ways in which they help to channel entrepreneurship. These networks have been closely identified here with regional complexes of economic activity, but to repeat, there are many – and probably growing numbers of – empirical cases of production networks that extend over vastly wider geographical ranges, including the national, continental and global scales, and in which entrepreneurial activities are accordingly equally dispersed. The problem in these instances, of course, is that entrepreneurs who lack the resources for system-wide scanning and the cultivation of long-distance business relations will find it particularly difficult to survive in the early stages of new firm formation.

4. Space-time dynamics of innovation I: Knowledge, learning and technical change

4.1. *Frameworks of practical knowledge*

Practical knowledge is a critical underpinning of all innovative activity. Practical knowledge in turn is structured by its intrinsic relationship to basic science (biology, chemistry, physics, and so on), though the relationship is never one-to-one because cost, demand, competition, and other variables play important roles in how specific pieces of information are actually deployed in the development of new and improved processes and products. Dosi (1982) has proposed that we use the term *technological paradigm* to describe any coherent combination of theoretical science, know-how, and practical applications. He has suggested that paradigms follow evolutionary trajectories such that they unfold according to an internal structural logic, though the process is almost always fitful and incomplete. The evolution of any given paradigm is also a social process to which many different parties contribute via piecemeal accretion of particular fragments of knowledge (Perez, 1983). Concomitantly, the innovative potential of any industrial system will be heightened where many of these fragments are sufficiently different from one another, yet intra-paradigmatically related, so that their combination yields new practical insights (Antonelli, 2003). This is a slightly different way of expressing the idea that a balanced mix of weak and strong links is likely to be more synergistic than a set of purely strong or purely weak links. Noteboom (1999) has made essentially the same point in his account of the impact of inter-personal cognitive distance (further refined in terms of novelty and communicability) on learning. Too little novelty or communicability is unhelpful, and so is too much; intermediate doses of

both are calculated to push learning forward most rapidly.

Technological paradigms, then, evolve over time by means of internal incremental changes generated by different participants in the knowledge-production process. Occasionally a paradigm will become exhausted and will cease to yield much in the way of new insights and competitive advantages. On other occasions a paradigm shift may occur as a superior new technology emerges, sometimes resulting in a brusque rupture in prevailing patterns of industrial development. The same rupture will sometimes be accompanied by radical readjustments in the locational structure of production, with corresponding changes in the geography of entrepreneurship and innovation. The point is dramatically exemplified by the crisis of the Manufacturing Belt and the growth of the Sunbelt after the early 1970s as post-fordist industrialism started its spectacular ascent (Storper and Walker, 1989). Steed (1971) has documented a more sharply-focussed case of technological-locational rupture in his study of the demise of traditional linen manufacturing in Ulster after the Second World War in the face of competition from the international synthetic fiber industry.

The ideational core of any paradigm is invariably composed of what can be identified in the terms proposed by Polanyi (1966) as both tacit and explicit knowledge (Foray and Steinmuller, 2003; Gertler, 2003; Lissoni, 2001; Pinch et al., 2003). Tacit knowledge is describable as a kind of inarticulate sense of how things work, which is embodied in particular individuals in particular organizational settings. Tacit knowledge is difficult to transmit to others and can often only be transferred by means of close personal interaction and practical demonstrations. By contrast, explicit knowledge is codified or codifiable in ways that make inter-personal communication relatively easy. Polanyi himself illustrates the difference between the tacit and the explicit by reference on one side to the know-how involved in being able to drive, and on the other to the systematic theory of the internal combustion engine. This illustration underlines Polanyi's contention that our total personal stock of knowledge is almost always more extensive than our ability to inscribe it all in formal texts. Since tacit knowledge is specific to given individuals, and may also be culturally encoded, it is especially difficult to transmit over long distances, whereas explicit knowledge can be more directly and cheaply transferred by means of formal inscription (Antonelli and Calderini, 1999; Gertler, 2003), though Foray and Steinmuller (2003) argue that new ways of recording tacit knowledge (with the aid of digital technologies) are likely to enhance its transferability to wider circles of recipients. In practice, the distinction between the tacit and the explicit is rarely cut and dried, and most forms of knowledge are a complex amalgam of the two types.

4.2. *Stocks and flows of knowledge in the creative field*

Whatever its paradigmatic features, or its tacit/explicit dimensions, economically useful knowledge is always unevenly spread out over many different sites at many different geographic scales from the local to the global (Archibugi et al., 1999; Bunnell and Coe, 2001). Typical active sites of knowledge-accumulation in the creative field are the individual worker, the firm, or the sector; other sites are represented by specialized institutions such as schools and universities, research laboratories, labor unions, or trade associations. Such sites constitute the atoms and neurons of the creative field, so to speak, but their power to generate new knowledge is magnified many times over when they come into definite interrelationship with one another. A central question at this stage is what kinds of knowledge accumulate at different sites, how are the bits and pieces interconnected, and how do the concomitant flows and interchanges promote spatially-determinate forms of process and product innovation?

The pressures of competition in capitalism make it imperative for firms continually to revitalize their core competencies in the search for production and marketing advantages. The knowledge that enables them to do so comes from two main sources. First, firms acquire knowledge by dint of learning based purely on their own internal resources. Learning-by-doing is one of the most common means by which they do so, above all in the case of small firms, which usually do not have the wherewithal to engage in

formal research (Antonelli and Calderini, 1999). Large firms, by contrast, are frequently capable of carrying out in-house R&D, and the results of this activity play an important role in identifying breakthrough innovations. Second, firms also learn by appropriating knowledge produced by external sources, such as other firms, or institutions like universities or government laboratories. The pathways by which knowledge spills over in this way are many and various; they include written texts, informal conversations, input–output links, inter-firm mobility of workers, strategic alliances, and so on. In these ways, knowledge produced at one site is acquired, often *gratis*, at other sites (Anselin et al., 1997; Audretsch, 2002; Feller, 2002; Grossetti, 1995; Maskell and Törnquist, 2003; Rodríguez-Pose and Refolo, 2003; Varga, 2000; Zucker et al., 1998b).

A particularly important form of knowledge generation and exchange occurs when firms engage in complex business transactions with one another, especially where these entail a good deal of preliminary discussion and mutual assessment. For example, Russo (1985) shows how small-scale, informal, but cumulatively significant innovation occurs in the tile-manufacturing district of Sassuolo in the Third Italy, as manufacturers and their suppliers of machinery negotiate with one another about the specifications of new orders for equipment. In a similar vein, Von Hippel (1988) has pointed to the important role of information feedback from users to manufacturers of surgical instruments. Manufacturers typically rely on such feedback as a major source of ideas for product improvement and innovation (see also Lundvall, 1988; Lundvall and Johnson, 1994). In some instances, groups of firms build specific managerial mechanisms such as joint ventures or R&D alliances in order to enhance the flow of knowledge, with the biotechnology industry being an outstanding example of this tendency (Powell et al., 1996).

By all accounts, inter-firm flows of knowledge are a pervasive phenomenon in the world of contemporary industry, and are critical stimuli of innovation. For a sample of relevant studies on this matter see Cumbers et al. (2003), Edquist (1997), Gertler (1995), Powell et al. (1996), Rallet and Torre (1999), Uzzi and Lancaster (2003). Most of these studies put a heavy, but by no means exclusive, emphasis on the importance of locational proximity as a prime requisite for the successful transmission of knowledge between different parties. In cases where face-to-face intermediation of tacit knowledge is at stake, the role of proximity is especially critical. A basic point that now needs to be pressed home is that this spatial condition reaffirms the major role of industrial agglomeration in the articulation of the creative field, and above all in the case of new-economy sectors with their transactions-intensive linkage structures (Audretsch, 2002; Morgan, 2004; Scott, 2000; Simmie, 2003).

Empirical confirmation of the powers of spatial agglomeration in regard to knowledge-generation can be found in the empirical work of Acs et al. (2002), Jaffe et al. (1993), ÓhUallacháin (1999) and others on the geography of patenting. This work suggests that patenting activities are typically concentrated in agglomerated centers of production. A parallel line of research based on data compiled by the US Small Business Administration underscores these results by consistently pointing to the spatial concentration of innovative events in industry (Acs, 2002; Audretsch and Feldman, 1996; Feldman and Audretsch, 1999; Feldman and Florida, 1994). The innovative activities of small firms appear to be especially susceptible to the positive stimulus that comes from agglomeration (Almeida and Kogut, 1997). The work of Jaffe et al. (1993) is notably significant as a confirmation of the positive impacts of proximity and agglomeration in the creative field because it actually traces out lines of influence from one patent to another as revealed by the citations to prior patents that accompany any application for patent protection to the US Patent and Trademark Office. On the basis of a large body of data on this phenomenon, Jaffe et al. show that cited patents originate with a high degree of statistical likelihood from the same geographic locality (state and metropolitan area) as citing patents.

Once this has been said, the ambiguities of patent data as a measure of innovation have often been pointed out (see, in particular, Griliches, 1990). Patents are notably troublesome as a measure of innovation, because not all innovations are patented, and not all patents are equally innovative or rewarding. For this reason, the empirical work cited in the previous paragraph is far from conclusive, even if it tends to point

fairly consistently in one direction. A particular problem with much of this work is that it proceeds largely on the basis of aggregate measures of patenting activity or innovation, in which data for many different sectors are pooled together. Disaggregated analysis would presumably indicate that great variety exists from sector to sector in regard to rates of patenting/innovation as a function of locational clustering, with some sectors exhibiting considerable responsiveness while others remain more or less unaffected. Moreover, whereas a high proportion of published studies based on aggregate data reveal that there is a statistically significant and positive relation between patenting and/or innovation and the clustering of firms, they rarely display evidence of the increasing returns to cluster size that we would expect on theoretical grounds. Beaudry and Breschi (2003), Breschi (1999), and Lamoreaux and Sokoloff (2000) show that numerous cases exist of industrial clusters that fail to demonstrate any proclivity whatever to innovation. Clearly, more refined analyses are required to push our understanding forward here.

One further line of research on the effects of agglomeration on industrial innovation and productivity merits some attention in this context. I am referring here to econometric work that proceeds on the basis of a fundamental division of agglomeration economies into so-called Marshall–Arrow–Romer externalities and Jacobs externalities (Baptista and Swann, 1998; Capello, 2002; Feldman and Audretsch, 1999; Glaeser et al., 1992). The former represent externalities produced and consumed only in a given sector; the latter are defined as externalities that flow between firms in all sectors. In some instances, Marshall–Arrow–Romer externalities are found to be dominant (e.g. Baptista and Swann, 1998); in others, Jacobs externalities are more prevalent (e.g. Feldman and Audretsch, 1999); in yet other cases, both types appear to be equally at work (e.g. Capello, 2002). On due reflection, this ambiguity is scarcely surprising. The simple reason is that while these measures obviously pick up on certain kinds of sectoral differences, they are inadequate substitutes for other more directly relevant variables, for from what has gone before (not to mention the wider literature on industrial districts), we may infer that the critical issue is less the origin of externalities in this or that sector, than their roots in transactional networks, learning processes, local labor market structures, infrastructural artifacts, and so on. When economists claim to find evidence for Marshall–Arrow–Romer externalities or Jacobs externalities, they are not uncovering fundamental dimensions of innovation, but only dark mirrors through which more basic processes are being reflected.

4.3. *Cultural and spatial differentiation of the creative field*

Spatial relations of proximity and separation exert profound effects on the functioning of the creative field, but cultural variations between different social groups and different places also modify these effects in very tangible ways. A shared culture is often a significant asset in promoting knowledge exchange and innovative effort, just as cultural differences can result in costly misunderstandings, particularly where tacit knowledge is involved. Gertler (1995) has documented a number of disruptive misunderstandings between Canadian users of advanced process machinery and German producers due to culturally distorted flows of information and contrasting codes of reference. In a complementary vein, Nonaka (1994) has emphasized that common patterns of socialization promote more effective communication of tacit knowledge. In circumstances where bonds of trust can be established, communication is likely to be even further enhanced (Cooke, 2002; Cooke and Morgan, 1998; Uzzi and Lancaster, 2003). A vivid illustration of the play of cultural factors in processes of communication and innovation is presented in the now classic work of Saxenian (1994), which traces out contrasts in the changing fortunes of high-technology firms in Silicon Valley and along Route 128 over the 1970s and 1980s. Firms in Silicon Valley were found to be relatively open to interchange with one another, whereas firms along Route 128 developed inward-looking cultures that effectively insulated them from incursions of new ideas. As a result, according to Saxenian, firms in Silicon Valley displayed a distinctively greater propensity for adaptation, survival, and innovation than those located along Route 128.

Once again, the important role of agglomeration as a nexus of performative intensity is underlined in these remarks. Localized clusters of firms and workers are sites of intense and recurrent daily interaction, and they are, by the same token, scenes of at least some forms of common socialization and cultural development. Local residents often acquire shared understandings and codes that ease inter-personal communication and that facilitate the formation of fresh insights in the workplace (Breschi and Malerba, 2001; Brown and Duguid, 2000a). Certain groups of residents and workers may form tightly-wrought technical and epistemic networks, or what Wenger (1998) calls communities of practice, endowed with unique kinds of problem-solving capabiltities. Still, and despite the apparently uplifting case of Silicon Valley (Brown and Duguid, 2000a; Saxenian, 1994), we should not exaggerate the tendency for community-wide cultural norms to function as a source of positive synergies. Examples of lock-in to less positive outcomes abound in reality, including the cases of traditional cultures that are in various ways at odds with the functional essentials of capitalistic development.

Notwithstanding the emphasis on agglomeration in much of the above, it bears repeating that the geography of industrial innovation also needs to be set within a much more extensive spatial context. As we have seen, the nation is a critical nexus of social forces constituting a distinctive innovation system. Increasingly, too, much innovative activity today resides in relationships that are nothing less than global in extent (Amin and Cohendet, 2004; Simmie, 2004). Multinational corporations are a major factor here. Moreover, whereas R&D activities were once thought to be congenitally tied to domestic locations (see, for example, Pavitt and Patel, 1991), the evidence now indicates that multinationals are increasingly prone to spread their research and scanning activities across multiple international sites (Cantwell and Janne, 1999; Dunning, 1993). A noteworthy detail here is that the foreign R&D laboratories of multinationals have a special affinity for locations in specialized agglomerations where they can tap into and appropriate local expertise and then re-diffuse it through their intra-corporate networks (Cantwell and Iamarino, 2002; Chacar and Lieberman, 2003; Cohendet et al., 1999; Ernst and Kim, 2002). This re-diffusion is accomplished by long-distance transmission of information complemented by occasional face-to-face meetings of key personnel. Indeed, it is common practice in both the corporate and non-corporate worlds to enrich the flow of information between individuals normally located far from one another by means of temporary gatherings (quasi-agglomerations) such as conferences, seminars, workshops, consultative meetings, and so on. These gatherings present an opportunity for brief but intensive inter-communication in highly personalized situations, after which the participants disband back to their scattered work sites.

New communications technologies are now bringing about major shifts in information-flow processes. Not only is it becoming possible to transmit ever larger quantities of explicit knowledge over greater distances at decreasing cost, but much tacit knowledge as well. Some analysts, such as Kaufmann et al. (2003) and Leamer and Storper (2001), have claimed that the capacities of the Internet are limited in this respect because it does not easily lend itself to ostensive interactions. However, if the speculations of Cohendet et al. (1999) and Foray and Steinmuller (2003) turn out to be on track, we can expect considerable relaxation of this limitation to occur in the future, as the Internet, in combination with embedded work stations, becomes increasingly capable of handling information transfers of enormous complexity and subtlety.

5. Space-time dynamics of innovation II: Culture, sensibility and symbolic products

One of the striking features of the types of knowledge, learning, and innovation that we have considered thus far is that they tend to be cumulative: one discovery leads potentially on to another in round after round of evolutionary progress. By contrast, there are important facets of the modern economy that are given chronically to the search for novelty, but that do not display much cumulative development in the guise of better and more efficient ways of doing things. The fashion industries, such as clothing or jewelry, are obviously strongly subject to this

syndrome, as are the media and entertainment sectors. More generally, cultural-products industries as a whole, as represented by motion pictures, music, electronic games, architecture, or tourism, as well as the fashion industries in the narrow sense, are all engaged much of the time in the pursuit of novel but essentially non-incremental variations in output configurations. These cultural-products sectors represent a major and growing share of employment and output in the new economy (Power, 2002; Pratt, 1997; Santagata, 2004; Scott, 2000), and they are the core elements of a rapidly widening system of design-intensive production in contemporary capitalism. To be sure, individual industries in the cultural economy are also susceptible to radical technological change (Schweizer, 2003), but the main emphasis in the present discussion will be on the symbolic and stylistic dynamics of their final products.

Just as conventional manufacturing industries fall under the sway of technological paradigms and trajectories, so cultural-products industries are subject to the play of design archetypes, i.e. basic frames of reference within which elements of symbolic content and style can be endlessly combined and recombined. Given archetypes are in one sense free-floating phenomena, in that they can be widely imitated, but they are also often intrinsically associated with a particular point of origin, such as a firm, region, sector, or nation. Like technological paradigms, design archetypes are subject to radical structural alteration, sometimes because of shifts in final market demand, sometimes because of technological or organizational change in underlying production processes. The history of Hollywood over the last century provides a number of illustrations of the latter type of change, most notably the aesthetic transformation of dramatic content that occurred as the classical studio system gave way to the so-called New Hollywood after the 1940s and 1950s (cf. Bordwell et al., 1985).

Cultural-products industries are in general exposed to high levels of uncertainty and risk due to the fickleness of consumer tastes, even where this does not entail basic changes in design archetype. In some sectors (such as music) the instabilities are compounded by the emergence of what Peterson and Berger (1975) have called "cycles of symbol production" in which large firms (or majors) and small independent producers vie with one another in rotating sequence for market share[6] (see also Hirsch, 1972). Because of this volatility, cultural-products industries are especially given to vertical and horizontal disintegration (Caves, 2000; Scott, 2002b; Storper and Christopherson, 1987), so that production is very often spread out over networks of many different firms. In addition, numerous sectors in the cultural economy exhibit strong signs of industrial dualism as represented by dominating groups of majors complemented by masses of smaller independents. The dense interlinkages that run vertically and horizontally through these sectors, combined with the massive aggregate labor demands that they generate, means that they are apt to assume geographic expression in the guise of dense agglomerations of producers. Such agglomerations occur especially in large metropolitan areas like New York, Los Angeles, Paris, London, or Tokyo, where they form distinctive industrial quarters or districts.

The transactions-intensive structure of the cultural economy is particularly characteristic of sectors like motion pictures or music recording, in that producers coalesce functionally together around specific projects (often financed and organized by majors), only to part company again when any project is completed, and then to re-coalesce in new combinations as further projects come along. Such interaction, as we know from the previous discussion, promotes the circulation of ideas and is a stimulus to creativity. Additionally, many firms, especially those that put a premium on imaginative product designs, organize their internal operations around temporary project-oriented teams in which regular employees, part-time staff, and freelance specialists combine together to pool their expertise and talent (Bielby and Bielby, 1999; Blair et al., 2001; Grabher, 2002; Sydow and Staber, 2002). Shifting, open-ended teams of this sort are often capable of multiplying the creative powers of their individual members many times over (Nonaka, 1994). Arresting examples of this phenomenon are offered by Hennion (1981) and Kealy (1979) in their accounts of how popular music recording sessions proceed through sequential adjustment as different participants, from the performers to the recording engineers, respond to

one another's comments and suggestions in actual working sessions. Grabher (2001) has described the organization of work in the advertising industry in analogous terms.

This multiple and constantly shifting transactional structure in cultural-products industries means that much of the workforce becomes enmeshed in a network of mutually dependent and socially coordinated career paths (Montgomery and Robinson, 1993). If anything, this condition is even more pronounced in the cultural economy than it is in other new-economy sectors, and it is a powerful mechanism of general socialization and habituation. Equally, it reinforces the effects of other mechanisms tending to engender distinctive cultural communities in particular places. Workers in these communities thus not only develop complementary technical skills, but also come to share sensibilities and mental attitudes that help to boost their joint creative capacities to yet higher levels. A work force molded in these ways is an exceptionally valuable asset in production systems where transfers of tacit knowledge are a key element of the labor process; and it is of particular moment in the cultural economy where competitive performance derives above all from the distinctive aesthetic and semiotic content injected into final products. In addition, densely developed industrial agglomerations are almost always endowed with formal and informal workers' associations that bring workers into even closer mutual interaction. Cultural-products agglomerations are rife with such associations, which are an important means of reducing the abnormally high-levels of uncertainty and risk to which creative workers are typically exposed (Benner, 2003). Workers participate in these associations both to facilitate the acquisition of labor market information and to keep abreast of new developments in their specialized fields of activity (Scott, 1998).

Communities of cultural-products workers and their associated production systems are the *loci classici* of what Florida (2002) has called the "creative class," though Florida's definition of this social category includes workers in a far wider group of sectors than cultural-products industries as such. Ambitious and talented individuals in search of professional and personal fulfillment find these communities irresistible, and they accordingly flock in from every distant corner in a process that Menger (1993) has referred to as "artistic gravitation." As a consequence, the labor pools of dynamic cultural-products agglomerations are continually subject to replenishment by selective in-migration of workers who are already predisposed to high levels of job performance even in advance of their arrival.

An additional ingredient in this rich creative mix of production networks and local labor markets is place itself, not only as a collection of industrial capabilities and skills, but also as a stockpile of traditions, memories, and images that function as sources of inspiration for designers and craftsworkers, and that help to stamp final products with a unique aura (Drake, 2003; Rantisi, 2004). Thus, Parisian fashions, London theater, Nashville music, or Scotch whiskey, are not just generic fashions, theater, music, or whiskey but authentic expressions of an accumulation of past accomplishments. They accordingly acquire distinctive reputations, which means that they can be imitated but never fully replicated elsewhere (Molotch, 1996). This association between place and product, moreover, is self-reinforcing because both of them are joined together through their interdependent reputations built upon the reprocessing of old images and the continual addition of new ones to local repertoires of symbologies and designs.

The capabilities and reputations of the individual firms that make cultural products and the places where they are located almost always imbue final outputs with unique competitive advantages on consumer markets. In the terms proposed by Chamberlin (1933), markets for such products are endemically given to monopolistic competition. This condition manifests itself in part in the addiction of cultural-products industries to the quest for novel product configurations. But so, too, is it evident in the occasional cases of firms that resist notable change in product designs over long periods of time because of their unique reputations on consumer markets. Thus, once a firm has established a brand with a durable reputation for quality (Louis Vuitton handbags, or Wedgwood pottery, or Rolls-Royce cars, for example) it has a strong incentive to

maintain the basic shape and form of its products. Even in these cases, periodic fine-tuning of final designs is prevalent.

The rapid rise of cultural-products agglomerations in almost all of the advanced capitalist societies in recent years goes hand in hand with cognate transformations in the wider urban environments in which they are ensconced. Cities in which high proportions of the labor force work in cultural-products sectors often express this state of affairs directly in their physical and social fabric. Landry (2000) has alluded to this phenomenon in terms of the encompassing notion of the creative city. Some of the most advanced expressions of this propensity can be observed in great city-regions of the modern world. Certain areas in these cities display a more or less organic continuity between the local physical environment (as expressed in streetscapes and architecture), associated social and cultural infrastructures (museums, art galleries, theaters, shopping and entertainment facilities, and so on), and the firms that cluster in adjacent industrial districts specializing in activities such as advertising, graphic design, audiovisual services, publishing, or fashion clothing, to mention only a few. Numerous cities have sought to promote this continuity by consciously re-organizing critical sections of their internal spaces like theme parks and movie sets, as exemplified by Times Square in New York, The Grove in Los Angeles, or the Potsdamer Platz in Berlin (Roost, 1998; Zukin, 1991, 1995). In these cities, work, leisure, and social life increasingly ramify with one another in synergistic interrelationship. The music scenes of Los Angeles and New York dramatically exemplify this trend, with their vibrant mix of live music venues, bars, restaurants, boutiques, and so on, and their associated recording industries (Brown et al., 2000; Gibson, 2003). The success of these two complexes of specialized urban life can be judged in part by the fact that they consistently turn out streams of hit records in numbers that disproportionately and significantly exceed even those that we might expect from their great size (Scott, 1999b).

Of course, the cultural economy, along with new-economy sectors at large, is also caught up in insistent processes of globalization, in the twofold sense that (a) producers are more and more inclined to shift relatively standardized work tasks to low-cost locations in other countries, and (b) final outputs flow in ever increasing volumes through international markets (Scott, 2002a, b). Like other dynamic sectors of modern capitalism, cultural-products industries are dominated by very large multinational conglomerates, most of which are involved in all phases of production, from content origination, through distribution, to final sales. The individual majors embedded in these conglomerates typically command significant economies of scale and scope, which permits them to concentrate their creative energies on the production of ambitious blockbuster outputs for global markets (Scott, 2002b). At the same time, and nowhere more than in media sectors, such as film and television, the majors are engaged in building global networks of creative partnerships such as international joint ventures, strategic alliances, co-productions, and so on. One of the benefits of these arrangements is that they allow producers to scour the world for talent, skills, and ideas. The Hollywood majors are the driving force behind this trend as they push ever forward in the race to produce successful global blockbuster films.

International markets for cultural products are currently dominated by the outputs of majors located in a small number of global city-regions, but they are also increasingly subject to contestation by producers in other places. A number of secondary cultural-products agglomerations around the world, even in peripheral countries, are in the process of upgrading their creative capacities and expanding their presence on export markets. Bollywood cinema is a notable case in point (Pathania-Jain, 2001). Many of these agglomerations have useful local assets in terms of distinctive traditions, styles, and worldviews, but producers often remain unable to tap into wider markets because of the cryptic cultural codes in which their outputs are enveloped. This state of affairs presents enormous creative challenges to producers and workers in these agglomerations as they seek to maintain significant levels of product differentiation (monopolistic competition again), and yet to cultivate more syncretic sensibilities so that their outputs are able to command a share of global markets.

6. Collective order of the creative field

The creative field that undergirds the new economy is constituted as a constellation of workers, firms, institutions, infrastructures, communication channels, and other active ingredients stretched out at varying densities across geographic space. This network of forces is replete with synergistic interactions variously expressed as increasing returns effects, externalities, spillovers, socialization processes, evolving traditions, and so on, and it is above all a locus of extraordinarily complex learning processes and knowledge accumulation. These properties of the creative field mean that much of it functions as a sort of commons, especially in the case of industrial agglomerations where so many of its constituent elements and processes are directly describable in terms of marshallian atmospherics. These atmospherics are the private property of none, and, in principle, the collective property of all, although they frequently evade explicit appropriation by the collectivity as such. They therefore often exhibit signs of severe over- or under-production and misallocation, and places where these maladjustments occur are liable to underperform in economic terms relative to their theoretical optimum (Lawson, 1999; Niosi and Bas, 2001; Oinas and Malecki, 2002). There are, then, real gains to be made where systems of public oversight can be brought to bear on these problems of the creative field, though once this statement has been made, it must immediately be qualified by the observation that our current insights and capabilities in terms of relevant policy-making and planning still remain far from equal to the task (Storper and Scott 1995).

In the period extending roughly from the 1920s to the 1970s, the perceived functional failures of industrial innovation systems (and the suggested policies directed to their rectification) were formulated in very different terms from those that dominate the present discussion. This was the period when a dominant system of fordist mass production was running its course, and when formal technological research was seen as being the critical source of increases in productivity. As economists of the period pointed out, this kind of research was (and is) subject to severe market failure (Arrow, 1962). Private firms have difficulty in exerting ownership rights over any new knowledge that they may produce, with the consequence that they tend to underinvest in research relative to potential overall social returns. Arrow's point, correctly, is that this state of affairs explains and justifies pervasive governmental programs in support of basic research.

To be sure, this problem has by no means disappeared, and government remains – as it must if capitalism is to realize its full growth potential – a major source of research funding and relevant regulatory activity. Thus, the strengthening of the intellectual property rights regime in the United States since the passage of the Bayh-Dole Act of 1980 has allowed for a great extension of patenting power across different products and institutional arrangements (Orsi and Coriat, 2003), with the consequence that a massive surge of new innovative activity has evidently occurred over the last decade or so (Antonelli, 2003; David and Foray, 2002). In the case of cultural-products industries, intensified attack by international regulating agencies on the problem of product piracy will also greatly fortify the intellectual property rights of producers and presumably help to boost creative energies in that segment of the economy. Further, as the new economy has gathered momentum, numerous shifts in the nature of public support for innovative activity have occurred, with non-governmental agencies such as civil associations, foundations, and private–public partnerships acting more and more to complement direct subsidies by the state.

Of course, much public support for innovation also comes from purely local sources. Since the 1970s and 1980s, many municipal authorities and other local agencies have played an increasingly important part in bolstering agglomeration-specific forms of innovation by providing specialized infrastructures, e.g. research laboratories, technological advisory boards, design centers, and the like (Bianchi, 1992; Castells and Hall, 1994). Specialized education and training activities subsidized by local governments are also invariably to be found in and around dense industrial agglomerations. In addition, public and quasi-public agencies frequently contribute to the formation of local social capital by promoting trade fairs, exhibitions, festivals, cultural preservation

measures, and so on, all of which have considerable direct and indirect impacts on entrepreneurship and innovation. In much the same way, there has been a notable expansion of late in the formation of institutional arrangements for the management of regional trademarks and warranties, certificates of geographic origin, and so on, all of which are important devices for protecting local economic interests. In the new economy, local authorities themselves are increasingly becoming part and parcel of the entrepreneurial and innovative powers of the creative field (cf. Harvey, 1989).

Urban planning is another of the instruments for enhancing the collective order of the creative field. Urban planners have always been concerned with issues of infrastructure and land use, but today their activities are focused more directly than they ever have been in the past on local business development and the promotion of innovative industries. A dramatic illustration these shifting priorities is offered by the grandiose Multimedia Corridor Project in Malaysia, with its focus on the promotion of new media industries and related services (Bunnell, 2002). Other illustrations are provided by the efforts of municipalities all over the world to develop science parks in order to encourage local economic development and growth. Some of these efforts – such as Stanford Science Park, Research Triangle Park, or Sophia Antipolis – have been spectacularly successful, but many others have failed to live up to their expectations (Luger and Goldstein, 1991). A further case of an urban planning initiative focused on supporting industrial creativity and innovation can be found in recent transformations of the central garment-manufacturing area of Los Angeles. In an effort to upgrade both the local environment and the clothing industry much of this area was turned into a specially-zoned enclave in the mid-1990s, officially designated the Fashion District. This enclave now exudes a carnivalesque atmosphere reflecting the renovated buildings, colorful street scenes, and up-scale shopping facilities that have sprung into existence since its creation. Although sweatshop factories still abound in the area, it has increasingly become a center of innovative fashion design and a unique tourist attraction (Scott, 2002a). Parallel developments are observable in the planned cultural quarters that can now be found in a number of old European manufacturing cities (Brown et al., 2000; Jeffcut and Pratt, 2002).

Institution-building to manage the plethora of information flows (and derivative learning effects) in spatial and functional clusters of producers offers yet another important set of possibilities for collective action in the creative field. We have already noted that these flows often take the form of involuntary and unreliable spill-over effects. Institutional arrangements that are capable of at least partially internalizing and rationalizing these flows are therefore highly desirable elements of the creative field (see, e.g. Audretsch, 2003; Lissoni, 2001; Walcott, 2002). Experiments in building arrangements of these kinds have proliferated in high-technology industrial agglomerations all over the world in the last couple of decades (Castells and Hall, 1994). One outstandingly successful instance is the CONNECT program in the San Diego area, which seeks to promote the local biotechnology industry by linking private entrepreneurs with science and business programs at the nearby University of California at San Diego (see Scott, 1993). In many cases, institutional arrangements like these also function as instruments for engendering trust between the participants in any given local economic system. Trust is a real but elusive lubricant of information flow and hence is an important stimulus for innovation. In the absence of trust – or perhaps better yet a calculated sense of mutual codependence – the long-term collaborative interaction that is essential for evenhanded exchanges of sensitive information between private firms can rarely be established (cf. Sabel, 1993). "Calculated" is the operative word here, for an excess of naïve trust only opens producers up to predatory business practices.

Lastly, the status of many segments of the creative field as complex structures of interdependencies suggests that their evolutionary trajectories through time will usually be marked by high levels of path-dependency (Boschma and Lambooy, 1999; Nelson and Winter, 1982). Path dependency is very characteristic of agglomerated production systems with their interlocking webs of transactions and local labor market activities which generally result in a developmental process

that is strongly subject to hysteresis (recall Figure 1). Institutional mechanisms that provide for at least some sort of collective system-steering can occasionally be beneficial in these circumstances, and, difficult as the task may be, may help to keep the pathway of forward evolution focused on socially-desirable outcomes. Two hypothetical cases illustrate the point. First, when a new industry emerges, it will sometimes assume an agglomerated geographic pattern at the outset, and will then rapidly begin to generate localized increasing returns effects. In this manner, the agglomeration as a whole benefits from so-called first-mover advantages, and it will tend systematically to outstrip all later competitor agglomeration by reason of its advanced dynamic of specialized entrepreneurship, innovation, and economic development (cf. David, 1985). Given the right conjuncture of circumstances, policy-makers can exploit first-mover logic to help push their region ahead in the developmental race. Second, as any regional economy grows, it may start to lock into increasingly dysfunctional configurations, as in the case of the high-technology firms located along Route 128 (Saxenian, 1994). Lock-in of this sort has many possible sources, but the induration of social and cultural conventions that may once have been beneficial, but then become shackles on further innovative advances, is assuredly one of them. Constant vigilance and mutual cross-checking are therefore required by all stakeholders in order to head off looming problems in this regard.

7. Finale: Geography and creativity

In this paper I have tried to sketch out a geographic theory of the creative field and the ways in which it shapes the functions of entrepreneurship, innovation, and economic development in the new economy. In writing the paper, I have drawn heavily on the primary research of many other scholars while simultaneously seeking to synthesize this work within a wider theoretical framework.

The creative field as identified here is representable as a nexus of locationally-differentiated, multiscalar interdependencies running throughout the domains of production, work, and territory. I have argued at length that attention to this tense force-field of relationships can help us understand a number of critical dimensions of the performance of modern economic systems. I have also suggested *passim* that very basic modulations of these relationships occur from place to place as a function of underlying spatial and locational processes. Geography, in other words, is not simply a passive frame of reference, but an active ingredient in economic development and growth. I should add that in my portrayal of entrepreneurship and innovation as socially- and spatially-embedded processes, there is no attempt on my part to depreciate the role of individual intelligence and imagination in the eventuation of economic phenomena. I have argued, rather, that human action is always an expression of the integrity of each individual's power to choose and to challenge, even as it is simultaneously and organically situated within real social structures that define the basic terrain of action.

As the difficult issues addressed by this analysis have come into view, I have hinted at a further question that can now briefly be made explicit. Why, in short, do certain places at certain times develop as foci of remarkable creativity in the form of exuberant entrepreneurship and innovation? Why did Lancashire become such a prominent center of the cotton textile industry in the nineteenth century and a vortex of related inventive genius? Why and how did Hollywood emerge as a world center of film production some time after 1915? Why did Silicon Valley evolve into a hotbed of high-technology entrepreneurial effort and innovation over the 1960s and 1970s?

The analytic deconstruction of the creative field as set forth above points to some fruitful preliminary ways of investigating these questions. By way of amplification of this remark, imagine a schematic sequence of events somewhat as follows. Assume that development is initiated in some given region by the establishment of a single unit of production, rather like the planting of a seed. For present purposes, the precise geographic location of this event may be taken to be entirely random. If subsequent growth of the type illustrated in Figure 1 occurs, the evolving industrial system will face many developmental options, but all of them will be marked by path-dependency. Regional competitive advantage will

then be secured by an endogenous dynamic of intensifying agglomeration economies in combination with the expansion of external markets. Throughout these stages of development and growth, the active mechanisms of change (i.e. the principal expressions human agency) are concentrated on the phenomena of entrepreneurship and innovation. More generally, any attempt to answer the questions posed above must formulate the problem by reference to a dynamic of cumulative causation whose logic is definable not in terms of some *primum mobile* or first cause, but in terms of its own historical momentum. This remark points once more to the importance of an ontology of regional growth and development that is rooted in the idea of path-dependent economic evolution and cumulative causation. By the same token, it also reconnects the discussion to the theories of Marx and Schumpeter, Bourdieu and Giddens, as conjured up at the beginning of this paper.

One final puzzling question remains. The essence of the question has already been partially articulated in this paper, but I shall re-frame it (provisionally) in terms that bring it more plainly into view, namely: Is it the search for knowledge and innovative energy that induces firms to agglomerate together in geographic space; or is it the prior convergence of groups of firms around their own center of gravity that gives rise to the high levels of knowledge creation and innovation so often observed in dense agglomerations? Different analysts veer to different ways of addressing this question, though there is currently an influential school of thought that puts heavy stress on the virtues of the learning region as the primary factor in agglomeration (e.g. Brown and Duguid, 2000b; Malmberg and Maskell, 2002; Pinch and Henry, 1999; Storper, 1995). I want to suggest that there cannot be any cut and dried resolution of this issue outside of any given concrete case, and that the question itself is actually not properly posed. Real industrial agglomerations, in fact, evolve along quite idiosyncratic pathways. There are plenty of agglomerations that are active and growing even though their creative capacities appear to be limited;[7] conversely, we can point to many agglomerations where the main engine of growth seems rather clearly to be their insistent creative vigor. Nor should we forget the (increasing?) number of instances of highly innovative industrial systems that show no proclivity to agglomeration whatsoever. Thus, even if we can offer reasonably plausible theoretical descriptions of the principal forces underlying agglomeration at large, each individual instance of agglomerated economic development will usually reflect a unique combination of general processes and empirical conditions, as already suggested in the classical marshallian approach to the problem. In this context, we need to stress once again that the derivative spatio-temporal dynamics are expressed not in a linear pattern of development but in recursive rounds of cumulative causation.

In other words, as I have argued consistently above, the creative field in all its manifestations can never be adequately grasped as a function of a set of "independent variables," but only in terms of structures of direct and indirect interdependence that play out in many different ways in different geographical and historical circumstances.

Notes

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[2] See Moulaert and Sekia (2003) for a useful review of these ideas and their interrelations.

[3] The preceding commentary admittedly runs counter to the emphasis accorded in much current theory to pure unmediated agency and the social autonomy of the subject. Under the guise of the "cultural turn" this point of emphasis has recently made great strides in a number of social sciences, most notably for our purposes in economic geography. However, an intellectually-vigorous economic geography, it seems to me, needs to ward off this kind of sentimental humanism (while simultaneously offering due acknowledgment of the significant role of culture in the eventuation of social outcomes), not only on the basis of the theoretical ideas developed by Bourdieu and Giddens, but also on the *ad hominem* grounds that if transformations of existing socio-spatial relations by means of free-floating acts of volition were on the cards then we would presumably already be within sight of utopia. As it is, these relations ramify with remarkably stubborn persistence on the landscape at every scale of geographical resolution.

[4] Schumpeter (1934, p. 93) refers to the motives of the entrepreneur in terms of "the dream and the will to found a private kingdom … the will to conquer … the joy of creativity."

[5] Contrary to most accounts of the origins of Silicon Valley, there was nothing truly decisive about the existence of Stanford University at nearby Palo Alto to Shockley's decision (Scott and Angel, 1987). It might be argued that if Shockley had studied location theory (even as it then was) his first choice would more likely have been Southern California with its burgeoning defense industry.

[6] The independents pioneer new styles that first attract audiences in marginal market niches. As some of these styles become popular, the majors then bring them aggressively into the mainstream. The scene is now set for new styles to appear on the fringes of the market. And so on.

[7] The garment industries of numerous large cities in both low- and high-income countries illustrate this point well.

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