A GEOGRAPHICAL PERSPECTIVE ON AUSTRIAN ECONOMICS

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> About a year ago I more or less suddenly realized that I have spent my whole professional life as an international economist thinking and writing about economic geography, without being aware of it.
>
> – Paul Krugman, *Geography and Trade*

> It has long amused high school philosophers that medieval theologians debated hotly about how many angels could stand on the head of a pin. It has only recently struck economists as strange, although not funny, that the bulk of economic theory assumes that all economic activities take place on the head of a pin. Given the capital equipment involved in most economic activities, compared to the harps and wings of angels, one would think that the pin-headed economic assumption the more ludicrous to maintain. Perhaps its greater longevity in economics says something about the relative realism involved in economics and theology.
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> – Michael Bradfield, *Regional Economics*

It has long been recognized that in order to postulate strict laws and equilibrium, neoclassical economists have oversimplified their basic models to such an extent that they have, until very recently, almost entirely excluded processes relating to time and space. As economic geographers would have it, most economists have long inhabited a "spaceless wonderland" and have behaved as if the invisible hand was located on the head of a microscopic pin. Topics like the location of the various elements of an economic system, their connection and interaction in space or the spatial impact of economic processes, most certainly because they made basic assumptions like perfect competition untenable, were thus simply tossed aside and, it seems, in time unconsciously forgotten.

Despite the fact that they were not prisoners of these constraints, Austrian economists' treatment of geographical space has been rather limited, with perhaps the exception of Fetter's turn-of-the-century contribution to the theory of rent (Fetter 1977). Otherwise, one can find echoes of a distinct Austrian perspective on geographical space in the few comments Mises made on the important role that the limited convertibility of capital goods plays in human geography (Mises 1966, p. 513). Murray

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Rothbard wrote somewhat more extensively on the "economics of location and spatial relations" and on "interlocal exchange," but he followed the lead of traditional location theory by focusing almost exclusively on transportation and sunken costs. He wrote:

> [The distribution of people and business over the face of the earth] will differ from location to location in accordance with the distribution of natural resources and the distribution of capital equipment inherited from ancestors. Another factor influencing location will be positive or negative attachments to certain areas. . . . The actual dispersal over the face of the earth is caused chiefly by the distribution of productive land and natural resources over the earth's surface. This has been one of the chief forces limiting the concentration of industry, the size of each firm, and population in purely industrial areas. (Rothbard 1993, p. 551)

Hayek's classical argument on the importance of "particular circumstances of time and place" (Hayek 1948) could have opened the way to a different line of argumentation. By that now-famous phrase, he meant things such as the heterogeneity of capital goods (i.e., that some goods are tailored for the specific needs of a very small number of consumers) and the importance of non-material components to goods (such as ease of availability, quality of service, reputation of a supplier, etc.). Obviously, these circumstances will differ greatly from one location to another, but his treatment of the impact of geographical space on these circumstances remained rather casual.

To be sure, most economic geographers would not debate Hayek, Rothbard, and other Austrians' views on economic geography, but most of them would argue that there is much more to be said on this topic. Somewhat curiously though, they would be pointing toward the importance of local conditions on a number of issues that Austrians have been addressing for a long time, such as the diffusion of tacit knowledge, and importance of local conditions on economic coordination.

Once the sole province of economic geographers and regional scientists, regional growth and development theory has been supplemented in the last two decades by a number of new offerings, both theoretical and empirical, by business school professors, political scientists, economic sociologists and, lately, by some economists.[1] In the wake of the spontaneous and spectacular rise of some regions of the world (Silicon Valley, Third Italy, M4 Corridor, Orange County, Baden-Württemberg, etc.) and the decline of once-prominent manufacturing centers (some portions of the American Midwest, Wallonie, Lorraine, etc.) which could not be accounted for by the theories then available, a large number of scholars have begun taking a new look at the industrial and social characteristics of a given place (be it a city, a town, or a region) in providing (or not) fertile soil for economic development and technological innovation. The distinctive feature of most of these analyses has been the movement away from mechanistic and static "resources allocation" or "location scanning" perspectives

[1]The recent work of mainstream economists will not be discussed at length in this article, mainly because in the opinion of this writer (and of most regional scientists and economic geographers) most of it is not very original. Additional comments and references on that issue can be found in the conclusion of this article.

towards more qualitative and dynamic analysis of technological change emphasizing the role of competition, cooperation, innovation, entrepreneurship, information diffusion, small business culture, flexibility, adaptability, and many other factors at the regional level. To put it somewhat succinctly, some places are said to be better than others at integrating the formal and informal collective processes essential to the production of permanent innovation. All participating agents profit from the advantages to be gained from being located in those special places, but the biggest benefits are said to be enjoyed by entrepreneurs and small firms who rely much more on their local economic environment than large, multi-plant corporations. The message emerging from this literature is two-fold: (1) where prosperity exists, it is regionally based; (2) the sources of this prosperity are to be found in the regions themselves and not in some exogenous factors.

This article is therefore intended as a complement to the Austrian tradition and will point out more specifically the importance of local conditions for the production of innovative goods and services. In doing so, it will borrow heavily from the main thrust of work in economic geography in the last decade, although it is not intended to be an exhaustive review of recent articles and current debates,[2] nor of the fate of planned science parks.[3] In fact, the views expressed in this article should not be taken as representative of those of the majority of economic geographers, for they depart from most of this literature on at least two counts. First, this author's views are not rooted in a belief that the "complex web of transactional relations" or the "network of synergy-producing interconnections" in a certain region—variously labeled industrial districts, innovative milieux, regional innovation systems, geographic industrial concentrations, technology districts, etc.—is an economic entity in its own right.[4] The purpose here is rather to illustrate how individuals living in the particular socio-economic environment of a region can have an economic advantage over other individuals living elsewhere. Second, it will be this author's purpose to illustrate that there is a body of economic geography theorems that are valid for all human action irrespective of time, something which is at odds with the "post-fordist"[5] theoretical framework now prevalent in economic geography.

[2]There have been many reviews of this literature in recent years. See, among others, Courlet and Soulage (1995), Garofoli (1992), Hansen (1992), Maillat (1995), Saxenian (1994), Sternberg (1996), and Storper (1995).

[3]To put things briefly, most science parks which have attempted to replicate the processes that will be described in this article have been failures. See, among others, Côté (1991) and Massey et al. (1992) for a broader discussion of this topic.

[4]A number of authors have pointed out that the conceptual apparatus used in the last two decades has still not been clearly defined, still lacks operational feasibility, and has often led to analytical confusion (Sternberg 1996). Storper (1992, p. 85) has even written that these concepts are sometimes so vague that they can be cut "to fit any circumstance, and that no particular factor or combination thereof corresponds to the cases."

[5]In short, the fordist mode of production, consisting of the mass production of standardized outputs using single-purpose equipment, is allegedly being replaced by newer production systems more attuned to greater demands for quality and variety, relying mostly upon flexible machine tools, programmable multi-task production equipment, just-in-time deliveries, and greater worker responsibility for work organization and quality control (Piore and Sabel 1984). For a critical look at this thesis, see Williams et al. (1987) and Gertler (1992).

TRADITIONAL ECONOMIC ANALYSIS OF GEOGRAPHICAL SPACE

Few economic phenomena can be considered ubiquitous. Somewhat paradoxically, one that qualifies best as a certainty, urbanization, has been virtually ignored by most economists. There is, however, a long tradition of spatial–economic analysis that can be traced back to some aspects of the work of classical economists (most notably Ricardo) and the German *Raumwirtschaft* tradition (featuring most notably the work of von Thünen and Weber), and that culminated in this century in the development of the fields of economic geography, regional science, and urban economics.[6] But to state matters briefly, until perhaps fifteen years ago the dominant approach toward geographical space was to view it as an abstract support for locational factors on which a purely exogenous "economic development" was equilibrating economies of agglomeration (centripetal forces) on the one hand, and diseconomies of agglomeration (centrifugal forces) on the other. Overall, these frameworks have mostly proven useful in explaining the locational behavior of consumer services and retail trade. Despite the completely static character of these schemes, some of the ideas used in those models are undoubtedly of great value, chief among which are "agglomeration economies," i.e., the benefits that derive from the spatial concentration of a certain number of firms. Agglomeration economies are of two types: those relating to the agglomeration of firms of the same industry in one area (localization economies), and those relating to the agglomeration of various industries in one location (urbanization economies).

Localization Economies

It has long been observed that most industries are not evenly distributed through space, but, rather, are usually highly concentrated in a few places. Thus, throughout history various cities have, at one point or another, been labeled "the capital of the world" in a highly specialized area of production. The universality of this phenomenon has long been established. For example, the Italian city of Sassuolo is famous for its ceramic tiles, Carpi for its woodworking machinery, Montebelluna for its ski boots, Arezzo for its jewelry, and Prato for its wool textiles. In Germany, Soligen has a long tradition in cutlery, Remscheid in toolmaking, Nuremberg in pen and pencils, Velbert in locksmith wares, Pforzheim in jewelry, etc. (Porter 1990).

Such geographical agglomerations of firms can be found at the city, neighborhood, or sometimes at the street level, usually depending on the capital requirements of each industry. Los Angeles's aeronautical firms are scattered throughout the city, whereas the firms involved in the specialized production of gems and jewelry in various metropolitan areas are usually packed close to the cores of their cities (Scott 1994). For example, in the middle of this century, the following trades were to be found within the confines of a few streets in Birmingham (England): goldsmiths, silversmiths, electroplaters, medalists, gilt and imitation jewelry fabrication, gem setting,

[6]On the relationships between economics and spatial analysis, see, among others, Hoover and Giarratani (1984), Dicken and Lloyd (1990), Coffey (1992), Mills and Hamilton (1994), Milne (1993), Feldman and Florida (1994), Scotchmer and Thisse (1994), and Hansen (1995). There are at least three theoretical traditions in spatial analysis, all of which are discussed at length in the classic textbook in economic geography (Dicken and Lloyd 1990): the neoclassical, the behavioral–organizational, and the structuro–marxist.

stamping and piercing, engraving, polishing and enameling, die sinkers, jewelry repair, refiners, general outwork, factors and merchants, dealers in bullion and precious stones, jewelers' material suppliers, manufacturers of optical goods, watchmakers, and miscellaneous manufacturers (Wise 1949).

Vertical disintegration is known to be positively associated with geographical agglomeration. Typically, apart from highly capital-intensive industries (steel, petrochemical, etc.), these dense agglomerations are usually made up for the most part of a huge collection of small firms from the same or closely interconnected branch of industry employing only a handful of workers, though often enough large producers are found in them. Thus, more than 60 percent of the firms in Birmingham's jewelry district had ten employees or fewer, and all were bound together in a dense structure of transactional interrelations. Closer to us, before mini-computers ran into trouble in the late 1980s, more than 70 percent of software firms along Boston's Route 128 employed fewer than 25 people, and more than 60 percent of manufacturing companies in that area employed fewer than fifty (Rosegrant and Lampe 1992, p. 27).

What are the advantages of a cluster of apparently redundant small firms over the economies of scale that a single large firm should bring? It mainly has to do with permanent innovation, flexibility, and sudden shifts in market demand. In short, the real economy is a turbulent, uncertain and highly dynamic phenomenon. Silicon Valley's *Sun Microsystems* will provide an illustration.[7]

> While specialization is often an economic necessity for start-ups, Sun did not abandon this strategy [of outsourcing] even as the firm grew into a multi-billion dollar company. Why, asked Sun's Vice President of Manufacturing Jim Bean in the late 1980s, should Sun vertically integrate when hundreds of Silicon Valley companies invest heavily in staying at the leading edge in the design and manufacture of integrated circuits, disk drives, and most other computer components and subsystems? Relying on outside suppliers greatly reduced Sun's overhead, while ensuring that the firm's workstations contained state-of-the-art hardware.
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> This focus also allowed Sun to introduce complex new products rapidly and to alter their product mix continuously. According to Bean: "If we were making a stable set of products, I could make a solid case for vertical integration." Relying on external suppliers allowed Sun to introduce an unprecedented four major new product generations during its first five years of operations, and to double the price-performance ratio each successive year. Sun eluded clone-makers through its sheer pace of new product introduction. By the time a competitor could reverse-engineer a Sun workstation and develop manufacturing capability to imitate it, Sun had introduced a successive generation. (Saxenian 1990, pp. 5–6)

Although Silicon Valley is a recent phenomenon, the geographical clustering of small firms is in no way new, and tales similar to Sun's can be found in various

[7]There will be a number of references to Silicon Valley in this article, but similar answers are obtained in all unplanned geographically localized industries (whether in manufacturing, financial services, entertainment, etc.). The emphasis on Silicon Valley is used mainly to illustrate that even in the industries most likely to use sophisticated means of communication, physical proximity still has some important benefits.

historical records. Indeed, many people noticed the phenomenon long ago and began positing various explanations for it.[8] The most well-known classical treatment of this question is Alfred Marshall's succinct characterization of "industrial districts."[9] Although Marshall apparently first noticed the phenomenon by looking at the cutlery industry of Sheffield and the cotton weaving industry of Lancashire, he noted that "indications of a like stage of things are found in the histories of oriental civilizations and in the chronicles of medieval Europe." He thus referred to a book written in about 1250 which noted such specialized production of scarlet at Lincoln; blankets at Bligh; burnet at Beverley; russet at Colchester; linen fabrics at Shaftesbury, Lewes, and Aylsham; cord at Warwick and Bridport; knives at Marstead; needles at Wilton; razors at Leicester; soap at Coventry; horse girths at Doncaster; skins and furs at Chester and Shrewsbury; and so on (Marshall 1986, p. 223). From these observations, he would derive his notion of "external economies of scale" to refer to the sources of a productivity increase that lie outside of the individual firm. As he put it:

> the economic use of expensive machinery can sometimes be attained in a very high degree in a district in which there is a large aggregate production of the same kind, even though no individual capital employed in the trade be very large. For subsidiary industries devoting themselves each to one small branch of the process of production, and working it for a great many of their neighbors, are able to keep in constant use machinery of the most highly specialized character, and to make it pay its expenses, though its original cost may have been high, and its rate of depreciation very rapid. (Marshall 1986, p. 225)

In Marshall's view, producers derive external benefits by sharing the fixed costs of such common resources as specialized infrastructure and services[10]; skilled labor pools[11] and specialized suppliers; and a common knowledge base. Although in the

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[8]Classical articles on this topic are F.S. Hall's Census monograph, "The Localization of Industries" (U.S. Census of 1900, *Manufactures*, part 1, pp. cxc–ccxiv); chapter 5 of A. Weber's 1909 *Theory of the Location of Industries*; and A.P. Usher's note on the location of industries in the 1912 U.S. Census of Manufactures. A classic analysis of the clustering of certain manufacturing industries on the basis of agglomeration economies external to the individual firm is Lichtenberg's (1960) study of the New York metropolitan region in which he identified eighty-seven industries dominated by external-economy factors of location. For a more colorful description of geographically concentrated industries, one can also look at some of the earliest articles (1937) of a young free-lance journalist, Jane Butzner —who would later marry an architect by the name of Robert Jacobs—on the flower and diamond districts of New York City. These articles were recently reprinted in Allen (1997).

[9]Marshall's characterization of industrial districts reportedly appeared in the first edition of his *Principles* in 1890 (see chapter 10, book 4 of his *Principles of Economics*, 8th ed., 1920, for the quotations used here).

[10]For example, various firms in the petro-chemical industry will cluster their installations to save on the cost of pipelines, oil ports, etc.

[11]Marshall (1986, pp. 225–26) noted that this benefited both the workers and the employers:

> Employers are apt to resort to any place where they are likely to find a good choice of workers with the special skill which they require; while men seeking employment naturally go to places where there are many employers who need such skills as theirs and where therefore it is likely to find a good market. The owner of an isolated factory, even if he has good access to a plentiful supply of general labor, is often put to great shifts for want of some special skilled labor; and a skilled workman, when thrown out of employment in it, has no easy refuge. Social forces

following decades many districts faded away with the obsolescence of their production, or through mergers,[12] or deliberate state planning,[13] most of them proved remarkably resilient and new ones kept appearing spontaneously. In Italy, the phenomenon became so widespread by the mid-1970s that it prompted some local sociologists and economists to resurrect Marshall's analysis. In Switzerland, the painful but quick adaptation of the local watch districts, following the serious setback brought about by the introduction of Japanese digital watches, also prompted a closely related literature. In the United States, high-technology analysts witnessing the spectacular rise of Boston's Route 128, California's Silicon Valley, and Orange County realized that, contrary to popular belief, agglomerative tendencies were not vanishing, and that the more "high-tech" an industry was labeled, the more likely it was to be geographically localized. As more scholars became involved in this research agenda, thousands of geographically concentrated industries were "discovered" the world over, from Thailand to France, Denmark to Japan, and Mexico to Portugal (Courlet and Soulage 1995; Garofoli 1992; Hansen 1992; Maillat 1995; Saxenian 1994; Sternberg 1996; Storper 1995). It has also been noted that metropolises are typically patchworks of industrial districts. Thus New York has, among others, its garment, financial, diamond, and advertising districts, while Los Angeles has its film and TV, clothing, furniture, and jewel manufacturing districts (Scott 1988).

Urbanization Economies

Although most cities are usually specialized in a few lines of work, they are also the hosts to many other activities supplying the most ordinary to the most prestigious piece of equipment or services to a whole range of industries. The spatial agglomeration of various activities will, for example, allow the operation of airports, hospitals or cultural activities, as well as law, accounting, and various consulting firms of the first order. The recent "core competencies" and "just-in-time" strategies of many firms has also reminded us of the benefits of a greater division of labor between firms in close geographical proximity to one another. It thus obviously makes sense for any business to externalize a function that can be done more effectively by a specialized external firm, but there are also many advantages for a subcontractor serving firms in a wide range of industries to be located close to its customers, both in terms of reducing transaction costs and increasing speed of delivery (i.e., by making daily deliveries, saving the buyer warehousing space, reducing the risk of running out of a needed item while it is being shipped from a long distance, etc.).

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here co-operate with economic: there are often strong friendships between employers and employed: but neither side likes to feel that in case of any disagreeable incident happening between them, they must go on rubbing against one another: both sides like to be able easily to break off old associations should they become irksome. These difficulties are still a great obstacle to the success of any business in which special skill is needed, but which is not in the neighborhood of others like it.

[12]Thus, Detroit's auto industry before Henry Ford and Alfred Sloan, was made up of a huge number of small firms.

[13]The silk and textile district of Lyon thus fell victim in the 1960s to the French state's campaign of economic modernization (i.e., unilateral mergers), whereas the gun district of Birmingham (U.K.) was dealt a major blow by state encouragement of mass-production in non-central areas.

On the Persistence of Agglomeration Economies

Agglomeration economies have existed from time immemorial, but non-specialists typically assume that they are something on the verge of collapse. Alfred Marshall thus wrongly believed, like many earlier and later popular writers and scholars, that production on a large scale and the fall of transportation costs of both knowledge and people—which he associated in his time mostly with the railway and the telegraph—would deal a major blow to geographic concentration. Like other prophets of the end of economic geography, however, he was proven wrong. The same can be said for the advanced telecommunication systems of recent years that show no signs of wiping out geographically concentrated industries and cities. The efficient allocation of resources over geographical space plays an obvious role in shaping the economic landscape of our world, but it cannot be the whole story behind the persistence of the geographic concentration of economic activity. What is it then? As a number of writers have pointed out, one must look at the importance of geographical proximity for innovation.

ON THE ADVANTAGES OF GEOGRAPHIC CONCENTRATION

To understand the persistence of geographical clusters of innovative firms, we first need to return to Marshallian analysis. As we have seen, Marshall identified the importance of a common knowledge base as the third major force behind agglomerative trends. As he put it:

> When an industry has thus chosen a locality for itself, it is likely to stay there long: so great are the advantages which people following the same skilled trade get from near neighborhood to one another. The mysteries of the trade become no mystery; but are as it were in the air, and children learn many of them unconsciously. Good work is rightly appreciated, inventions and improvements in machinery, in processes and the general organization of the business have their merits promptly discussed: if one man starts a new idea, it is taken up by others and combined with suggestions of their own; and thus it becomes the source of further new ideas. (Marshall 1986, p. 225)

In short, Marshall rightly pointed out that people of related trades gather close to each other because geographical proximity increases the concentration of tacit knowledge and the speed of information flows. As Austrians have long pointed out, innovation is all about continuous learning. The crucial knowledge in an industry is not standardized information, routine patterns, or even the public knowledge of science. The important knowledge is uncodified and is not available in any formalized mode of communication. It is what is new, what are the latest changes, and what is the specialized know-how that individuals have acquired through practice and mistakes. To compete effectively in many industries, it is not enough to look at trade journals or computer screens, to communicate via telephone conferences, or to monitor plants in remote locations via modern communication means. Being where your partners and competitors are is an important asset. Socializing with them allows the opportunity to ask for advice or for a specific bit of information, but it can also lead to unexpected benefits. Informal encounters where one person says to a second, "What are you working on?" and where a third jumps in and adds "I know somebody you've got to talk to; I'll call you with the number" are often very fruitful. Although exchanges of this kind might last less

than two minutes, they may prove to be the most productive encounter of the entire day for everybody involved. It was true in Marshall's time and earlier. It is still true in today's geographical clusters of innovative firms.

According to Saxenian, it is not simply the concentration of skilled labor, suppliers, and information that distinguish Silicon Valley, but the dynamics of its social networks.

> A variety of regional institutions—including Stanford University, several trade associations and local business organizations, and a myriad of specialized consulting, market research, public relations and venture capital firms—provide technical, financial, and networking services which the region's enterprises often cannot afford individually. These networks defy sectoral barriers: individuals move easily from semiconductor to disk drive firms or from computer to network makers. They move from established firms to start-ups (or vice versa) and even to market research or consulting firms, and from consulting firms back into start-ups. And they continue to meet at trade shows, industry conferences, and the scores of seminars, talks, and social activities organized by local business organizations and trade associations. In these forums, relationships are easily formed and maintained, technical and market information is exchanged, business contacts are established, and new enterprises are conceived. . . . This decentralized and fluid environment also promotes the diffusion of intangible technological capabilities and understandings. (1990, pp. 96–97)

Some authors studying less dynamic firms in stagnant regions have, however, downplayed the role played by social networks in local environments and have stressed that most small firm owners and managers tend to be individualistic and too busy to engage in constant networking (Rallet 1993; Julien et al. 1994; Joyal 1996). Be that as it may, geographical proximity in an urban setting has some undeniable advantages for those individuals who are willing to use them, namely timeliness in getting or delivering something and the opportunity of frequent face-to-face communication. Often enough, if most economic actors do not realize the importance of physical proximity when they first go into business, it later becomes apparent to them, through trial-and-error, that it is an important asset in any innovative business venture.

We shall now look in more detail at the advantages of geographic concentration on the transmission of tacit knowledge, human cooperation, and entrepreneurship.

Geographical Proximity and the Diffusion of Tacit Knowledge

The main argument in favor of the importance of physical proximity for the transmission of tacit knowledge is that deconcentration cannot be accomplished easily for activities dealing with creative work, mainly because long-distance communication is still inadequate for the continuous and detailed engineering or technical adjustments that are needed in the course of technological creation. Technology transfer typically involves specialized knowledge and is thus a personal interaction process. Information systems and data bases are enabling tools, but successful technology transfers still require the personal contact with the persons possessing effective know-how. It has also been pointed out that local distributors and representatives are usually considered poor alternatives to the actual producers (Gertler 1995).

Following von Hippel (1988), we can assume a situation in which a firm's staff of engineers has to develop a new product (exchanges of technical information take place frequently between firms, but it is not possible to apprehend the magnitude of these activities in financial or statistical terms). When required know-how is not available in-house, it is often not in publications either. It either does not exist or is only in the minds of other technical people. Since in-house development is always time-consuming and expensive, there is often a high incentive to seek the needed information from people working in other firms. And although engineers and technologists have met other technical people at various meetings, trade shows and conferences, they are more likely to be acquainted with and ask for help in the staff of nearby firms, if only because it is more convenient.

von Hippel has described this process, but in an a-spatial context, in this way:

> The informal proprietary know-how trading behavior I have observed to date can be characterized as an informal trading network that develops between engineers having common professional interests. In general, such trading networks appear to be formed and refined as engineers get to know each other. . . . In the course of such contacts, an engineer builds his personal informal list of possibly useful expert contacts by making private judgments as to the areas of expertise and abilities of those he meets. Later, when Engineer *A* encounters a difficult product or process development problem, *A* activates his network by calling Engineer *B*—an appropriately knowledgeable contact who works at a competing (or non-competing) firm—for advice. Engineer *B* makes a judgment as to the competitive value of the information *A* is requesting. If the information seems to him vital to his own firm's competitive position, *B* will not provide it. However, if it seems useful but not crucial—and if *A* seems to be a potentially useful and appropriately knowledgeable expert who may be of future value to *B*—then *B* will answer the request as well as he can and/or refer *A* to other experts. (von Hippel 1988, p. 77)

The importance of physical proximity in producer–user relations is also well documented. Considering the fact that in many industries, users, and not manufacturers, create most innovations (von Hippel 1988; Slaughter 1993),[14] this point seems indeed most relevant and explains why, historically, physical proximity between the producer and user of machinery seems to have been indispensable. In short, as Rosenberg (1970, p. 570) noted almost three decades ago, successful instances of technological change typically involve

> a direct confrontation between the user of a machine, who appreciates problems in connection with its use, and the producer of machinery, who is thoroughly versed in problems of machinery production and who is alert to possibilities of reducing machinery (and therefore capital) costs.

To quote the down-to-earth language of a Silicon Valley president:

> I don't care how well the specifications are written on paper, they are always subject to misinterpretation. The only way to solve this is to have the customer's engineers right here. There is no good way to do it if you are more than fifty miles away. (Saxenian 1990, p. 17)

[14] Kealey (1996) reminds us that this is a point Adam Smith made in the *Wealth of Nations*.

In reporting the results of a survey of users of advanced manufacturing technologies in southern Ontario, Gertler (1995, p. 16) wrote that his interviews revealed an

> emphatic and widespread agreement that site visits between user and producer—ideally throughout the entire acquisition [of a new technological] process—were absolutely crucial for ultimate success when the technology was new, complex, and expensive.

Typically, face-to-face contact was deemed especially important during the installation and initial operation of a newly acquired technology. But actually, the importance of face-to-face communication went beyond the effective exchange of information. It was also judged extremely useful in delivering training to the user's technical and operative personnel. As he put it, printed manuals were often considered "next to useless" and videotapes were regarded as poor substitutes to "being there." Gertler also mentioned the following anecdote to illustrate implementation difficulties resulting from geographical distance.

> One [Ontario] medium-sized manufacturer of plastic products described how a service person for a machinery producer in Ohio failed repeatedly to solve the user's technical problem despite repeated contact via telephone and fax. In frustration, the producer finally "sent a box of parts" by courier for the user to try. This strategy too was unsuccessful. After the user had incurred considerable expense and delay, the service person finally paid a site visit to the user's plant, whereupon the problem was solved "in about five minutes." (Gertler 1995, p. 11)

This author has also alluded to the difficulties faced by European producers in serving the North American market directly from Europe or through American distributors. Some evidence thus indicates that, unless the information transmitted is relatively standardized, new telecommunications technologies still cannot be substituted adequately for face-to-face contact.

The conventionally held view that telecommunications technology will produce a decentralization of economic production is, as we have seen, a very old one. But history tells us otherwise, as typically better communication technologies are associated with a higher geographical concentration of decisionmaking centers and highly specialized productions of goods and services, while only the most standardized operations usually become truly footloose. And although, under particular circumstances, some people might like to work from their home offices, in the end it is probably true that most humans are really social animals who like to be with other humans.

Geographic Proximity and Human Cooperation

Human cooperation is, of course, nothing new to Austrian economists (Mises 1966, p. 143). But cooperation of the type mentioned before is not always easily done, for the most important question is always: "Can I trust this guy?", something which is still impossible to establish over a telephone or a computer. Lack of full trust or a sense of insecurity typically implies some concealment of information or the expensive hiring of attorneys. Geographical proximity, because of the frequent interactions and long-term contracts or commitments between people that it allows (whether in working environments or in social activities), often plays a crucial role in

building the trust bonds that are needed in this process or in a successful customer–supplier relationship. As a Silicon Valley CEO put it:

> We've never been successful for any length of time outside of a local area. We might get a contract initially, but the relationship erodes without constant interaction. Sophisticated customers know that you must be close because these relationships can't be built over long distances. (Saxenian 1990, p. 22)

Many authors have, however, pointed out that regions dominated by large firms or branch plants, as well as almost all scientific parks, are less likely to develop cooperative behaviors than others in which the industrial structure is predominantly made up of small- and medium-sized businesses who need to get most of their inputs from their region (Piore and Sabel 1984; Hansen 1992).

Geographical Proximity and Entrepreneurship

Another area where the recent economic geography literature differs markedly from older offerings is in the focus now being put on entrepreneurship, but more specifically on "spin-offs" or "start-ups." Following Côté (1991), we can describe a typical situation. While employed, a dynamic worker acquires specialized knowledge and credibility in a particular line of business. He gets to know a number of workers who also possess specialized know-how in production, management, marketing, finance, and so on. He learns about the marketplace and about the features and weaknesses of products that sell. He also gets to know who matters in the industry, the important clients, the key distributors, the potential mentors. He learns about marketing practices and techniques, upcoming developments, and so on. Although he has seen reports on TV about great entrepreneurs, it is the successes of a former co-worker or of an acquaintance in his neighborhood that has made him realize that he too could make it on his own.

Then one day, this salaried worker sees an opportunity in the marketplace, a fragment of work in which his current employer is not interested. Leaving the security of a salaried job, however, is not an easy decision. The potential entrepreneur recognizes that he is taking a risk with his money, his future, and that the opportunity that he wants to seize must be developed as quickly as possible in order to achieve a good position in the market. Finding competent employees quickly, various inputs at an affordable price, potential buyers, and maybe an investor who believes in him weighs heavily in his decision to launch or not launch his business. It is at this junction that agglomeration economies are often the key. Their importance is highlighted by the fact that most "spin-offs" always tend to be located close to their former employers. Thus, to take a typical example, the highly successful medical equipment industry of Minneapolis–St. Paul can in many ways be traced back to *Medtronics*, whose spin-offs include, or have included: *Cardiac Pacemakers Inc., Renal Systems, Stimulation Technology, EMPI, Aequitron Medical, Med Tel, Medical Devices Inc., Pharmadyne Corp., Vivatron Inc., WR Medical Electronics Company, Population Research, Angiocor, Biomedicus Inc., Sci Med Life Systems,* and *Mentor* (Miller and Côté 1987, p. 92). As one might expect, it has also been pointed out that cooperation with the parent company is often secured if the new product is different from that produced in the mother enterprise and that spin-off activities not only lead to the exploitation of product niches, but also to an intensive interplay among local firms (Hansen 1992).

THE PROBLEM WITH RECENT RECONCEPTUALIZATIONS

If it is well known that people in organizations continually absorb new technologies (by buying them from external suppliers, inventing their own, or doing some of both) and that they also diffuse their own in numerous ways (by employees changing jobs, client-supplier relations, sponsor relations, incubation of entrepreneurs, etc.), it seems fair to say that local conditions often play a crucial, if neglected, role in this process. Although a large number of reconceptualizations have done a lot to point out the importance of local conditions, in the opinion of this writer most of these contributions do exhibit a major flaw. It is that, although their main goal is to explain the impact of local conditions on technological innovation, the analyses offered typically focus on highly specialized districts or holistic concepts. They implicitly ignore the most fundamental aspect of any type of creative process, which is that innovation typically proceeds by combining heterogeneous facts, ideas, faculties, and skills.

As a design engineer has put it: "[the main thrust of an engineer is] to gather knowledge from diverse places in order to help solve technical problems" (Fores 1979, p. 853). This obviously has happened countless times in the past. Practical metallurgy thus began with the making of necklace beads and ornaments in hammered native copper long before knives and weapons were made. Ceramics began with the fire-hardening of fertility figurines molded of clay. Rotary motion was first used in the drilling and shaping of necklace beads, and it is most likely that the playful rolling of beads strung upon a wire is an antecedent to the idea of a pair of wheels turning purposefully on the axle of a cart or carriage, and so on (Smith 1982). There is actually plenty of evidence, both quantitative and qualitative, showing the importance of the diffusion of technical knowledge between industries (Glaeser et al. 1992; Desrochers 1996; Feldman and Audrestch 1997).

If there are reasons to believe that small- and medium-sized firms get most of their technological inputs from their region's industrial base, there are also many reasons to believe that they do not limit themselves to one industrial fragment of it. This is a point that the urban theorist Jane Jacobs addressed more than twenty-five years ago (Jacobs 1969). In short, her argument is based on the contention that the spatial concentration of large groups of people permits a great deal of personal interaction, which in turn generates new ideas, products, and processes. Although her argument on the importance of local conditions for the cross-fertilization of ideas and techniques is often sketchy, it proved to have remarkable insight.[15] It was also in many ways a forerunner of the current qualitative work now being done in economic geography, although, following Lucas's endorsement (Lucas 1988), it mostly drew the attention of scholars with a more quantitative frame of mind. Some of them have presented evidence pointing toward the greater importance of industrial diversity on local job creation in both American (Glaeser et al. 1992) and Canadian cities (Coffey and Shearmur 1996), while others have used data on new product announcements at the city level to conclude that the presence of diverse industries within the same science-base in a city appears to lead to increased innovation (Feldman and

[15]This article can thus be interpreted as an attempt to clarify and elaborate on Jacobs's work.

Audretsch 1997). However, quantitative analysis cannot properly address the impact of local conditions on the cross-fertilization of knowledge, and only by looking closely at the actions of individuals will we gain any real insights into the processes at work (Desrochers 1996).

Gutenberg's invention of the printing press will afford a first illustration. In many ways, this story helps us to understand why historically most inventions have been made in cities, and why the combination of agglomeration economies and of various people interacting together indeed seems to be a major factor in technological creation. At the dawn of the fifteenth century, printing was no longer a novelty in Europe. Printing from wooden blocks on vellum, silk, and cloth apparently started in the twelfth century, and printing on paper was widely practiced in the second half of the fourteenth. Oddly enough, though, the starting point of Gutenberg's invention was playing-cards on which a few words had been printed by way of rubbing wood-blocks on a sheet of paper. As he wrote in his correspondence to a clergyman:

> Well, what has been done for a few words, for a few lines, I must succeed in doing for large pages of writing, for large leaves covered entirely on both sides, for whole books, for the first of all books, the Bible. How? It is useless to think of engraving on pieces of wood the whole thirteen hundred pages. . . . What am I to do? I do not know: but I know what I want to do: I wish to manifold the Bible, I wish to have the copy ready for the pilgrimage to Aix-la-Chapelle. (Koestler 1969, p. 122)

Gutenberg then searched for a device more resistant than wood-block, which lead him to notice the seals used to authenticate documents, but rubbing them on paper did not give a clear print. He found the solution one day, while attending a wine harvest near his city.

> I took part in the wine harvest. I watched the wine flowing, and going back from the effect to the cause, I studied the power of this press which nothing can resist. . . . God has revealed to me the secret that I demanded of Him. . . . One must strike, cast, make a form like the seal of your community; a mold such as that used for casting your pewter cups; letters in relief like those on your coins, and the punch for producing them like the foot when it multiplies its print. There is the Bible! (Koestler 1969, pp. 123–24)

Closer to us is Stan Mason, a prolific inventor who has made innovations in a wide range of industries.[16] Mason has frequently claimed that he doesn't know a thing about a lot of things, but that he does keep a very thick Rolodex. According to one reporter, "for most projects, Mason calls in three or so outside experts to noodle the problem, usually without each other's knowledge [and then] picks the best solution" (Cyr 1997, p. 47). Being based in the Connecticut extension of the New York City metropolitan area gives Mason the opportunity to easily access the tacit knowledge of a large number of experts, and clearly this seems to have been an asset in his case. Similarly, Petroski (1994, p. 35) describes the extraordinary ingenuity of

[16]A man who, among other things, perfected the stringless Band-Aid package, the squeezable ketchup bottle, wilt-proof microwave cookware, placenta bins, double-sided acne pads, and plastic underwire supports for bras. His clients have ranged from medical entrepreneurs to Pepsico. In inventing across industries, this inventor reflects the rule rather than the exception.

Jacob Rabinow,[17] a man who lived almost all of his life in the bustling industrial and commercial diversity of New York City. His creativity was greatly enhanced by living in a city where he had contact with a variety of people and their wide range of technical problems. Rabinow was able to apply the knowledge he gathered to a broader range of problems than if he had lived in a less diverse environment.

Another classical type of intersectoral diffusion is that many technology transfers between industries actually take place as a result of firms adding to, or switching, their product lines. This typically happens when individuals in a firm have developed a new technique in response to a particular problem in one industry and when it later becomes apparent that this technique, or the know-how associated with it, is applicable in another industry. This is a process that defies the economists' notion of products or well-defined industries.[18] While trying to match patent classification and SIC classification for further statistical analysis, Schmookler (1966, p. 23) made some interesting comments on this issue.

> [A major] deficiency arose from the fact that I could not assign many [patented] inventions to a single industry. In part this resulted from my own ignorance, but often it reflected the interindustry character of technology. Thus, a given improvement in the diesel engine may be used in generating electricity or driving a locomotive, a given bearing may be used in a shoemaking machine or a lawn mower, and a given knife may be used in harvesting or in kitchens. In consequence, the patent statistics used below generally do not include power plant inventions, electric motors, bearings, or other instruments or materials whose industry of origin was either multiple or simply not evident. Unfortunately, this means that the railroad data do not include inventions in the field of the steam or diesel engines, and that neither the farm nor the construction data include inventions on tractors.

This phenomenon is well documented, but to this writer's knowledge, nobody has specifically looked at the impact of local conditions on this process. Although this was not the primary focus of their study, researchers have recently begun addressing this issue in some detail in the context of the skills acquired by various Montréal firms in developing new materials and technologies for a magnetic fusion facility (Trépanier and Bataïni 1995). Thus sometimes the specific technology, but more typically the know-how that was developed in providing new components and apparatus for this particular facility, has been reused in fourteen other domains such as telecommunication, aerospace, and electronics industries. In most cases, geographical proximity was deemed crucial in the development of new technologies by providing a setting for frequent face-to-face communication between people working in various industries and in the magnetic fusion center itself and, in a later stage, by providing either local customers or a network of various technical people on which the firms could rely were they to run into particular problems in selling and implementing their new expertise outside of Montréal's metropolitan area.

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[17] Born Jacob Rabinovich, he produced a huge number of inventions ranging from self-regulators for watches and clocks to the automatic letter-sorting machines used by the Postal Service.

[18] As the prominent mainstream economist Zvi Griliches has put it, the idea of a well-defined industry "may be a mirage anyway" (Griliches 1990, p. 1666).

After a reasonably diligent search (Desrochers 1996), I think that we can identify five frequent modes of intersectoral diffusion, although it is true that they are only variations of the combined problem-solving process involved in any creative act. Some of them occur in the diffusion of products or processes: (1) an individual working alone or for a firm[19] sells his new product or process to firms from various industrial sectors; (2) a product or process already sold to firms in many industries is improved in a specific manner, and this improvement in the product or process then benefits all the previous customers. Others occur in the production of products or processes: (a) individuals working for two or more firms from various industries collaborate to develop a new product or process; (b) a product or a process already used in one industry is noticed and picked up by an individual working in another industry, with or without the collaboration of individuals working in the industry of origin; (3) an entrepreneur/manager hires workers from another sector so that they can apply their knowledge to a new production. If there are still no detailed studies of the impact of local conditions on these processes, it seems fair to postulate that the phenomena described earlier will probably play the same role here.

Without getting into the specifics of each of these modes of diffusion, the following example will provide an illustration of these processes. In the 1980s, aerospace manufacturers began using carbon composite material instead of aluminum to make tail sections, wings, noses, and fuselages. Used first in tennis rackets and skis, composite material is just as strong but typically only weighs about half as much as aluminum. But it is also far more expensive and much more difficult to handle because if the composite material is not kept refrigerated before being cut to the proper shape, the material will be wasted. Properly refrigerating a huge aircraft while in production, however, was no simple task. When production managers at *Northrop* began wrestling with this practical dilemma, one of them decided to call up the refrigeration specialists at *Sara Lee*. Not long after that, knowledge and expertise gathered through decades of refrigerating large facilities became part of modern aircraft production technology (Rothschild 1990, p. 128).

Examples of this type abound, either in historical records, technical magazines, or newspapers, but although the reasons for these transfers are intuitively well understood, their timing and the circumstances that are conducive to them are still not very well documented, probably because they usually don't leave any of the "paper trails" which social scientists are used to following. Nevertheless, they appear to be an important determinant of technological progress. One may hope that they will generate more interest on the part of students of regional growth in years to come. The final words here belong to scientist/entrepreneur/manager turned academician Ralph Landau.

> Once, in a philosophical discussion with a representative from my corporate partner . . . we examined why our relatively small research organization consistently seemed to produce extraordinary results when many other similar organizations in large companies did not, despite the obvious advantages they were offered. We attributed it in part to the fact that we had employees who lived close to the large metropolitan center of New York and who were intimately involved with global problems through the participation of the entire organization in world affairs. This gave them an extremely cosmopolitan perspective.

[19]There can, of course, be more than one individual involved.

> In private life, these people enjoyed many of the features that only a large city can offer. In fact, the kind of person who is attracted to New York is very often the kind who would not fit into the culture of a large company. For New York one can substitute few other major cities in the United States. Nevertheless, research organizations are often located on predominantly semi-rural or rural campuses where it is supposed that people can think more effectively. I have often felt that this is not always so and that the research environment for an industrial organization requires a feeling of intense energy—even pressure—and the knowledge that there are important problems that must be solved every day. (Landau 1996, p. 2)

CONCLUSION

Economic geography as an area of inquiry has enjoyed tremendous popularity in recent years, as it moved from essentially the two sides of location theory—the cost-oriented analysis of optimum plant location and the demand-oriented analysis of sales areas—to more qualitative analysis of networks of firms and the regional systems they generate. The main message emerging from the new literature is that if geography is not always a necessary condition for innovation, some environments are more likely than others to bring forth a stream of innovations. There are still, however, a number of problems with recent contributions and thus a number of reasons to believe that an Austrian perspective on regional analysis could add much to the study of these questions.

Somewhat paradoxically, the new popularity of economic geography has not so much been the outcome of economic geographers and regional scientists somehow being able to market their work to a larger audience, but rather the result of a number of outsiders to the discipline who have stressed the importance of geographical space to an audience unfamiliar with these issues, often enough making a name for themselves in the process or confirming their reputation as "authentic visionaries." Thus, few people paid attention to the "Third Italy" phenomenon before Michael Piore and Charles Sabel presented the work of Italian scholars to the world in their 1984 bestseller, *The Second Industrial Divide*. Clusters of innovative firms were "discovered" by many people through Harvard Business School's Michael Porter in his 1990 *Competitive Advantage of Nations*. Lately, business guru Kenichi Ohmae (1995) has been praised by one *Wall Street Journal* reviewer for advancing the "provocative thesis" that nation-states are dinosaurs waiting to die and that there are mysterious creatures, region states, each inhabited by five to twenty million people, that have somehow emerged as real natural units. By and large, these works have been welcomed by economic geographers and regional scientists as interesting additions to their own work.

The same can probably not be said about the work emanating from more mainstream economists who began "discovering" geography at the turn of the decade, mostly through the work of Paul Krugman (1991). Thus, the reviewer in the *Southern Economic Journal* obviously had a vocabulary problem when describing his admiration for Krugman's "meaty ideas" such as his insight of bringing "Alfred Marshall up to date" and for making the important observation that "most localizations are not high-tech" (Khalil 1992). In what has now become a typical disclaimer, prominent mainstream economists have recently written: "The second set [of theories of international trade patterns] interacts increasing returns with transport costs to

create what Krugman . . . has dubbed models of "economic geography" (Davis and Weinstein 1996).

The point here is not to express the frustrations of geographers and regional scientists with the recent work of mainstream economists,[20] something which has been done in much detail elsewhere (Martin and Sunley 1996; Hansen 1995), but rather to underline the fact that many economists, from the neoclassical mainstream to the various neo-institutionalist subdivisions, have admitted the value of a geographical perspective to our understanding of a market economy. Only Austrians as a group seem to have been spared the "geography fever" of recent years, although Austrian economics has recently been making some headway in regional analysis (Kirat 1993; Hite 1995). It is to be hoped that this article will have convinced some long-time Austrian scholars of the importance of a geographical perspective to our understanding of market processes, and that before long regional analysis will benefit from their unique perspective.

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[20] Altough a comment is probably worth making here. The most prominent mainstream economists involved in the "new regional economics" are also regulars of the trendiest academic think tank, the Santa Fe Institute, where they closely interact with luminaries of diverse fields (physics, cognitive psychology, computer science, etc.) (Waldrop 1993 [1992]). As might be expected, their work shows tremendous cross-fertilization of ideas from these other fields, yet some of them, such as Brian Arthur (1990) and Paul Krugman (1991), cling to the view that the regional specialization of industries is somehow the most efficient form of spatial organization. One of the few exceptions in that group is Jose Scheinkman (Glaeser et al., 1992). This probably shows that there is nothing mechanical about the cross-fertilization of ideas, and that any attempts at formalizing this phenomenon as if it was somewhat automatic is probably misguided.

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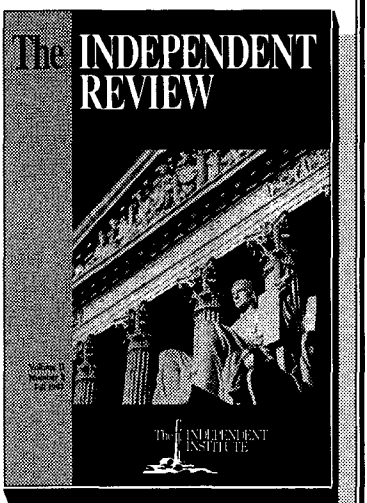

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