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Globalization, networks and regions

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GLOBALIZATION, NETWORKS, AND REGIONS

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ABSTRACT

Globalization has caused theoreticians of international trade and of technological change to rediscover the importance of place in their models. If one accepts the proposition that institutional and technological changes are the main driving forces of globalization, one has to raise the following questions: (1) To what extent does history matter, i.e., how strongly are the competitive positions of regions shaped by initial conditions and path dependence? (2) Has the increasing international mobility of capital and information replaced hierarchical institutions with networks, in the process undermining the strengths of established industrial regions? (3) How have these developments affected the locational structure of production, and therefore the general economic significance of regions as cohesive units? An attempt to answer these questions draws on theoretical considerations and empirical evidence. The conclusion is that none of the processes associated with globalization has invalidated the economic principles which explain the geographic agglomeration of particular activities.

GLOBALIZATION, NETWORKS, AND REGIONS

I.

It seems appropriate at the outset to pay a historical tribute to our host city... the birth place of the world's first public communications network. The story deserves more space than I can give it here, but I hope that even this sketch will testify to the venture's pioneering character.

In 1516, Franz von Thurn und Taxis was granted an imperial charter to establish the first scheduled, public postal service. In the same year, his relays of mounted messengers began delivering mail between Vienna and Brussels. In a few decades the service had connected most of Europe's political and commercial centers. After the Thirty Years War, the monopoly of the house of Thurn und Taxis was broken, and soon a dense system of competing routes covered Europe.¹

Although the use of courier relays to transmit messages between two locations was not a novelty, the development of regular, multi-point mail represented a genuine breakthrough. For the first time, ordinary merchants, scientists, and other men of affairs could avail themselves of a service that carried letters and documents to their destination at the unprecedented speed of 130 to 150 kilometers per day.

The innovation's features were shaped in good part by existing technical and institutional conditions. Thus, for example, mail carriages would have had a clear advantage in capacity. But the absence of decent roads meant that travel on horseback was much faster. Individual regions had no incentive to improve their portion of the road system, as long as other regions' were not improved, because the more cumbersome the progress of carriages, the greater the earnings of innkeepers and craftsmen.

Of course, the design of messenger routes was also influenced by the location of places that could serve as relay stations. And the existence of numerous political units, each with its own economic interests, produced a hodge-podge of duplicative services that fell far short of realizing the efficiency gains that might have been obtained through what we would nowadays call system integration.

Nevertheless, the innovation also helped to transform existing institutions and practices. Perhaps its most significant impact was to undermine the information monopoly of the large merchant houses, like the Fugger, whose access to their far-flung branches had given them a distinct competitive advantage. Furthermore, major nodes in the postal system soon attracted regional clusters of enterprises dependent for their business on timely information. Along the way, improved communication also contributed to the standardization of commercial practices.

Equally important was the innovation's effect on the collection and diffusion of technical knowledge. Historians agree, for example, that without regularly receiving information from abroad, a scholar like Georgius Agricola would have been unable to write his famous *De re*

¹ For this account I have drawn on Gertels (1989) and Darmstaedter (1908). A more elaborate discussion can be found in Rosegger (1991a).

metallica, a survey of the state of the mining and metallurgical arts at more European locations than he could possibly have visited in person. When it came to the spread of knowledge via the new postal service, we also encounter another familiar problem: the violation of intellectual property rights. According to contemporary accounts, couriers were frequently suspected of “using subtle practices to open the letters of learned men and having their contents copied. Then they sold these copies and thus unwittingly contributed to the spread of new ideas” (Gertels, 1989, p. 32].

My brief account of an early innovation in communications is not meant to imply that its technical features, the speed of its diffusion, or its socioeconomic ramifications are analogous to those of the late twentieth century. Nevertheless, the contours, if not the dimensions, of the innovation represent familiar variations on a few persistent themes of technological change:

- There is the influence of existing institutions, geographic activity patterns, economic practices and economic interests on the rate and direction of change.
- There is the potential of an innovation to transform existing social and economic structures.
- There is a game being played between those who would benefit from rapid diffusion and and those who consider their traditional ways challenged.
- And there is the concern of actors (individuals and organizations) that their ability to appropriate newly-generated knowledge may be threatened by innovations in the transmission of information.

The account is also intended to suggest that even radical technological change is an evolutionary phenomenon, whose directions and effects are influenced not only by purposeful action but also by self-reinforcing processes of circular causation and -- more often than our theories admit -- by plain good luck ... or bad luck.

In my following observations, I shall first look at globalization as an evolutionary process. I shall then examine the extent to which globalization is the result, and at the same time the shaping force, of the development of two types of networks -- the first institutional, and the second technological. On the basis of these observations I shall finally argue that, from both a political and an economic perspective, globalization has raised the importance of regions as cohesive units with defined structures and common interests.

II.

Globalization has become such a nebulous and overworked concept that an economist might well wish for a moratorium on its use in learned discourse. But at a time when journalists and novelists can write best-selling books attacking globalization, and with it the slender body of knowledge that forms the undisputed core of economics, that would be wishful thinking.

Yet, at the same time globalization has produced at least one intellectual benefit: It has forced mainstream economists to recognize, once again, the importance of place and distance in their theories. This is not a point that needs elaboration before an audience of regional scientists, but members of my profession had to be reminded of the fact. Thus, for example, one critic points out

that, "the modern analysis of international trade makes virtually no use of insights from economic geography or location theory. We model countries as dimensionless points within which factors of production can be instantly and costlessly moved from one activity to another, and even trade among countries is usually given a sort of spaceless representation in which transport costs are zero for all goods that can be traded" (Krugman, 1991, p. 2).

This criticism of economic theory, like all generalizations, immediately calls to mind some significant exceptions. Arguably, economists' return to geography was triggered by the growth of multinational enterprises, one of the central features of globalization. Dropping the simplifying assumptions of standard models, and moving beyond the confines of neoclassical theory, a number of researchers began to investigate the determinants of businesses' transnational location decisions. The results of these efforts have been summarized in a number of surveys, outstanding among them Dunning (1993).

A second impulse came from the growing recognition of the importance of transaction costs. Broadly defined, these include all costs incurred in the buying and selling of goods or services, in addition to those directly derived from production and consumption. The same applies to coordination costs, which include the costs of planning, organizing and controlling the activities of the widely dispersed components of multinational enterprises. Their role cannot be meaningfully discussed without consideration of place and distance. As a result of increasing intra- and international specialization, the "transactions sector" has absorbed ever larger proportions of modern economies' resources. According to one estimate (Wallis and North, 1986), in the United States it accounted for 45 per cent of GNP by 1970.

Inquiries into the social and cultural determinants of economic performance added a third strand to the story. Economists are not very comfortable with parameters that cannot be quantified. Nevertheless, explanations of the causes and effects of globalization could not get around the fact that where one conducts activities matters. Most obviously, experience with international technology transfers demonstrated that one ignores the socio-cultural peculiarities of places at one's peril. On the other hand, the monocausal attribution of economic successes to these factors has been unsatisfactory. Thus, for example, recent developments demonstrated the limitations of the often-cited "Asian cultural values" in explaining the remarkable performance of several newly industrializing economies. Whatever role these values may have played, they could not overcome the rules of the global financial game.

Concurrent contributions to the re-integration of time and place into economic theory have come from work broadly labeled evolutionary economics. The recognition that history matters more than neoclassical models admit has produced a number of insights that are relevant to the analysis of globalization patterns. The importance of initial conditions as determinants of economic activity, the role of path dependence in the development of new technologies and industries, and the notion that self-reinforcing processes can be driven by continuously increasing returns, are among these insights. Evolutionary economics has also contributed to a better understanding of

regional development, in the process giving offense to the rational visions of techno-enthusiasts and neoclassical economists.

Despite, or perhaps because of, a veritable flood of studies, one central question remains open: What, if any, are the features of the current globalization wave that distinguish it from earlier history?

One set of answers emphasizes the continuity of economic history and points out that current conditions are no more than a return to the global economy that defined the period from roughly 1850 to the outbreak of World War I. During this period, it is pointed out, millions of people migrated freely to more promising environments, capital flows in relation to GDP were greater than they are now, and the gold standard constrained the pursuit of destructive policies by individual governments (Brittan, 1998). In this view, the protectionism and monetary instability of the interwar years were no more than aberrations from the historical path toward an integrated world economy, a path that had been shaped mainly by institutional and technological innovations.

History obviously matters, but proponents of the uniqueness of contemporary globalization can point to developments that have significantly modified long-term, evolutionary trends. If one were to look for such “mutations,” one would have to point at least to the following:

- Direct foreign investment, in the nineteenth century largely confined to colonial or politically dependent territories, has become footloose, responsive only to risk-return calculations.
- Portfolio investment, the movement of funds in response to the prospect of even minor earnings differentials, has produced daily turnovers in excess of \$1 trillion. [Needless to say, these would have been impossible without modern communications technology.]
- The fastest-growing sector of the international economy is not manufacturing and trade in manufactured goods, but services of all kinds. In part these represent spin-offs of pre-existing activities from manufacturing, including the above-mentioned transaction and coordination services; in part the movement of national service sectors beyond national borders, and in part new service activities whose very nature depended on conditions that simply did not exist fifty or hundred years ago.
- Finally and most importantly, an unprecedented pace of technological change has acted as both a major stimulant and a prime beneficiary of globalization. Put more strongly, modern technology has generated a virtuous cycle, whose influence prevails over all attempts of countries to isolate themselves from the effects of globalization for reasons of some poorly-defined national economic interest.

If one were to look at the “inside” of these apparent mutations, one would of course again find numerous elements of continuity, as economic historians will be quick to point out. Furthermore, many historians are also likely to caution against the over-enthusiastic attention paid to so-called “high technology” and to the transforming power of formal treaties and agreements. In their view, globalization is as much a “bottom-up” process, promoted by competition and cooperation among firms, as it is a “top-down” process, pushed along by spectacular innovations and the policies of

national governments.

It is difficult to add anything very new to the continuity vs. discontinuity discussion. I would propose, however, that if there is anything radically new about developments since the end of World War II, it is the remarkable growth of networks. By this, I mean institutional and technological changes that have increasingly put into question such traditional constructs as center-periphery, hierarchical, and bilateral models in the analysis of international economic relations.

Global networks are sociotechnical systems that have their origins not in some deliberate, once-and-for-all design but in ongoing processes of political and economic experimentation. Although the proximate driving force seems to be technological, their power derives from the way in which they increasingly forge institutional linkages among geographically dispersed nation-states and regions. In an evolutionary sense, institutional and technological changes are mutually reinforcing and therefore inextricably interwoven. Nevertheless, convenience dictates that I discuss some of their features separately.

III.

I can do no better than to follow Douglass North (1991) in defining institutions as “humanly devised constraints that structure political, economic and social interactions. They consist of both informal constraints (sanctions, taboos, customs, traditions, and codes of conduct), and formal rules (constitutions, laws, property rights).” North also explains institutions as attempts to create order and reduce uncertainty, which “evolve incrementally, connecting the past with the present and the future.”

In terms of their potential impact on regional polities and economies, three types of institutional evolution appear to be of special interest: (1) the development of globalized, agreements and organizations, like the GATT, its successor the WTO, and numerous others; (2) the growth of geographically limited, preferential trading blocs; and (3) the even more rapid growth of interfirm cooperative arrangements.

From a political point of view, a country’s participation in global agreements and organizations involves a yielding of some degree of autonomy in legislating and policy-making, that is, a transfer of sovereignty.² Globalization of these institutions has already gone far enough for one observer to conclude:

The state is not disappearing, it is disaggregating into its separate, functionally distinct parts.

These parts -- courts, regulatory agencies, executives, and even legislatures -- are networking with their counterparts abroad, creating a dense web of relations that constitutes a new, transgovernmental order (Slaughter, 1997).

Whether these networks deserve the label “New World Order” is a question I shall sidestep. Of interest for my purposes is the question as to the impact of the emerging networks of global institutions on a nation’s various constituent parts, among them its regions.

² The attendant issues are discussed by Sir Leon Brittan in his 1997 Rede Lecture. (Brittan, 1998).

The first, and rather obvious point is that whatever the effects of global institutions, they do not bestow equally distributed benefits and costs upon a nation's economic sectors and regions. To give just one example: International environmental agreements may impose heavy costs on some industries and regions, while leaving others essentially unaffected. More generally, when international undertakings of central government place burdens on regions without financing these burdens, regions may well consider themselves pawns in a globalization game over whose rules they have insufficient influence.

A second observation concerns the possibility that the "disaggregation of governmental functions" may in fact increase the political and economic significance of regions. This is so not only because global institutions will tend to intensify the articulation of sectoral and regional interests, but also because similarly-situated regions in several countries may form coalitions to pursue these interests, in the process bypassing their respective national governments' preferences. Matthews (1997) describes this as "a shift away from the state -- up, down, and sideways -- to a supra- state, sub-state, and above all, nonstate actors."

Finally, one ought to recognize also that collective, global action by affected sectors or regions may give rise to a serious free-rider problem. According to Olson (1965), the larger and more diffuse a group with common economic interests, the greater the likelihood of free riding; therefore, the benefits sought by such coalitions may be diluted to the point where (potentially) active members' cost-benefit calculations cause them to abandon the quest for common solutions to apparently common problems. In other words, one would expect the problem to be less serious in a geographically limited than in a global context.

Although issues of sovereignty and conflicts between international and sectoral interests arise in seemingly analogous fashion, the rapid growth of preferential trading agreements (trading blocs) poses these issues in a very different context. In the first half of the 1990s alone, over thirty such agreements have been notified to the GATT, representing roughly one-third of the total reported since 1947 (Bilal, 1998). In scope and depth of coverage, the agreements range from loosely constituted free trade areas to the degree of integration achieved by the European Union.

What all of them have in common, and what distinguishes them from global institutions, is their focus on more or less well-defined "provincial" interests. These may cover the continuum from crude protectionism to the joint enhancement of a bloc's international competitiveness through industrial, competition, investment, technology and other policies. Simultaneously, the more formally organized institutions, like the EU, should primarily be viewed as "a highly sophisticated attempt on the part of European countries to have the maximum possible influence over their future in a world of globalised economic activity" (Brittan, 1998).

From the point of view of individual regions within a bloc, the pursuit of twofold objectives -- internal economic development and enhanced international bargaining power -- raises a number of potential conflicts. These are exacerbated whenever the devolution of sovereignty to some central bureaucracies leads to what particular sectors and regions may perceive to be overly rigid efforts

to standardize and regularize widely divergent types of economic activity. And these concerns are intensified in turn when sectors and regions feel that their particular interests have been compromised by their national governments, in the interest of achieving multilateral unity and global bargaining power.

It is not surprising, then, that we are seeing a tendency for sectoral and regional efforts at lobbying with bloc institutions in order to complement what is often seen as inadequate representation of their interests by their governments. At the same time, the very existence of these efforts suggests that, inside multinational blocs, regions are assuming an importance that rests not only on the dilution of national sovereignty but also on the recognition that national boundaries may be an awkward parameter, at best, for defining economic commonalities. From my observation of the dynamics of NAFTA, I have come to believe that this applies, though in differing degrees, to loosely organized blocs as well as to highly structured ones.

There can be little question, in any event, that the combination of economic integration and the emerging regionalism have, within their geographic context, transformed the character of the nation-state more than has globalization. They have also emphasized the political significance of spatial inequality, even though the evolution within blocs may have brought member economies closer to the neoclassical assumptions about competitive markets and factor mobility. This inequality is a product of history; whether the remedial policies of integrated economic blocs can break the path dependence of regional evolution must at this point remain an open question. Whatever the ultimate outcome of the debate about the respective roles of endogenous regional development efforts and regional policies implemented by supranational institutions, one claim seems incontrovertible: Global market integration and regionalism, together with a general tendency toward a roll-back of the nation state's economic power, "... have dealt a severe blow to traditional models of territorial management in which national states were able to use protectionism, subsidies, and a variety of collective and individual clientelist methods to secure [political] support in peripheral regions" (Jones & Keating, 1995, p. 11).

When all is said and done, supranational institutions and their centralized decision-making processes arguably have had less impact on the economic fortunes of regions than have those privately generated institutions -- multinational enterprises and cooperative arrangements among these enterprises. The role of multinationals has been evaluated, positively and critically, in such an extensive literature that it is difficult to say anything new about them. I shall desist. The growth of international, interfirm cooperation is an evolutionary phenomenon whose implications for national and regional economies has been recognized only in the past decade and a half.

As usual, pioneering empirical investigations, like those of Contractor and Lorange (1980) and Mariti and Smiley (1983) called attention to the phenomenon. These were followed by initial, evaluative efforts, among them Mowery (1988), Furino (1988), and Link and Tassej (1989). In the 1990s, both empirical and analytical work proceeded at a rapid pace. Time constraints prevent me from making any more than casual references to this work. A sketchy description would claim

that, initially, the evolution of interfirm cooperation was explained primarily in high-technology terms. In other words, it was thought that the network characteristics of recent innovations in communications and information technology were the main driving force for cooperation. This direction of work necessarily focussed on the formation of linkages among so-called "creative regions," as well as on the impact of the cooperative establishment of technical standards -- which would tend to stimulate or retard the development of particular regions.

Soon, however, it was recognized that cooperative arrangements also had begun to play a major role for traditional industries, most of which were -- due to historical forces -- just as heavily regionalized as their high-tech counterparts (Rosegger, 1991b). These arrangements covered vertical cooperation, along the production path, as well as horizontal cooperation, at particular stages of production, from R&D to marketing (Rosegger, 1989; Rosegger, 1996). While the forms of cooperation varied from the mutual acquisition of equity shares to loose, ad hoc agreements, their main strategic motivations were reasonably clear: They drew on both, variants of the network economies originally posited for the information technologies and on complementarities among the members of a coalition. Even if in many cases learning and coordination costs turned out higher than expected, coalitions in established industries have become a feature of global competitiveness.

As a consequence, mature-industry regions -- such as steel and automobile producers -- became linked into networks subject to strategic decisions that transcended the traditional, firm-level context. That many of these networks are transnational is a natural consequence of globalization. And that they tended to weaken the influence of national governments is another. What matters for my observations is that, on the whole and with few exceptions, the growth of interfirm cooperation has tended to confirm the path dependence of individual regions. In other words, cooperation was based on the pre-existence of technological, economic, and marketing strengths rather than on radical "mutations," in the evolutionary sense.

IV.

As I observed earlier on, institutional innovations and technological change have been closely linked in the dynamics of globalization. On the technology side, the "electronic revolution" has received the lion's share of attention in attempts to explain the emergence of new kinds of global networks. If we look at technological change in terms of Schumpeter's distinction between process, product, and organizational innovations, the high-technology emphasis certainly seems justified, because the computer and its complements have affected all three types of innovation.

I would argue, however, that first of all, the new information and communications technologies have changed economic structures and ways of doing business more than they have measurable economic performance, and second, that innovations in traditional technologies have had effects that match those of the electronic revolution. From this it follows that the survival and growth of individual regions, grounded as the economies of most of them are in well-established

technologies, depended more on their ability to adopt innovations in these technologies than on the benefits of revolutionary, "high-tech" innovations. To put the matter differently: Participation in the new communications and information networks has become a necessary but not a sufficient condition for regional prosperity.

The transition to an increasingly "knowledge-based information economy" (Eliasson, 1990) has not stopped at the boundaries of the new technologies. Many of these technologies have facilitated the storage, manipulation, and transmission of information, but they have not changed the substance of the old and new knowledge required for the successful operation of a business. Looked at in the context of the history of technology, recent basic innovations have gone through developmental stages resembling earlier basic innovations. All of them -- the steam engine, the railway, the electric generator, the internal-combustion engine -- were recognized as "basic" only after they had been diffused among potential adopters in a great variety of sectors.

The somewhat surprising aspect of recent technological transformations is that they have greatly affected the structure of economies, sectoral employment, and the fortunes of individual regions, but they did not appear to have resulted in striking improvements in economic performance. The "productivity paradox" has been the subject of numerous investigations. I have surveyed various explanations and proposed that the seeming paradox is typical for periods of major technological transitions (Rosegger, 1998). In this, I follow the suggestion of Paul David (1990) that the productivity benefits of basic innovations like computers become apparent only after long lags. In his econometric study, Sichel (1997) has come up with a variety of rigorous explanations for the paradox. Convincing as they are, they, too, suggest that it may be simply too early to come to any definite conclusions.

When structural shifts triggered by innovations impose costs on particular industries and regions, while their benefits, if any, accrue to other sectors, political tensions are inevitable. In the case of the electronic revolution, for example, exuberant media attention contrasts sharply with the symptoms of structural difficulties, leading among them unemployment and growing earnings inequality. Economists have not been of much help in redressing the balance: Since we want to measure something, and since in the case at hand we are much better at measuring inputs than outputs, we may well have presented an exaggerated picture of the information revolution's pervasiveness. [One of the most important American statistical sources on technological developments is the National Science Board's Science and Technology Indicators. By my rough count, some four-fifths of the 200-plus tables in the 1993 edition deal with what economists would define as input measures.] Stuart Macdonald (1992) put the problem bluntly when he criticized the tendency to regard data on the diffusion of information hardware and software as synonymous with the spread of economically useful information.

Fritz Machlup (1983), the great Austrian economist, insisted on distinguishing between data, information, and knowledge. The term, data, simply refers to things given -- numbers, words, records, assumptions, etc. Data flows become information flows only if the recipient possesses

the stock of knowledge necessary to turn a stream of data into information. As I have suggested elsewhere (Rosegger, 1991a), the oft-lamented "information explosion" may be no more than a data explosion. My argument was that the rate at which modern technologies have enabled individuals and organizations to receive, store, and distribute data has been much higher than the rate at which potential recipients have gained the knowledge required to turn these data into economically useful knowledge.

If it is true that a growing knowledge base is the foundation of success in global competition, then one can gain another perspective on structural unemployment and income inequality. At one time, the "problem regions" of advanced economies were identified in terms of the general characteristics of underdevelopment. More recently, however, technology-driven changes in the nature of demand for labor have turned previously prosperous regions into problem regions. These shifts could have two possible explanations. One is that the demand for knowledgeable or skilled workers has grown within all industries. If this demand could not be met, firms had an incentive to substitute innovative capital for labor; but once such capital was developed, it quickly became footloose and gravitated to economies where unskilled labor was available at lower wages. The other explanation is that there has occurred a shift in the global mix of industries, such that sectors employing a large number of knowledge workers have grown more rapidly than other sectors (Krugman, 1994).

Casual evidence suggests that both explanations have some validity. In particular, it is worth emphasizing that the massive shifts in employment from manufacturing to the service sector have raised the demand for educated workers. While the popular image of services as involving hamburger-flipping at MacDonald's seems hard to erase, the fact is that the fastest-growing services have been those involving high levels of education or training -- finance, insurance, legal work, health care, consulting, computer programming, and so on. Simultaneously, the development of global networks in services has matched that of the manufacturing sector.

I turn now to the second part of my observations, that radical innovation in traditional industries has played a role equal to that of the spectacular "high-tech" industries. The steel industry of the 1990s bears little resemblance to the steel industry of the 1960s; new technologies have reduced the economies of scale connected with large, vertically-integrated enterprises and have served as the basis for the rapid growth of so-called mini-mills, in the US and elsewhere. In the process, old regional competitive advantages were eroded, as new entrants set up operations in new locations. Modern machine tools are as much products of electronic technology as they are of mechanical engineering. Firms that failed to recognize this in time were forced out of the global market. The food processing and packaging industries have been revolutionized by a series of innovations. And so on.

Consequently, the economic fortunes of regions depended no so much on their ability to convert to "high technology" but on their firms' initiatives in innovating on the basis of their existing knowledge base. My own hometown, Cleveland, provides a good example. It is part of

an old industrial region that stretches from south of Chicago all the way to Pittsburgh. Only two decades ago it was referred to as the "rust belt." Forecasters declared the region moribund, and the media delighted in showing pictures of blast furnaces being exploded and factories shut down.

Today the former rust belt is prosperous once again, not because it abandoned its traditional mainstays -- steel, automobiles, and machinery -- but because its firms drew on the tools of the information revolution and relied on cooperative networks with foreign producers, in order to overcome a clear case of technology slip. Although innovator-entrepreneurs provided a dynamic element in other sectors, the region's basic structure has not changed. They may never have heard of evolutionary economics, but it is to the credit of state and local governments that their policies recognized the region's path dependence. Instead of chasing after the, politically attractive, *fata morgana* of revolutionary new "high-tech" industries, they pursued strategies that aimed at reviving and strengthening the existing industrial base. Firms based on new technology followed on their own, mainly because they recognized the value of a well-trained and mobile labor force.

How innovations within the framework of existing technologies and industries can lead to radical transformations is illustrated by the example of ocean transportation. Arguably, sharp reductions in the cost of shipping both bulk commodities and general cargo have been among the major factors in globalization. Thus, for example, Japan's ability to draw raw materials for its steel industry from sources thousands of miles distant revolutionized competition not only in the world's steel markets but also in the markets for derivative products. More generally, the lowering of transport costs, alongside wage differentials, helps to explain successful transfers of industrial technology to the new players in the global game.

From a technical point of view, the underlying innovations were anything but spectacular. From an economic point of view, they were radical. In the case of bulk carriers, new methods of construction made possible the realization of economies of scale previously beyond the reach of the ship-building arts. In the case of general cargo, the introduction of containerization transformed one of the world's oldest businesses. The idea of placing such cargo into standardized boxes that could be transferred directly from trains and motor vehicles to vessels and vice versa would hardly seem earth-shaking. But Joseph Schumpeter would be delighted to know that the idea did not originate with the shipping companies but with the head of a trucking firm.

At this point, it is tempting to draw parallels between the introduction of the Thurn und Taxis mail services and the evolution of containerization, but this would take me too far afield. Let me just mention that although shippers derived obvious and immediate benefits -- protection against damage, reductions in handling costs, the elimination of pilferage, and so on -- the members of the shipping industry initially were less than enthusiastic. Container transfer required investment in new handling facilities, in new systems of logistics, and in communications networks. However, once the advantages of containers had been demonstrated by a few pioneers, competition drove the new technology's diffusion. Without appropriately equipped transfer points, seaports would lose business. Once the necessary equipment was put in place, adopters would gain not only in

turnover but also by attracting new businesses to their region. Each node (seaside or inland relay point) benefited from the establishment of additional nodes in the system, which thus became self-propelling. Despite its obvious advantages, it was not, of course, just inertia that caused resistance to change: the stevedores' trade unions, the conventional freight forwarders, and other parties tied to the old technology fought a valiant rear-guard action against the innovation, but they could not prevent its success.

I do not want to imbue this story with excessive significance, but I think that it provides a fine example for a more general aspect of technological change -- its network effects. These are obvious in the cases of transportation or the transmission of messages, but they may also be paradigmatic for the less clearly visible features of evolution in other areas of political and economic activity -- which brings me back to the role of regions.

V.

If one accepts the propositions that institutional and technological innovations are the main driving forces of globalization, and that taking advantage of opportunities for the adoption of innovations requires a pre-existing knowledge base for turning data into information, then one may propose an appropriate definition of regions: They are clusters of competence. What distinguishes one region from another are its process-, product-, or market-specific knowledge base, as well as its ability to deal with exogenous institutional changes.

To state that a region possesses competence is, of course, a short-hand way of saying that its businesses and its labor force are the bearers of this competence. Following Nelson and Winter (1982), one may distinguish between "routines" (tacit knowledge) and explicit knowledge. Routines are largely the result of learning by doing. They represent the cumulative effects of path dependence, for organizations as well as for individuals.

The main effect of organizational routines is to reduce coordination and control costs: Tasks get done as expected, without specific information flowing up and down the organization, because certain situations have been experienced many times before. Within regions, patterns of firm behavior become part of the expectational infrastructure. And communications among members of organizations are made more efficient by an implicit understanding of this infrastructure.

But this produces a dilemma for well-established regions: The more successful their members are because of developed routines, the more difficult it becomes for them to recognize the need for change. Adaptation to institutional changes, such a region's integration into a new economic entity, is one aspect of the difficulties. Even more important is the need to respond to technology life cycles and consequent market shifts. Sticking with old routines, processes and products for a while longer always appears less risky than adopting major innovations. In his collection of case studies Utterback (1994) provides examples of both effective and inadequate responses to change. Similarly Richard Foster (1986), of the McKinsey consulting firm, comments on the disturbing regularity with which leading companies follow their well-tried technologies into obsolescence and

obscurity. The implications for seemingly prosperous industrial regions are obvious.

Following up on the distinction between routines and explicit new knowledge, we may ask how organizations acquire this knowledge. Answers to this question are important, because they may help us better to understand the implications of the "information revolution." As I have discussed elsewhere (Rosegger, 1996), increases in an organization's stock of knowledge are a function of the rate at which it absorbs public goods-type knowledge from its environment, the rate at which it acquires other organizations' proprietary knowledge, the rate at which it generates new knowledge in cooperation with other entities (strategic partners, governmental bodies, universities), the rate at which it hires experienced personnel, and the rate at which it produces new knowledge internally (R&D, suggestion systems, market studies, etc.). At the same time, this stock of knowledge is reduced by the outward movement of employees, by organizational and technical obsolescence, and by a process I labeled "forgetting by not doing." This refers to the opposite of "learning by doing," the source of organizational routines.

I have also argued that the relative significance of these sources varies with the life cycle of basic technologies. In an initial phase, the acquisition of knowledge is motivated mainly by the goal of reducing technical uncertainty. Subsequently, efforts are aimed at reducing economic uncertainty. Finally, as technologies mature, new knowledge is needed to deal with the emerging socio-technical systems' complexity. There is not time further to pursue the implications of this admittedly highly stylized version of the life cycle. I mention it here only because it will play a role in my summary argument: That the institutional and technological revolutions accompanying the process of globalization have in no way reduced the political and economic importance of regions, but that, on the contrary, regions continue to play a crucial role as "knowledge-based nodes" in the emerging, world-wide networks.

On the political side, the dilution of national sovereignty through international agreements and its devolution to supranational bodies have clearly increased the opportunity for regions to take a more influential role in the shaping of their own fortunes. They have done so partly by forming joint-interest coalitions, and partly by directly representing their particular interests at the international level, in the process often bypassing their national governments.

These tendencies toward an autonomization of regions have been reinforced by the growth of multinational enterprises and of cooperative ventures among them. As a result, regions have often become members of transnational production networks. This development has characterized not only "high-tech" regions but also those whose economies are based on mature industries. The automobile sector provides an outstanding example (Rosegger, 1989, 1996a).

When we turn to an examination of the impact of modern information and communications technologies on regional structures, we are confronted with a common problem: In an historical perspective, these basic technologies are simply too new to make any conclusive assessments, not to mention longer-term forecasts. As an example of the risks involved in such forecasts I shall mention only one: The prediction by experts, made only two decades ago, that computerization

will lead to a "paperless society." I would place more recent pronouncements about the evolution of "no-place economies," on account of the diffusion of communications innovations, in the same category. I think that it is safer to say that we do not yet know enough to make any generic judgments about the ultimate impact of our ability to move large amounts of data from one place to another... except for the fact that, as I have argued earlier on, transmission of such data will be of no consequence unless the recipients possess the knowledge base required to turn data into useful information. And such knowledge continues to reside in the people and organizations of particular regions. I do feel reasonably confident, therefore, in concluding that where we are will continue to matter greatly for economic activity.

Balanced analysis suggests that exuberant statements about how the information age will do away with the age-old constraints of time and place are wide of the mark. To be sure, the development of the global financial markets provides an example of how split-second communications can create a system that operates 24 hours a day, with few differences in terms of the location of transactions. And worldwide television services have brought events in remote corners into households' living rooms.

But these are spectacular exceptions to the continuing validity of the economic principles establishing the advantages of being in a particular location, for particular activities. The most important sources of such advantages, economies of agglomeration, were enunciated by Alfred Marshall, forgotten for a while, and then rediscovered. Why and how regional agglomeration of people with special skills and competences initially occurred is often best explained by historical accident. But once a region is set on a specific path of evolution, it acts as a magnet for similarly-situated and ancillary organizations. If nothing else, the knowledge embodied in people and their mobility among firms place a premium on being in a certain place at a certain phase in the technology life cycle.

If any further evidence for the power of the "laws" of agglomeration, of external economies of scale, and of path-dependent growth were needed, the emergence of regions like Silicon Valley and its replicas all over the world provides ample testimony. Even high-technology industries, many of them involved in developing global electronic networks, follow the same principles which in the past produced regional economies with their own distinctive characteristics. Whatever else the future may bring, there is little reason to assume that this feature of global economic evolution will be replaced by some new, as yet unimaginable, alternative.

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