PART V

CONCLUSION

CHAPTER SIXTEEN

Regional governance structures in a globalized world

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Regional trajectories in a globalized economy

According to Giddens (1990: 21) our modern age is characterized by increasing spatial and temporal "distanciation" and by the disembedding of social relationships from their locally bound contexts of interaction. This disembedding and increased distanciation is largely brought about by money and by "systems of technical accomplishment or professional expertise", which Giddens refers to as expert systems. Thus, Giddens perceives globalization as a central element of our modern age.[1]

The increasing globalization of economies – the object of our special interest here – must not be mistaken for the levelling of all local and regional characteristics and differences. Precisely the opposite is the case: corporate globalization strategies are meaningful only if local, national and regional differences exist and can be harnessed on a global scale. Giddens also emphasizes this fact and points out "that all disembedding mechanisms interact with re-embedded contexts of action, which may act either to support or to undermine them" (ibid.: 80). Therefore, globalization strategies can be understood as organized efforts to utilize local and regional differences in a worldwide context. This necessitates the adaptation of objectives, possibilities and strategies to the given local contexts. The risky and onerous implantation of foreign companies into new sociocultural environments is already associated with considerably higher demands than conventional export strategies. Without doubt, a global player must be capable of a considerable measure of empathy and must create more local embedding and networking, and consequently a more precise working knowledge of a certain region becomes an essential operating condition.

Through this interplay of disembedding and re-embedding, a given location

1. "Globalization can thus be defined as the intensification of worldwide social relations which link distant localities in such a way that local happenings are shaped by events occurring many miles away and vice versa" (Giddens 1990: 64). The time–space distanciation and the increasingly longer chains of interdependency were already described by Simmel (1989), taking money-mediated exchange relationships as an example.

changes: "The local community is not a saturated environment of familiar, taken-for-granted meanings, but in some large part a locally situated expression of distanciated relations" (ibid.: 109). This implies the following for the globalization of economies: regions will be reconstituted on a global scale – and in some instances this may arise only because a globally active corporation (and this could also apply to a company with only 300 employees) has observed a certain region in terms of its potentially exploitable economic advantages over other regions for present or future investments. This process also changes the challenges with which local or regional actors are confronted. Business or professional associations, unions and politicians concerned with industrial policies are faced with the task of creating an innovative local environment, wherein innovative strength must increasingly define itself in a global context. Regional innovation policies increasingly derive their parameters from a global horizon of different development paths, technological options, product life-cycles, and so on, and must also do justice to regional policy objectives such as employment, income, taxation and welfare development.

The presentation of cases in this book documents impressively how the 14 regions investigated employ different strategies and achieve different results in holding their own in an increasingly global context. In this concluding chapter we are concerned with those factors determining the strategies outlined. On a general level, the scope for action and the strategic options of regional players will be identified against the background of evolved regional structures. The authors argue that the new constitution of regional economies within the context of an altered division of labour is determined to a considerable degree by institutional and industrial structures that have emerged in the course of regional industrialization history often spanning hundreds of years. It is the authors' intention to cast light on economic–structural and institutional path dependencies. In doing so, the authors proceed on the assumption that there are not only technological (Dosi 1982) but also regional trajectories. Technological knowledge is not only organized in large-scale technical systems (Hughes 1987), in branches or in professions, but often also in regional innovation systems; and this knowledge, incorporated in regional production clusters, cooperative relations, institutions and policy patterns, does not usually develop in great leaps and bounds, but incrementally, step by step.

An evolutionary theory approach leans intentionally to one side, as other determining factors of regional economic strategies – such as a region's geostrategic position within NAFTA, the EU or in Southeast Asia – are blended out of the picture or are only interpreted in view of the internal development potentials of a region. Secondly, such a view is not be understood in the meaning of institutional or economic determinism. The regional traditions of work, management and innovation are perceived less as an "iron cage" and more as a repertoire of behaviour and interpretation patterns (Swidler 1986). Regional players draw on this repertoire in a more or less targeted manner. Thirdly, in emphasizing regional development lines of innovation patterns, it is not our intention to underestimate the significance of sub- and supraregional governance structures. We are convinced that theories postulating the end of nation-states neglect unjustifiably the continuing signifi-

cance of national work and management patterns (e.g. Heidenreich & Schmidt 1991, Whitley 1992, Hickson 1993).

In the introduction, Cooke dealt with various modes of learning in and by given regions. He arrived at a grading starting with "learning by doing" and extending to "learning by learning". This indicates that regional economies can be understood as places of collective technological learning. Given today's global economic conditions, the institutionalization of learning is what counts the most, and thus also the elevating of the "collective" level of reflection. In this line of thought we are interested in the possible typological classifications concerning preconditions and different courses that processes of learning will run, and we are also interested in the way in which the regions presented here can be differentiated with regard to their industrial development paths and their present problems – as a concrete expression of regional "learning curves" and "learning requirements". We assume that learning processes are also evolutionary and therefore run a path-dependent course (whereby the convergence of development paths of technologies and regions is naturally an exception). Technical knowledge and technological learning are therefore bound to context and region; "technological capabilities . . . reflect local, regional and national contexts and environments" (Storper 1995: 897).

Accordingly, the future development of every region is largely predetermined by its technological, economic, cultural, political and social history. In our context, regionally rooted technological competence plays an exceptional role. Here, regionally developed "assets", which may be embedded in densely woven networks of interactive and exchange relationships, must be comprehended as the key to understanding regional problems and regional capacity for taking action, as they are a central precondition for regional capacity for action. In addition, information concerning, or insight into, interregional conditions and relationships must be available. The latter reveals something about the relative significance of regional assets. As examples for interregional significance we could consider Singapore, on the one hand, which has successfully evolved into Southeast Asia's logistics and service centre. On the other hand, one could take the Finnish region of Pirkanmaa, where a reservoir of technological competence and outstanding wood and paper processing companies (including the production of investment goods) stands in contrast with low or declining profit–sales ratios and return on capital, and the world market would appear to be absorbing these highly esteemed and technologically sophisticated products in quantities unsatisfactory for the region. Looking elsewhere, Wolfe & Gertler have illustrated convincingly that Ontario is very well endowed with automobile production facilities. In view of the poorly developed independent R&D capacities in this sector, however, Ontario is unlikely to be able to overcome its functional dependence on the US states of the north and Midwest over the medium term. The account of Southeast Brabant provided by Boekholt & van der Weele illustrates an excellent example of the significance of regional economic structures. In that region, the authors investigated regional technological competence developed under the autarchic regime (cf. Herrigel 1996) of a single large-scale corporation; the economic utilization and exploitation of these capabilities hinge on the fate of a single corporation.

The above examples reflect different organizational and regulatory forms of technological capabilities. Based on these studies, we now re-analyze these forms from a comparative perspective.

Industrial change and technological competence

The economic development paths of the 14 regional economies can be positioned in a three-dimensional space. In adopting this approach, our intention is to summarize under certain uniform aspects the preceding expertise, in which the authors have naturally chosen various points of focus and elaboration, while remaining conscious of the risks with which such an attempt may be beset. In the first of our three dimensions, we will position the central economic areas of focus and the associated technological capabilities. The second dimension is concerned with the relative position of the given region within the respective fields of technology. Thirdly, we will raise the question as to how successfully the given region, with its chosen economic strategy, has positioned itself within the global division of labour. In this way the individual characteristics of technological and regional development paths will be duly considered. Subsequently, we will also be concerned with the special features of the respective regional governance structures that have developed in a manner complementary to these economic structures.

We will position the individual regions in the first two dimensions on the basis of a nine-field layout. In the vertical columns specifying the economically dominant sectors of a region, we differentiate between three different development phases of industrialization. Figures 16.1–16.4 reflect the inherent continuing trend, namely the global shift of industrial activity from labour and resource-intensive industries (extractive industries, wood, iron and steel, the food industry, sections of the mechanical engineering and chemicals industry) via the technology-centred mass production of the industrial age (automobile manufacturing, electrical engineering, electronics and computers, textiles and garments, furniture, shoes and other simple consumer goods, telecommunications) towards knowledge- and service-based industries (aerospace, multimedia, biotechnology, corporate services). Here we have chosen the definitions "old industries", "mature industries" and "new industries". In opting for this classification we are not passing any kind of judgement on the innovative activity or the high-tech intensity of industrial branches. The intention is to mark the present relative position of a region within an imagined continuum of industrialization, from traditional to new industries. In addition, we would like to render the traces of regional development paths visible.

The horizontal entries reflect the relative technological competence in these sectors. We differentiate between three classes of regional competence, namely "catching-up regions", "routine producers" and "pioneer or top manufacturer". We refer to those regional economic sectors as "pioneers or top manufacturers" that occupy a top position by global standards. The GERD (gross domestic expenditure on R&D) value is an indication of such a position, as well as the endogeneity

of regional R&D or design capacities. "Routine producers" denotes production areas, in which the regional corporations trail behind leading manufacturers, although these regional companies maintain high levels of productivity and quality. In most instances, the technological competence of routine producers concentrates on controlling manufacturing and assembly operations. However, the strategically important technological capabilities in research, development and design are rarely endogenous. Manufacturers involved in the process of catching up have either developed an independent industrial basis on certain technological trajectories in several functional areas of routine production, or else we are dealing with economic areas of a region that have fallen behind in a new technological area. We assume that sectoral and technological focal points in the regions influence their development possibilities and that their contents make special demands on the regional innovation system.

By entering the information on the respective dominant industrial sectors and technological capabilities, different regional development patterns are obtained. The distributions reflected in Figures 16.1–16.4 form the foundation for development of the four following types.

Type 1: top position in knowledge- and service-based economic branches

In those regions classed as type 1, there is a predominance of knowledge- and service-based economic branches. Prime examples are the development of the California multimedia industry, the rise of Singapore to Southeast Asia's leading service and logistics centre, and the aerospace and electronics complex concentrated in the Midi–Pyrénées region (Fig. 16.1).

The basic conditions of these three regions positioned in the upper right field of the chart are widely divergent. Although California has probably accomplished the technological development indicated here as a result of path dependency, behind the regional success stories of Singapore and Midi–Pyrénées massive government intervention and/or far-reaching government arrangements in the background have acted as driving forces. California has been able to maintain its pioneering and leading position in the mature industries (electrical engineering, electronics, computers) and to expand this position further in pursuing a strategy of knowledge- and service-based industrialization. Apart from the multimedia industry Scott described, the worldwide leading position in biotechnology is also notable. So far, there is no other region that has occupied three industrial sectors (in terms of endogenous technological competence) in the top right-hand corner of our chart. As Scott convincingly documented in his contribution, the electronics and computer industries have played a decisive role in achieving this top position. Within a very short period of time Midi–Pyrénées and Singapore advanced from an agriculturally orientated region or from a developing country to regions that have been able to build up knowledge- and service-based industries in a leapfrog manner. This is also a reflection of the special institutional conditions in the two regions (cf. Chs 14 and 15).

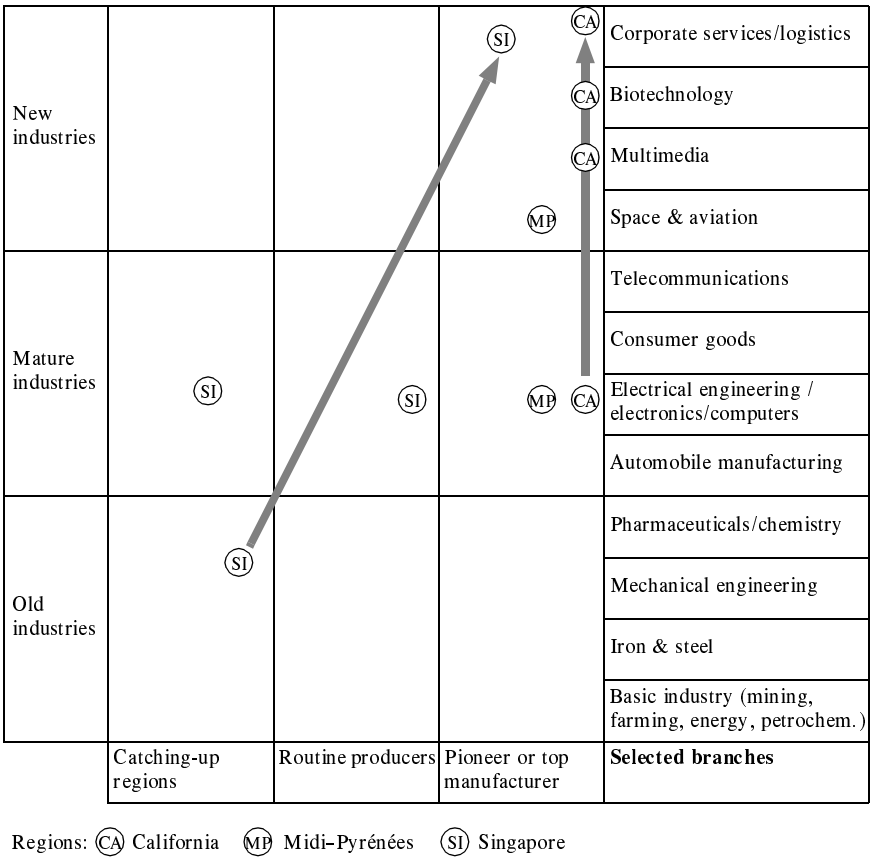

Figure 16.1 Top regions in terms of knowledge- and service-based industries (type 1).

In comparison with California, Midi–Pyrénées and Singapore, Baden–Württemberg, Catalonia, North Rhine–Westphalia, Ontario and Québec tend to occupy more waiting positions with regard to knowledge- and service-intensive branches, and at best hold positions of gaining ground or catching up.

Type 2: industrial cluster formation paired with technological excellence

In the regions classified under this type, industrial players are organized in relatively strongly locked production clusters (Fig. 16.2). In many instances two or three dominant industrial branches are very closely interwoven through regional supply and performance relationships. This high degree of interaction and integration gives rise to the development and stabilization of technological competence. Among those regions with top technological positions in the areas of old or mature industries and whose economies are very strongly organized in clusters, we find North Rhine–Westphalia (coal, steel, iron, mechanical engineering,

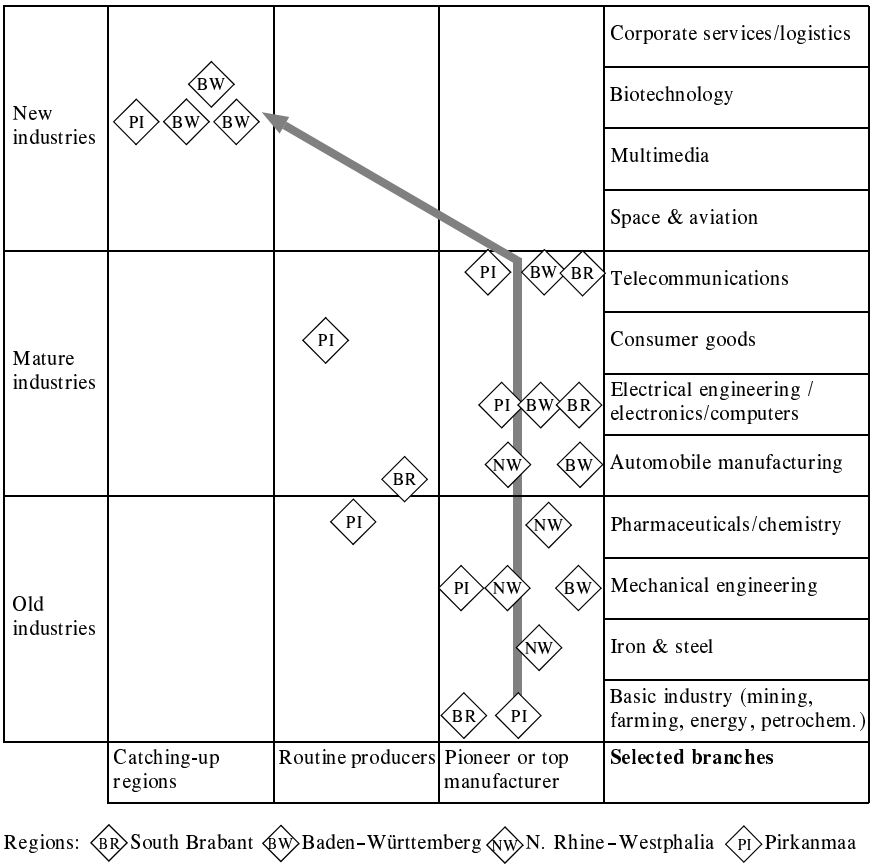

Figure 16.2 Regions characterized by industrial clusters paired with technological excellence (type 2).

automobile industry), Baden–Württemberg (automobile industry, mechanical engineering, electrical engineering, electronics), Pirkanmaa (forestry and timber industry, paper machines and paper industry), Southeast Brabant (automobile industry, electrical engineering/electronics). Figure 16.2 reflects this development pattern.

Type 3: catching-up and routine manufacturers in old and mature industries

Under the type 3 heading we will group regions that occupy a relatively subordinate or downstream position (relative to other regions) in terms of their economically utilized technological capabilities. Our chart layout (Fig. 16.3) shows a line of development progressing from old industrial branches to the younger industrial sectors, primarily in the area of so-called routine producers. These are

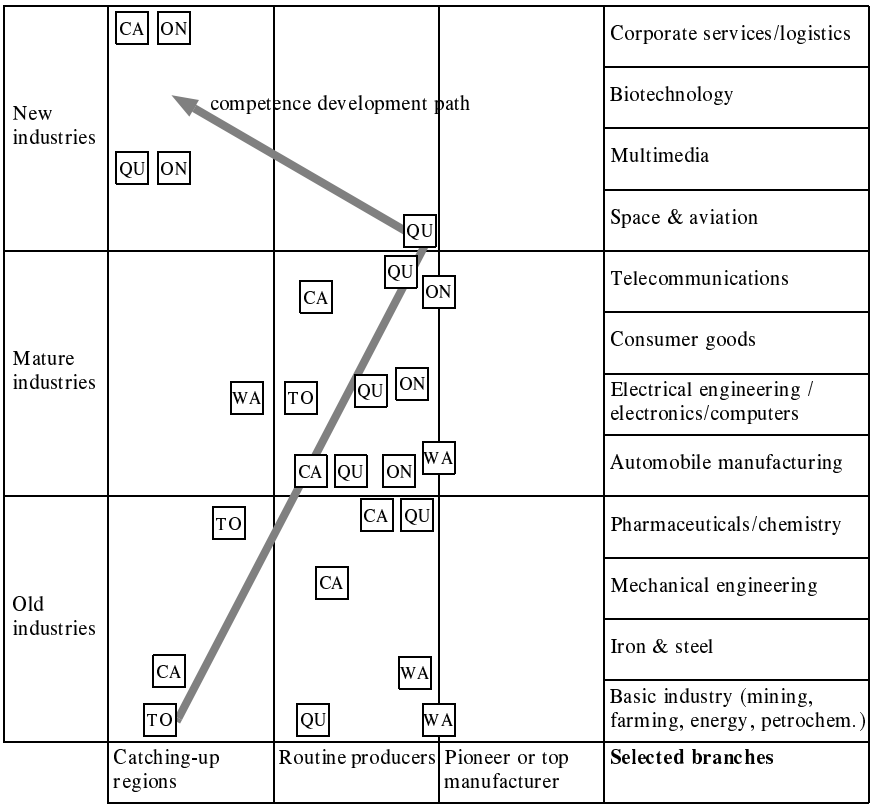

Figure 16.3 Regions in a catching-up position dominated by old and mature industries (type 3).

either regions in which industrialization set in relatively recently (e.g. Tohoku) or industrial regions that are strongly dependent of exogenous technological expertise (i.e. on foreign direct investors). Catalonia, Ontario and Québec largely conform with this development pattern. The industrial reorganization and the successful relocation of foreign companies (above all, Japanese and western European corporations) that followed the Welsh mining industry crisis also places Wales in this category.

The regions we grouped as types 2 and 3 have at best attained a catching-up or follow-the-leader position in the sector of knowledge- and service-based industries. Most regions still firmly rooted in old and mature industries have hardly gained a foothold in new industries to date. None of these regions has so far been able to use their average or leading position in conventional industries towards developing knowledge- or service-based industries.

Type 4: technological decoupling and niche production

Denmark and the Tuscan industrial districts represent a type characterized by technological decoupling and niche production (Fig. 16.4). Both regions are distinguished by their extensive specialization in consumer goods development and production. In doing so they decoupled themselves from the leading edge of the continuing high-tech race; the technological competence of these regions revolves around exceptional design competence and highly flexible forms of intercompany division of labour. Considering the exceptional export success of Danish and Tuscan companies in the area of technologically less sophisticated products, this decoupling is a viable economic option. Moreover, it would seem that it lends a considerable measure of resilience. According to the interpretations by Dei Ottati and Maskell, there is little cause to regard the Tuscan industrial districts or the Danish economy as endangered just because they have not made any major inroads into knowledge- and service-based segments.

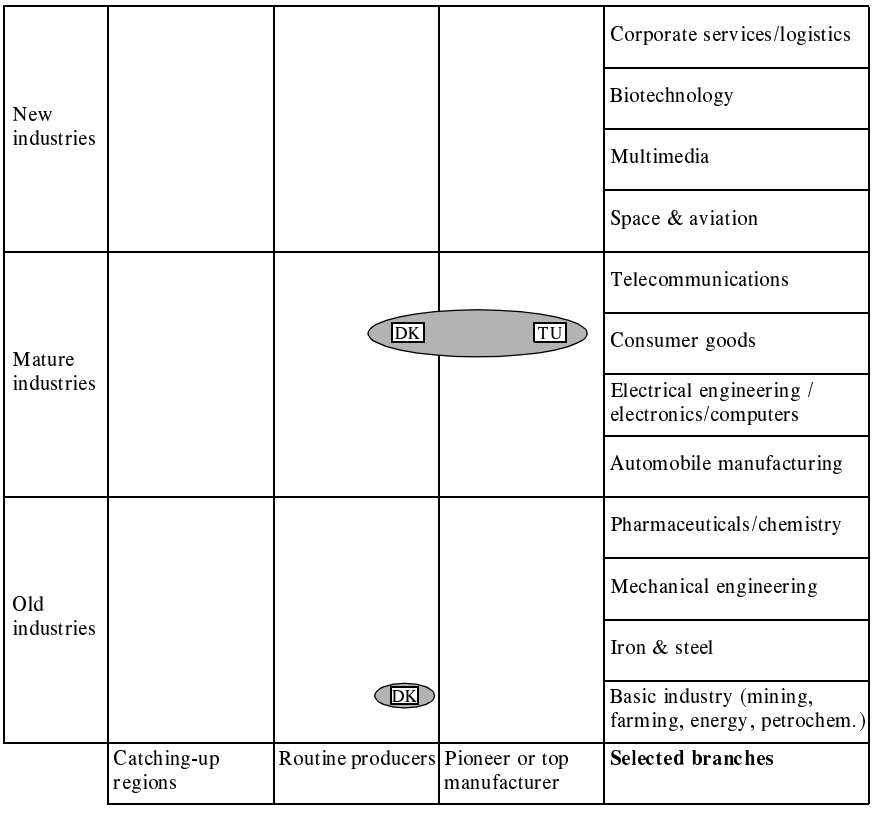

Figure 16.4 Technologically decoupled regions and niche production (type 4).

We will now add a third dimension to the two-dimensional concept, namely that of the economic position. Economic growth and employment will be taken as indicators of a region's economic position. As the case studies show, those regions that have either opted for high technological competence in knowledge- and service-based sectors (such as California and Singapore; not Midi–Pyrénées, however), or have charted a course of decoupling and niche production, have recorded the greatest success. However, regions with technological capabilities concentrated primarily on old or mature industries are experiencing growth and, above all, employment difficulties. Viewed against the backdrop of their development to date, these regions can no longer be regarded as successful without reserves. These regions include Baden–Württemberg, North Rhine–Westphalia, Pirkanmaa and Southeast Brabant. Of the four above-mentioned areas, we must differentiate those regions that are fully or predominantly in catching-up positions, or focus on routine production. Seen in terms of their respective basic or general conditions, these regions must be regarded as economically successful. Wales and Ontario, and also Catalonia and Québec, are such regions.

Based on these findings we arrive at the following conclusion: the path-dependent development of technologies (recorded here by a rough approximation with the help of industrial sectors, an approach that may certainly be open to criticism) represents a restriction for most regions that cannot be simply circumvented. Only in exceptional cases has the branch- and technology-induced prestructuring of technological capabilities been broken through. Frequently, massive government intervention, coordination and accompanying measures have been required to this end, as the examples of Singapore and Midi–Pyrénées show. An alternative strategy consists of specializing on consumer goods markets, where design competence, quality, flexibility and closeness to customer are called for. Here, the development and utilization of leading-edge technologies play a less prominent role (Tuscany, Denmark). However, the latter confirm the rule that regional development paths are to a considerable extent prestructured by the technological capabilities incorporated in branches, corporations, clusters and other regional networks to date. These regionally available technological capabilities only represent a potential, the utilization of which hinges very strongly on the political–institutional structures of a region (i.e. on the design and endowment of the regional innovation system). Next, we shall take a closer look at these issues.

Institutions as resources and restrictions

In the following discussion, we aim to show that the development of regions is determined not only by technological but also by institutional path dependencies. Institutions such as the education and training system, regional research and development capacities, industrial relations and financial services regulate the manner in which the technological knowledge available within a region is generated, further developed and harnessed economically. Amin & Thrift (1994b: 14 ff.)

introduced the term "institutional thickness" to denote the above. They call attention to the following aspects of this concept:

- the staying power of institutions is of considerable significance
- the local construction and enrichment of a reservoir of shared knowledge is a notable aspect
- Amin & Thrift perceive the capacity for learning and change as inherent to institutional flexibility
- the innovative capacity of companies is viewed as a shared characteristic of a given region
- regional interactions are firmly based on trust and reciprocity
- regions give rise to a consolidated feeling of belonging among their inhabitants.

This analysis accords a special resource quality to institutional settings. In actual practice, institutions offer resources for the acquisition, implementation and economic utilization of technological knowledge. The interaction of education and training, research and development, technological information, production and financing is the foundation for a more or less innovative local atmosphere. A dense institutional endowment, whether formal or informal, is often regarded as an indicator of the regional collective capacity for taking action, innovative strength and flexibility. Frequently, the development of regional innovation systems is equated with the establishment of the respective "innovation-promoting" institutions. In particular, regions in catching-up positions and with a strong focus on routine production unfold considerable activities in founding educational, transfer, consulting and communication facilities for economic and technology promotion. This is also borne out by the chapters in this book. The latter are orientated to the institutional depth and structure of highly developed and economically successful regions. According to the findings set out in the preceding contributions, such strategies of institutional learning or institutional borrowing can hardly be transferred to regions that are now battling with difficulties, in spite of a highly developed institutional thickness and former successful economic development. Particularly in the once-successful regions with a dense institutional landscape (such as Baden–Württemberg, North Rhine–Westphalia and Southeast Brabant) the creation of new institutions will not suffice. The extension of the local or regional institution sets alone would not guarantee the necessary flexible adaptation and innovative behaviour characteristic of economically successful regions.

Therefore, there is no clear-cut measure for the value and significance of institutional density. First, the resource functions are also associated with the limitation to trusted and tried development paths, the concentration on certain contents, the exclusions of other possibilities – up to institutional lock-ins (Grabher 1993). This has also been impressively documented by post-socialist transformation research (cf. Dittrich et al. 1995).

Secondly, regions are neither autonomous nor sovereign in terms of relations with the nation-state or supranational organizations. The regional institutional arrangement is linked with elements of superordinate governances. In spite of the considerable significance of regions in the globalization process, the national

governance level remains important for the regional level, as Shiro Abe emphasized in his contribution. Regional players must make efficient use of their connections at the national level, or in some cases establish these relations in order to lend weight or call attention to their interests and demands (cf. Storper 1995) to local lobbying groups and coordinating councils. Institutions and governances on the national (and also the supranational) level exert considerable influence on regional issues and interests (Drache 1995). The relative scope for autonomous action of a region defines itself in its dependence on national and sometimes supranational institutions (as in the case of the EU). The rising significance of regions as playing fields of corporate globalization strategies also sets limits to the regional scope for taking action. Quite rightly Kohler-Koch (1996) raises the question as to where exactly the special regional competence for action lies. To an increasing extent, attention must be given to the difference between regional identities, economic regions and political–administrative classifications below the level of the nation-state. It cannot be assumed *a priori* that the scope or design of the latitudes deemed ideal for economic concerns concur with the existing political–administrative or sociocultural boundaries.

Thirdly, regional innovation capacity depends on whether the individual elements of local order (Friedberg 1995) and their inherent governance elements are compatible (Braczyk 1997). Educational facilities, technology transfer, financing and industrial relations can be structured in such a manner on a regional level that a negligible degree of synergy is generated for regional players. This means that, apart from the existence of institutions through which qualified and motivated employees, scientific findings, venture capital and technology transfer services are provided (the provision or resource function of institutions), the internal coherence and compatibility of local order must be taken into consideration so as to arrive at a qualified judgement of a given regional innovation system (orientation-providing and -regulating functions of institutions).

As the provision or resource function of institutions has been amply demonstrated in preceding contributions and is acknowledged beyond doubt, we will concentrate on the orientation-providing and -regulating functions. Here we will be especially concerned with the way in which the individual regional institutions are interconnected, as well as their links with national governance levels. In the following we shed a light on the orientation-providing and -regulating functions of regional institutions and discern certain types – functions that are always associated with restrictions for the selection, promotion and economic utilization of technological capabilities (Table 16.1). Here we are primarily dealing with the question of whether the given institutional characteristics and features are compatible and to what extent the regional patterns of order are determined by national regulation structures. With particular regard to four different variables – intercompany patterns of cooperation and division of labour, knowledge and technology transfer, financing, and industrial relations – we believe that we are able to ascertain and record the regional differences of institutional order. We will exclude the regional training system from our account, as the availability of qualified personnel does not pose a substantial problem in the investigated regions. The orientation-

Table 16.1 Regional innovation systems and their institutional regulation.

	Example	Organization and control of intercompany division of labour and cooperation	Knowledge and technology transfer	Financing	Industrial relations
Knowledge- and service-based industries	California	Technology and market driven	Market driven and networks	Regional and national	Self-regulation
	Singapore	Industrial policy	Company relations and government moderated	Government moderated	Government regulated
Industrial cluster formation with technological excellence	SE Brabant	Autarchic	Autarchic	Autarchic	Centralistic
	Baden–Württemberg	Collective and autarchic	Technology transfer for existing industrial clusters	Regional and national	National/regional
Catching-up and routine manufacturers in old and mature industries	Wales	Exogenous MNC	Local transfer organizations	Local and international	Company orientated, hardly formalized
Technological decoupling and niche production	Tuscany	Collective order	Collective order	Collective order	Collective order

providing and -regulating functions of training institutions are more important, however, and the latter can be covered by the variables of "intercompany cooperation patterns" and "knowledge and technology transfer".

Knowledge- and service-based industries

California

The dynamics unfolding within and between subsectors in the further development and utilization of new technologies is especially notable in the development of the Californian multimedia cluster. The contribution by Scott can presumably be interpreted as indicating that the common sense of the regional innovation system is primarily orientated to utilizing and further developing the possibilities of a given technology to their fullest extent. This process in turn generates many impulses for further technical developments. Technological competence and visions of new applications are the basis of the regional multimedia cluster. Organizational fields develop along the lines of technological developments. Therefore, our interpretation is as follows: the organization and control of inter-organizational division of labour and cooperation is primarily realized by market relations

and is technology driven. The boundary lines between sectors and subsectors have a comparatively weak ordering function; this facilitates branch overarching cooperation and innovation processes; for example, by harnessing the synergies between the computer and entertainment industry.

Relatively independent of state, regional and local support organizations and facilities, access to technological information is primarily organized via the market. The necessary communication channels apparently operate as "obligational networks" (Lindberg et al. 1991). Financial sources can be tapped at local, regional and national levels. Considering the comparatively extensive possibilities for acquiring venture capital and government promotion programs (Scott & Bergman 1995) one gains the impression that the financing of business start-ups and new technological developments poses fewer obstacles than in many of the other regions investigated. And the low extent of standardization and formalization of employment and industrial relations in the Californian multimedia clusters is highly compatible with the primarily technology- and market-driven manner in which intercompany forms of cooperation and division of labour are organized. The many business start-ups in the category of up to ten employees, the preference for freelance workers and subcontracting relations also concur with the image of a technology-centred "innovation and corporate culture". Therefore, we regard industrial relations in California as being characterized by the self-regulation of employment. Neither the institutional fortification of branch identities nor a more far-reaching formalization and regulation of labour and employment relations would be particularly compatible with a production and innovation regime of this type. Therefore, highly developed and formal designs of industrial relations are not be expected, and indeed find no mention in Scott's account.

All in all, the institutional orientation of the Californian innovation system can be described as technology centred. Business and economic practice is primarily geared to the reproduction of technology and thus also to technological change. The institutional and organizational, as well as normative, limits of this practice are apparently not very pronounced.

Singapore

Although government (or governmental agencies) plays a significant role in all of the regional innovation systems discussed here, this is most obviously the case with Singapore, where the process of economic development can be described as state controlled. The aim here is to concentrate a large stock of technological capabilities, primarily in knowledge- and service-based industry sectors, within the country itself. This internalization has mainly succeeded because of the multinational corporations that have established themselves there. However, this means that the country remains dependent on exogenous technological capabilities. The organization and monitoring of inter-organizational division of labour and cooperation are coordinated by the government's industrial policy, with a view to establishing Singapore as a Southeast Asian services and logistics centre, although the

majority of company headquarters are located outside the country. In view of the dominant role of the state, industrial relations are subordinated to the primary goal of modernizing the economy. In this innovation model, the attempt to add rapidly to domestic technological capabilities features prominently. More than the other 13 regions, Singapore has opted for a globalization of the economy and subordinated itself to the "imperatives" this entails. Industrial policy is primarily geared to increasing the attractiveness of the location for foreign businesses, and the associated constraints are accepted accordingly. This may lend the model a certain vulnerability, which could also be increased from the inside because of the distinctly subordinate role of participation rights. In terms of establishing a regional innovation system, however, this model appears impressively consistent and successful. The aim is not to preserve and shield an established constellation of economic structures, but to create new structures and capacities. The evaluation criteria for the effectiveness and efficiency of this approach lie outside the system, and are defined in the wider Southeast Asian context by the dominant firms operating there. Singapore's innovation system thus has an open structure, in a model where the pursuit of regional interests always comes second.

Industrial cluster formation with a leading technological role

Southeast Brabant

In the industrial cluster-building model, the institutional focuses lie in the reproduction of branches of industry (sectors and subsectors) or organizations (few or single businesses). An extreme, but by no means unique, example of this orientation towards one or a small number of organizations can be found in the innovation system of Southeast Brabant, which was closely linked to two large groups (automobile production and electrical engineering). Here we can see quite plainly how the regional innovation system stood or fell by the fortunes of these large-scale businesses. In our view, Southeast Brabant provides an excellent example of a governance structure that was geared towards an autarchic economic structure dominated by large-scale businesses.[2]

Philips (electrical/electronic engineering), and before it also DAF (automobile production), had essentially established (and monitored) a complete regional infrastructure. This innovation system is or was part of a focal organization of which it was both the means and the end, resulting in distinct operating conditions for innovative activity. Hierarchy represents the dominant mode of coordination here, with inter-organizational divisions of labour and cooperation remaining subordinate to the regime of a large corporation. The accessibility of technolog-

2. The categories referred to here were proposed by Herrigel, who reconstructed two distinct industrial orders based on the example of German industrial history. He draws a distinction between a collective decentralized order and a centralized order based on large-scale businesses (Herrigel 1993), which he calls an autarchic industrial order (Herrigel 1996).

ical information and its commercial exploitation are institutionally tailored to the strategic interests of the large-scale business. Access to financial sources was presumably organized in this case exactly as described by Herrigel with reference to autarchic set-ups in Germany; that is, national and international financial markets must have been the main sources. Into this pattern fits centrally governed industrial relations based on interest representation, with highly standardized and formalized labour relations. The entire regional innovation system is tied to the viability of one focal organization. The case of Southeast Brabant thus clearly illustrates the vulnerability of a whole region, because of this strong dependency on the individual economic performance of one or two large-scale businesses.

Baden–Württemberg

In the case of Baden–Württemberg, the focal organization is replaced by the two dominant industrial clusters of automotive and mechanical engineering, together with the associated electrical and electronic companies. The institutional and substantive design of the regional innovation system is primarily geared to strengthening and reproducing the industrial subsectors included within it. This applies in equal measure to the decentralized SME sector and to large-scale autarchic businesses. A good example of this is the extremely high proportion of parts that Mercedes–Benz buys from domestic suppliers, and in many cases from other regional companies. Only recently has the group begun to pursue a more international procurement policy. It is this very strong regional base, and the intensive regional supply and service relationships, that make Baden–Württemberg's economy so dynamic in terms of growth and innovation. The intercompany cooperation and procurement patterns among the firms of the region have largely contributed to the stabilization and reproduction of regional industrial structures. The regional institutions too are geared towards the two main industrial clusters. This is true, for example, of the organization of Baden–Württemberg's system of technology transfer: whereas the Steinbeis transfer centres are designed to meet the needs of the decentralized SME sector, the institutes of the Fraunhofer Society specialize in the transfer requirements of large-scale autarchic businesses. Access to financial sources also operates along similar lines: whereas local and regional financial institutes are mainly available to small and medium-size enterprises, large corporations rely on the national and international banks. A strongly regional emphasis can also be detected in the organization of industrial relations. The regional metal workers' union IG Metall (collective bargaining district of North Württemberg–North Baden) played a leading role in the negotiation of collective wage agreements in the 1970s and 1980s, even though IG Metall's central office in Frankfurt is still the place where union strategies are formulated. It remains to be seen whether this leading role can be maintained in the face of changing governance requirements (decentralization and transfer of industrial relations to company level).

On the whole, Baden–Württemberg's innovation system is very much shaped by the requirements associated with the reproduction of the dominant industrial

clusters. At the same time, the limits of regional autonomy are evident. Ever since the Second World War, the export-orientated regional companies have had to promote their products in the world market, although this did not threaten the coherence of the industrial clusters until well into the 1980s. Only with the break-up of regional supply and service relationships have the tensions between individual aspects of the regional institutional order begun to increase. The transfer of technology faces a particularly difficult challenge, because the former orientation towards the two industrial clusters facilitates incremental change but is hardly compatible with the transformation of the previous technological paradigms currently required. Also, strongly in need of adaptation is the relationship between the centralized control of industrial relations and the need for a more flexible, local and company-based organization of working conditions.

"Catching-up" routine manufacturers in old and mature industries

Wales

Wales has succeeded in shifting its industrial focus away from the coal-mining and steel sector, attracting instead manufacturing and assembly firms from the automobile and electronics industry, which are becoming increasingly embedded in the local setting. The organization and monitoring of intercompany division of labour and cooperation policies are essentially managed by foreign multinational corporations (MNCs). The main incentive for firms to settle here is the comparatively low cost of labour. In response to this development, more and more supplier networks are springing up as the final producers attract regional and foreign firms. This cluster formation creates a ramified network for the exchange of technological information, which is complemented by transfer and consulting offices for assisting the learning process. Funding within is mainly indirect, via tax relief. Industrial relations are characterized by close company links, a high degree of informality and a low level of union militancy.

After the economic decline of the old industrial sectors and the failure of the unions' struggle to preserve these industries, Wales managed to achieve radical industrial reorganization accompanied by a parallel institutional development. Once it was clear that there was no longer any chance of keeping the old industries and social structures alive, new industries and new institutional structures were able to develop, whereby the establishment of new institutions helped to stimulate new industrial settlements, and vice versa.

Decoupling models

Tuscany

In the industrial districts of Tuscany, a coherent collective order is reproduced by both formal and informal practices. The coordination of economic activity, dissemination of information, funding of innovations and settlement of labour conflicts all take place within a local collective order, the persistence of which is clearly emphasized by Dei Ottati. The interest in reproducing this order in no way rules out the existence of power asymmetries and clear economic differences. This local collective order is one of the decisive factors in the above-average economic success of the Italian industrial districts. Part of this arrangement is to shield the local production chain (furniture, shoes or porcelain and ceramics) from outside influences. The risk of losing competitive advantage through this protective policy is apparently lessened by the fact that the production chains, which are mainly located within the consumer goods sector, are exposed to intense technological competition (manufacturing processes, productivity increases, environmental safety, etc.) only to a limited extent, the more important factors being competence and flexibility in terms of design. Within this arrangement, which is tailored to the reproduction of the collective local order, there is little scope for opportunistic behaviour.[3]

We can conclude from the foregoing that even similar industrial settings can be accompanied by quite different institutional orders. This is illustrated, in the first instance, by the two regions associated with knowledge- and service-based industries: whereas the institutional order in Singapore is determined to a large extent by the state, the largely market- and technology-driven development of Californian industry is accompanied by only a minimal set of institutions. However, it remains open to investigation whether relations between industrial actors in California are not governed in a less institutionalized way – by common life-styles, working practices and performance specializations. Secondly, there are also differences between the institutional orders in those regions with a more mature technological basis: whereas Southeast Brabant (like North Rhine–Westphalia a few decades ago) is strongly dependent on a few large industrial concerns, the governance structures in Baden–Württemberg are geared towards industrial clusters.

Despite these differences, however, there are also clear similarities between those regions associated with the same technological development path: whereas the institutional orders in the knowledge- and service-based regions tend to be shaped by their dynamic potential and opportunity for mobilizing technological capabilities and translating them into industrial practice, the mature industrial regions are characterized by highly stable, and sometimes even antiquated, institutions. A similar distinction can also be detected in the other two types: whereas the institutional structures in Denmark and Tuscany are typified by a high degree

3. In Chapter 8, Peter Maskell analyzes the importance of this circumstance for the success of the Danish economy.

of stability (which in no way implies rigidity), the "catching-up" regions closely embedded in the international division of labour context (Wales, Tohoku, Québec, Ontario and Catalonia) are characterized by more flexible and often politically organized institutions. This points to a link, however loose, between the technological and institutional order, and to a change in political requirements.

Between institutional legacies and renewal

In the previous sections, we drew attention to the path dependency of regional innovation models, emphasizing the momentum and continuities of regional industrialization paths. These regional trajectories are secured partly by established economic structures and production clusters, and partly by regional institutions. Particularly in innovation research, which tends to concentrate on industrial and technological changes, the importance of this inertia cannot be emphasized enough. The challenges involved in reforming regional innovation systems and the many different barriers to learning – as referred to initially by Cooke – can only be properly understood against the background of a relatively stable industrial and institutional order. In order to deal with these barriers to innovation in a systematic way, the following discussion sets out initially to explain the assumption that such a learning process is possible only within innovation networks. Such networks are based on long-term cooperative relations between businesses, politico-administrative authorities and scientific institutions. Only in such innovation networks is the recombination of technical knowledge and the social embedding of new technologies possible. In our view, such innovation networks are crucial to the success of regional innovation systems. The possibilities of stimulating and facilitating innovation networks vary according to the previously reconstructed industrial and institutional orders.

The importance of regional innovation networks results from changed requirements in terms of the organization of innovation activities. For one thing, the emphasis is now on the development of complex, socially embedded technologies (occasionally referred to as large technical systems; see Hughes 1987, Mayntz & Hughes 1988), which are established in close cooperation with businesses, scientific institutes and politico-administrative authorities. The associated challenges are now too great to be dealt with by individual pioneer industrialists or by setting up new businesses. Secondly, it is in many cases no longer enough simply to improve established products on an incremental basis; unless fundamentally new technical solutions are developed, the high living standard of advanced working societies will become extremely difficult to defend. This limits the possibilities of developing new products systematically in differentiated industrial research and development departments, as the strengths of such departments lie in the gradual improvement of existing technical systems (cf. the example of the automotive industry: Clark & Fujimoto 1991). Often, neither innovative new companies nor highly specialized development departments are, in our view, capable of rapidly

developing enough fundamentally new products. In reality, more complex technical systems, such as information and communication systems, transport and energy systems, and genetic and bioengineering, have to be built up through prolonged, open-ended power and interactive relationships between a large number of actors (cf. Tushman & Rosenberg 1992). This complex weave of relationships is becoming increasingly difficult to generate or control by a single organization or indeed by a single talented individual. The successful improvement and marketing of the fax machine by Japanese companies, or the development of the computer tomograph, were only possible thanks to the successful cooperation of various suppliers, manufacturers and users, public and private regulatory, normative and standardizing authorities, investors and scientific institutions. Such innovation and cooperation networks face two major challenges. First, new technologies are created by recombining existing (or sometimes even new) stocks of technical knowledge. This raises the question of how to engineer the cooperation between different disciplines, businesses, professional and status groups. Secondly, complex technologies in particular rely on sociocultural and institutional embedding in the context of application; intensive contact with the intended users, establishing standards and norms, taking existing technical systems and interfaces into account, and adapting laws and administrative regulations – all are essential to the development of technical systems.

The first challenge can be illustrated using the example of the personal computer. All the components and know-how necessary for developing the PC were available in many regions of the world in the 1960s and 1970s (Castells & Hall 1994): semiconductors, software and computer manufacturers, electronic firms and renowned universities. The essential task was to arrange the available capabilities and components in a completely new way. This rearrangement of technical knowledge succeeded in one region, Silicon Valley, mainly because of its particularly cooperative atmosphere and freedom from domination by large-scale businesses (Saxenian 1994). This example shows that innovations are not primarily the result of systematic, or at best interdisciplinary, research efforts. Rather, technological knowledge is largely produced by a different, highly practical and problem-orientated method (cf. Gibbons et al. 1994). Central features of this new form of knowledge production are the abandonment of a strict division of labour between research and application, and more obvious embedding in the relevant contexts of application and utilization. Research and development are no longer primarily geared to disciplinary criteria and problem definitions, but rather to the solution of practical technical problems. The objective is no longer principally or exclusively to create "new" knowledge, but to be able constantly to recombine and apply theoretically existent stocks of knowledge. The decisive factor is the ability to channel a wide range of capabilities, experience and resources into the development of a new product.

The second challenge is the social embedding of the new product in the context of application. This involves securing the acceptance of customers and the general public, ensuring compatibility with existing technologies, technical standards, experience and practices and adapting the political and legal framework conditions

(e.g. the question of data protection in the development of multimedia services), and so on. The new product has to be adapted to the ideas, skills and previous experiences of a particular society – or, alternatively, new conventions and usage habits have to be developed (as in the case of electronic mail or the fax machine, for example).

These two coordination requirements cannot be dealt with exclusively via the market, organizational hierarchies or governmental industrial policies. The market is a limited framework for combining the necessary capabilities and stocks of knowledge, as the knowledge necessary for innovations is hardly tradable. Highly specific irregular transactions can be coordinated via the market only at considerable expense (Williamson 1985). Also, it is often impossible for a single company to take on large-scale innovation projects; even large companies rely on external capabilities in the current trend towards downsizing and outsourcing strategies. This trend is evident not only in the many development partnerships between firms and their suppliers, but also in the many strategic alliances between globally operating companies (e.g. in the development of memory chips, multimedia, cars and financial services). Thirdly, it would be a mistake to hope for a solution to the current innovation problems on the part of an omnipotent omniscient state. Many failed projects demonstrate the limits of dirigiste, mission-orientated approaches (e.g. the development of Concorde, the sponsoring program for the European semiconductor industry JESSI, or the scheme to promote a new high-definition television).

Therefore, neither science nor industry nor politics can meet the challenges of global competitive innovation single-handedly. It is much more a question of coordinated cooperation between governmental, scientific and political actors. Such polycentric ways of organizing innovation activities may be referred to as innovation networks (cf. Powell 1990, Kowol & Krohn 1995). These are understood in the sense of cognitively and normatively anchored reciprocal relations between businesses, training and research institutes and politico-administrative authorities. These relations facilitate the recombination of technical knowledge and the development and social embedding of new technologies. One extremely important factor in the stabilization of cooperative relations beyond the spheres of market, politics and hierarchy is that of common ideals such as the vision of the "data highway". Such ideals can open up new horizons of perception, reflection and decision-making (orientation function), motivate companies to translate their visions for the future into practice (motivation function), facilitate communication and cooperation between businesses, politics and science (coordination function) and secure acceptance and public support for new corporate systems (cf. Dierkes et al. 1995). Another important precondition for long-term cooperation arrangements are common patterns of behaviour, experience and governance structures. Cooperation on long-term uncertain innovation projects always demands a high degree of trust. It is therefore extremely important for innovation networks to reduce the risks of opportunistic behaviour by means of common binding governance structures. Unless common patterns of interpretation, orientation and behaviour can be developed or assumed (cf. the reference to "taken-for granted

scripts, rules, and classifications" by DiMaggio & Powell 1991: 15), it is scarcely possible to stabilize long-term cooperative relations in more sophisticated innovation projects.

The central achievement of regional innovation systems lies, in our view, in their ability to solve such cooperation problems. The "untraded interdependencies" of regional economic areas (Storper 1995) – referred to by many authors in this volume – are common patterns of interpretation that grow out of involvement in a common "everyday reality". Also, regional cooperative relations can be stabilized through direct interaction and geographical proximity, through regional institutions and regional economic and industrial policies. Regional contact networks, training and research institutions and industrial and financial interpenetration can stabilize regional cooperative networks, since economic regions are often characterized by "a common meaning system" and increased chances of interaction (cf. Scott 1995).

A common, institutionally embedded meaning system and stable cooperative relations are in no way sufficient as a basis for regional innovation networks; however, cooperative networks are rather a necessary, but in themselves inadequate, precondition. It is therefore necessary to distinguish – in addition to the institutional density or institutional poverty of a region – whether the existing institutions and their associated collective orders render the recombination of technical knowledge easier or more difficult. Two different challenges can be distinguished here: one is concerned with institution-building, that is, the establishment of an order that supports industrial and social investment in the generation of collective goods, such as peace in labour relations, for instance by means of industry-wide collective wage agreements and reliable labour law, calculable working and pay conditions and a high level of public and private research and development activities (Streeck 1991, Reich 1992). This challenge is emphasized predominantly by authors from Anglo-Saxon countries (i.e. countries with a traditionally lower public sector share and less institutionalized employer–employee relations). The aim here is to set up institutions that will provide a more stable basis for cooperation between various companies, between staff and management, between businesses and research institutions, and between businesses and their investors. But it is also important – particularly in countries with stable collective governance structures – that the existing institutional structures should contribute towards the creation of a climate conducive to innovation. Institutional learning processes (as a precondition of "learning by learning"; see Ch. 1) are equally necessary. This often calls for the reform of established institutional and industrial structures, which may have been extremely successful in the past. Established technology transfer institutions (such as the Steinbeis Foundation in Baden–Württemberg) may still provide models for countries without such institutions, but when the major objective is no longer the application of academic knowledge to industrial practice but a problem-related recombination of existing technical experience and funds of knowledge, it is time to find new forms of cooperation between science, industry and politics. The same applies to traditional forms of vocational training and cooperative employer–employee relations.

When the advances in productivity and rates of innovation achieved by a cooperative and qualified workforce are no longer sufficient to compensate for higher labour costs on a global scale, this poses a special threat to the basic principles of western European labour and social policies.

The 14 regions analyzed in this volume face both the challenge of institution building and the difficulties of institutional change. However, according to the regional development paths identified in the Introduction, the relative impact of institution-building and institutional re-engineering differs from region to region. Particularly for regions assigned to types 1 (knowledge- and service-based industrialization) and 3 (catchers-up and routine manufacturers in old and mature industries), the establishment of "cooperation-promoting" institutions is a priority, as demonstrated by experiences in Catalonia, Ontario, California, Wales, Tohoku, Midi–Pyrénées and Singapore. For a wide variety of reasons, there is as yet no dense institutional landscape of the kind that tends to grow up in an industrial society, either because the economic development of the region is mainly based on new industries and services (California and Singapore) or because of a late, externally induced, industrialization process linked to the underdevelopment of its socio-industrial institutions. This is true of California and Singapore, as well as most of the type 3 regions (Ontario, Québec, Tohoku and Catalonia).[4]

The development of an independent collective order in these regions is also hampered by the necessity of keeping down labour costs, and hence also training and social security costs, as part of a world-market orientated industrialization process (a fact emphasized particularly in the chapters on Wales and Ontario). As a general rule, these regions – some against the background of a more individualistic corporate and labour culture (California) – are influenced very little by the institutions that have grown up in developed industrial societies over decades of conflict and cooperation, often as a compromise between the various interests of employees and management: institutionalized collective wage negotiations between unions, employers' associations and the state; labour laws; a developed vocational training system; a more or less dense network of welfare state facilities (unemployment, health and pension insurance); and a dense network of technology transfer facilities.

Such institutions are characteristic of the collective order in the type 2 and type 4 regions (particularly in Baden–Württemberg, North Rhine–Westphalia, Pirkanmaa, Southeast Brabant and also, in a distinctly different way, Denmark and Tuscany). In the case of Baden–Württemberg and Central Italy especially, it has often been stressed that these institutions support a wide variety of cooperative relations, for instance, by neutralizing wage competition between large and small firms, between different groups of employees, and in some cases between

4. The Welsh innovation regime is in some ways a special case, as the institutional legacies of "old industries" (particularly that of conflictual labour relations) have already undergone a fundamental change in this formerly old-industry based region (steel, coal). This testifies to a successful strategy of attracting foreign businesses.

different sectors of industry by means of collective wage agreements (Streeck 1996). Thanks to co-determination rules, the management's rights of control and the rights of the employees are clearly defined, thereby preventing permanent conflicts. However, what is often overlooked is that the collective orders thus defined – in so far as they are the product of a hierarchically organized society strongly anchored in the division of labour principle – also have their own specific barriers to communication, cooperation and hence innovation: in Emilia–Romagna (and possibly in Tuscany too) there are scarcely any synergy effects between the various local industrial districts, for example (Heidenreich 1996). Added to this are the cooperative barriers between businesses and banks, and between industry and science. In North Rhine–Westphalia, Baden–Württemberg and Southeast Brabant, there are considerable communication barriers between companies belonging to different production clusters, between highly institutionalized employer and employee associations, between different courses or levels of training, and between politics and economics. It should therefore be stressed that long-term trust-based cooperative relations do not in themselves guarantee successful innovation networks. Indeed, it may even be necessary for companies within established production clusters to break out of their former trust-based cooperative relations, since trust can also prevent one from seeing and grasping new opportunities for action. In themselves, high-trust relations are nothing more than processes of cognitive, normative and social closure (and hence restrictions). This also applies, for example, to highly institutionalized labour relations or a developed welfare state: although they are an important precondition for high-trust relations, they also limit the opportunities for action and creativity open to economic and political actors. The crisis suffered by some national systems of industrial relations (Ferner & Hyman 1992) and the limits of social welfare benefits, particularly in the western European regions under analysis, indicate that it is these strongly institutionalized regions (and nations) that are facing the challenge of complementing – or perhaps even replacing – their institutionally stabilized and trust-based cooperative relations with new cooperative networks. In many cases, this will not be possible without the development of new governance structures.

This goal can be approached either through neoliberal deregulation strategies or by setting up new "cooperation-promoting" institutions. An attempt can be made (as is currently the case in western Europe in the wake of the Maastricht agreements) to modify or abolish those forms of social security that can no longer be financed, by attacking inflexible labour relations, rigid collective wage agreement rules and antiquated governmental bureaucracy. Alternatively, an attempt can be made to imitate successful examples; for example, by building technopoles, technology parks and innovation centres along the lines of Silicon Valley, promoting the establishment of new technology-orientated businesses, or by simply easing taxation on corporate research and development expenditure. The limits of a voluntaristic, patent-remedy type approach to institution building are demonstrated by the failure of most Silicon Valley imitations (cf. Ch. 12 or the case studies by Castells & Hall 1994). For one thing, it has proved extremely

difficult to integrate innovative forms of organization into old collective orders; secondly, such additional institutions do nothing to solve the central problem of stable institutions and production structures; and, thirdly, the spill-over effects of new institutions are often negligible.

There is probably no clear and unambiguous answer to the question of how to develop new regional cooperation and innovation networks within an established industrial and institutional order. Leaving aside simple patent remedies, it is presumably necessary to resort to a whole cluster of different strategies, for which the 14 cases analyzed in this volume offer a wide range of illustrative material:

- Attempts can be made, by means of dialogue-orientated economic policies, to integrate a range of different businesses into common innovation projects (e.g. multimedia projects involving network operators, software and hardware manufacturers, and service providers). The aim is to build on existing regional capacity and to develop the available capabilities in new forward-looking directions. This can be supported by a system of tax incentives for innovations, a scheme that appears to have produced impressive results in Canada especially.
- It is also necessary to develop new forms of knowledge and technology transfer in order to ensure a successful interplay between the actual problems of an industry or business on the one hand and the corresponding knowledge inside and outside the department, company, industry and science on the other. This does not necessarily have to be new knowledge; indeed, most new technologies are composite or hybrid technologies derived from the recombination of existing technologies and know-how. Knowledge and technology transfer thus have a great deal to do with mutual communication, discussion and association, and very little to do with a one-sided provision of information. Within the context of innovation networks, mutual coordination processes between (potential) technology manufacturers and (potential) technology users must be used to create not only new technologies but also new markets and the necessary institutional and political framework for putting these new technologies to use.
- By deliberately encouraging staff mobility between the spheres of science and industry (e.g. via practically orientated training courses, traineeships, practical dissertations, etc.), by establishing transfer and contact points at universities and by offering financial incentives, the links between universities, research institutes and businesses can be improved.
- By developing new instruments for financing venture capital and improving contact opportunities between newly founded and old-established businesses, the number of new businesses and their chances of survival can be increased.
- By reforming collective wage agreements and vocational training courses, the cooperative relations between various professional, status and hierarchical groups can be improved.
- The globalization and export strategies of regional businesses can be supported either through governmental or public advisory bodies abroad (e.g. by setting up foreign branches of chambers of industry and commerce)

or through the "transplantation" of domestic supplier–consumer networks abroad (e.g. by setting up a foreign assembly plant).

It is perhaps easier to meet the challenges of institutional re-engineering via many small-scale changes such as these than by attempting to implement the entire list of future technologies. What matters most is the intelligent development of the endogenous technical and institutional potential; the location of these in knowledge- and service-intensive industries will similarly depend on the existing regional potential and chances of development.

When analyzing possibilities of political action, however, we must also bear in mind that regional powers of action vary from country to country; some of the regions already described have virtually no say in the organization of their institutions and very little politico-administrative autonomy. If we were to draw a continuum ranging from low relative autonomy to extremely high relative autonomy among the different regions,[5] the region of Tohoku (followed by Midi–Pyrénées) would be at the bottom and the industrial district of Tuscany (followed by Baden–Württemberg, North Rhine–Westphalia, Catalonia, Québec and Ontario) at the top end of the scale. Tohoku still has no regionally anchored endogenous governance authorities to this day. Indeed, this region is both directly and indirectly dependent on the decisions of central government and the business sector, and was long overshadowed by exogenous power and decision-making centres. Not until the central and peripheral Japanese regions began to move apart did a greater sensitivity to the unintended consequences of the national innovation strategy develop, and the considerable regional disparities are now bringing peripheral regions such as Tohoku to the focus of attention. Actors at both national and regional level are now facing the question of whether a politico-administrative revaluation of the region could open up new possibilities of action in terms of industrial policy. Only on this basis will opportunities arise for regional actors to form institutions with a primarily regional function. By contrast, the industrial districts of Tuscany represent a genuinely endogenous set of mainly informal, locally restricted conventions, governance procedures, networks, and so on. A remarkable feature of these is their locally orientated design, and the evidently high mutual compatibility of the various local orders. Support networks with regard to the local – non-organizational (!) – management and control of a production chain, the locally assured accessibility of funding, the local provision and interpretation of production-related information and the locally orientated organization of industrial relations, indicate a potentially extensive, but in this particular case local collective, autonomy on the part of economic actors. Although the districts are of course embedded within higher-level governance authorities and national institutions, the remarkable thing about them is that the institutional setting allows action at local level in all technological, economic, financial and labour-related spheres. This means that local agencies are also at hand for implementing supra-regional and national imperatives.

In conclusion, let us summarize the central considerations that have guided us

5. Denmark and Singapore are not included here, as these "regions" are also states.

in our comparison of the technological and institutional dimensions of regional development paths.

First, the economic position of a region within the context of global competition is partly the result of path-dependent developments; it is also influenced by the institutionally anchored governance structures that influence regional innovation capacity. The institutions of the regional innovation system not only serve as a resource for firms to draw on (technological know-how, qualified workforce, cooperative labour relations, etc.), but also fulfil important orientation and governance functions for regional actors in industry, science and politics. As institutional thickness increases and gives rise to institutional inertia, the industrial development paths of a region also become institutionally stabilized; technological path dependencies are therefore accompanied by institutional ones.

Secondly, one means of increasing regional innovative capacity is by creating institutions. This often proves to be an inadequate solution, however (cf. Amin & Thrift 1994b). Harder to achieve is the development of a new regional identity and the generation of synergy effects between institutional and technological development paths. This is the task facing, in particular, those regions that have been very successful up to now, and which have achieved a high level of technological competence in the so-called mature industrial sectors. For these regions, the hitherto established institutions and the institutional thickness thus achieved can even become an additional problem, since training, research and funding facilities tend to stabilize the traditional patterns of industrial development.[6] Against a background of intensified global competition, this problem of institutional inertia and restrictions deserves special attention.

Thirdly, the findings from the 14 regions reveal interrelationships between technical and industrial development paths and regional institutions. This means that technical innovations also need to be accompanied, in certain circumstances, by institutional innovations. In some cases, institutional innovations – such as initiatives for establishing and facilitating regional innovation networks – may even be necessary preconditions for further technical innovations. Within the context of globalization, national and regional actors in industry and politics are faced with the challenge of constantly reappraising the functional and operational principles of regional innovation systems and, if necessary, devising strategies for reforming the institutional and industrial order (cf. Ch. 1 and Drache 1995).

6. The difficulties involved in rearranging regional institutions are intensified if the regional innovation system is closely linked to national institutions. This link between regional innovation systems on the one hand and national social security systems and labour relations on the other is especially clear in those regions associated with the traditional or modern industrial development path. The example of Finland in particular demonstrates how developed welfare state arrangements and the associated public expenditure make it difficult for the state to finance and facilitate a reorganization of regional innovation systems, even if only on financial grounds (for a general comparison of Europe and the USA, see Naschold & de Vroom 1994).