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Governance and the Knowledge Economy

Relevance and potentialities of the “analytical governance concept” within the EURODITE context

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1. Introduction: The four meanings of “governance”

During the last two decades, “governance” has become a widely used term, if not a buzzword, both in social sciences as well as in practical policy-making. As a consequence, there are today different meanings of “governance” that vary considerably in terms of their respective focus on different aspects of social interactions. Basically, one can differentiate at least four directions in the use of the term “governance” (cf. Benz et al. 2007: 14-15; for an alternative, “thematic” differentiation see: Hirst 2000: 14 ff):

Firstly, **governance as a descriptive term** denoting the fact that collective decision-making in modern western societies is taking place today less frequent in form of hierarchical order by governmental authorities, but increasingly by network arrangements of public and private actors that negotiate cooperative solutions. In this case, the term indicates that there has been a shift from “government to governance” (Boyer 1990) as non-hierarchical modes of governing characterized by the involvement of non-state actors in the formulation, decision-making and implementation of public policies gain importance.

Beyond the nation-state scholars of international relations even identified processes of rule-making characterized by “governance without government” (Rosenau/Czempiel 1992). This does, however, not indicate that governments do no longer participate in such regulatory mechanisms, but that governance, which embraces also different kinds of transnational non-state organizations, functions effectively even without the formal authority and the police powers to ensure implementation of policies (Rosenau 1992: 4).

Concerning the emergence of various forms of governance it has been argued that they have occurred in the wake of a “hollowing-out” of the traditional sovereign nation-state from above (because of market liberalization and growing international interdependence), from below (because of the growing outward “paradiplomatic” activities of local and regional bodies (Michelmann/Soldatos 1995; Aldecoa/Keating 1999), and sideways as specialized executive agencies gained importance in the sequel of public sector reforms (Rhodes 1994, 2007; Jessop 1997). Even so, it is still disputed whether the rising of various forms of (new) governance actually points to the alleged retreat of the state or whether they rather indicate a transformation of the traditional perception of statehood and sovereignty (Sørensen 2004; Grande/Pauly 2005). In the latter sense, governance arrangements within and beyond the nation state may result in a partial loss of “sovereignty”, but they make it possible to influence societal groups or foreign countries in a specific way without affecting their autonomy.

In the field of political science, the different effects that caused the transformation of the state have induced the emergence of a variety of governance concepts. The concept of *multi-level governance* (Marks et al. 1996, Hooghe and Marks 2001, Peters and Pierre 2002), for example, primarily points to the specific nature of those policy-making processes within the European polity that reach across territorial levels (see section 3) while the concept of *global governance* (Held/McGrew 2002; Barnett/Duvall 2004) focuses on new forms of coordination and cooperation of social actors, which are arising as the “national boundedness of traditional governance and the unique and decisive role of the nation state are increasingly challenged under conditions of globalization and societal denationalization” (Zürn/Koenig-Archibugi 2006: 236). The collective noun of *new governance*, finally, stands for a number of approaches that discusses “novel” practices and tools of public administrations that collaborate with different levels of government as well as with private sector organizations in order to guarantee a more efficient public service or the availability and quality of services which are no longer provided by the public sector itself (Salamon 2002; Jann/Wegrich 2004).

Secondly, **governance as a normative term** that refers to the ways and means of “good” governing characterized by effective, efficient and legitimate rule-making. As such, this normative term is to some extent related to the approaches of “new governance” in the sphere of public administration. More important, however, is its reference to superior norms of democratic legitimacy, the rule of law, and accountability. Normative concepts of governance play a role both in practical policy-making as well as in academic discourses. In respect of the first case an important step was taken by a 1989 World Bank report on the cumbersome economic development in Sub-Saharan Africa which related most of the problems to a “crisis of governance” (World Bank 1989). Since then, the World Bank itself as well as other international organizations, such as the IMF, UNEP or the OECD, developed guidelines and indicators that measure progress in the “spreading” of *good governance*. In the academic field, the normative term of governance is reflected primarily in the concept of *participatory governance* (Grothe/Gbikpi 2002; Heinelt et al. 2002). Here, participatory governance has been defined as the “regular and guaranteed presence when making binding decisions of representatives of those collectives that will be affected by the policy adopted” (Schmitter 2002: 56).

The normative claim for participation of actors affected by a specific regulation has, however, certain weak points. One of them is that there is no guarantee that all involved actors have the same interest in solving a collective problem. And even if this should be the case, one still has to admit that in those governance arrangements “societal interests are unequally represented, interest groups often lack the necessary minimum of public spirit, politicians are more interested in maintaining power than in public welfare, and state authorities are too weak to discipline the particularism of powerful interests groups” (Mayntz 2006: 21). Beyond the nation-state, participatory governance is an even greater challenge if not precarious. This holds especially because of the increasing informalization which seems to be inherent in European and transnational governance arrangements. Even though informality may enhance the problem-solving capacity of those arrangements, it certainly decreases the degree of transparency, accountability and thus legitimacy (Greven 2005: 264).

Thirdly, **governance as a practical concept** for the implementation of governing techniques that, on the one hand, respect the requirements of good and participatory governance, while, on the other hand, primarily address the need to manage interdependent activities of a variety of actors vertically across different territorial levels as well as horizontally across different decision-making arenas (Héritier 2002: 3). Up to now, governance

as a practical concept has become especially relevant within the complex negotiation and decision-making system of the European Union. It is thus no surprise that the most advanced practical concept was presented in the European Commission's White Paper on European Governance of 2001 in which governance is defined as the "rules, processes and behaviour that affect the way in which powers are exercised at European level, particularly as regards openness, participation, accountability, effectiveness and coherence (European Commission 2001b: 8, Fn. 1). The main challenge of governance is therefore to establish procedures which "sustain coordination and coherence among a wide variety of actors with different purposes and objectives such as political actors and institutions, corporate interests, civil society, and transnational organizations. What previously were indisputably roles of government are now increasingly seen as more common, generic, societal problems which can be resolved by political institutions but also by other actors" (Pierre 2000: 4).

And fourthly, **governance as an analytical concept** that focuses on the two central functions of steering and coordination which are at hand for the solution of collective problems. These functions can be performed within single, but also in combination of different institutional structures (the state, the market, social networks, etc.) by means of different mechanisms (negotiation, adaption, influence or exit). As such, the analytical governance perspective sheds light on the institutional structures, mechanisms and effects in the process of management of interdependencies among individual, collective and corporate actors (Benz 2004: 20; Benz et al. 2007: 16).

This analytical perspective has two substantial advantages over the various approaches outlined before. First of all, it refers to established theoretical traditions primarily in the disciplines of political science and economics. Moreover, it is suitable for answering one of the specific research questions of the EURODITE project, namely the question of the "policy levers and coordinational activities available to the EU and other levels of governance to enhance knowledge dynamics and their contribution to regional development and competitiveness, economic and social cohesion" (EURODITE project proposal, page 8).

The aim of this report is therefore three-fold. Based on the differentiation presented in this introduction it firstly proposes to project partners to subscribe to the analytical perspective of the governance term. In the following section, we will turn our attention first to the conceptual substance of this perspective, its theoretical traditions and main propositions as well as its further elaboration in current social science literature. Secondly, in accordance with the core research agenda of the EURODITE project, the report aims at discuss-

ing specifically the territorial dimension of governance. This will be done in the first instance in section three, which summarizes the main conceptual elements of the multi-level governance approach, and in section four, which will show that within the European system of multi-level governance different regions have significantly varying actor qualities and capabilities not only to “design” regional trajectories to the knowledge economy, but also to influence collective decision-making within the European polity. Section 5 will turn our attention to the governance of science and innovation and will thus discuss how the steering and coordination of technological development have changed over the last decades. The third and final aim of this report is to provide a limited number of hypotheses and research questions related to the role of governance in the development of regional knowledge economies (section 6). It is, however, important to mention that this report is neither based on nor proclaims a specific understanding of the concept of the knowledge economy. In this respect the author is in total agreement with Powell and Snellman who have rightly criticised that there is hardly a clear understanding yet of what a knowledge economy actually is (2004).

For the purpose of this report it will suffice to accept that there are today specific policies (and governance problems) at different territorial levels that are targeted at new challenges for the production, use and distribution of knowledge not only in science-based, but also traditional industries.

2. The conceptual substance of the analytical governance term

As mentioned above, “governance” as an analytical term provides a number of advantages over the descriptive, normative or practical variants. A first advantage is that the analytical governance term is a more broader and inclusive one. While the descriptive term is more or less based on a clear distinction between governance and government, the normative term overemphasizes representation over problem-solving capacity. The practical term lacks, unsurprisingly, a sufficient theoretical grounding.

From an analytical perspective, governance can be defined as the “conceptual or theoretical representation of coordination of social systems and [...] the role of the state in this process” (Pierre 2000: 3). To put it another way, governance comprises steering and coordination as the two central means to manage interdependencies between collective actors (Benz 2004: 25). Both processes of steering and coordination take obviously place not in a vacuum, but within an institutional structure of different governance arrangements.

From this follows that the analytical governance term, and that is the second main advantage, has two dimensions: **governance as a structure** and **governance as a process** (Pierre/Peters 2000: 14).

2.1 Governance as a structure: five distinct institutional arrangements

In structural terms governance takes place in one of at least five different institutional arrangements or in combination of these arrangements. These arrangements (hierarchies, markets, networks, associations, and communities) have distinct capability characteristics and are thus best suited to solve some “governance problems” while they are ineligible to solve others. **Hierarchies**, for example, are governance arrangements that are typical for the state and its bureaucracy in which the hierarchy find its expression in the regulation of society by command and control through the impositions of laws and other kinds of regulation. Outside the state, hierarchies are also implemented in vertically integrated firm. In economic governance, however, hierarchies “compete” – certainly more than in the state-society relation – with another governance arrangement, the **market**. Market coordination involves autonomous actors that define the rules of exchange through contracts, while hierarchical coordination takes place within a single organization with a formal administrative and bureaucratic command system (Lindberg et al. 1994: 19-22). Both governance arrangements thus differ primarily in view of the actors involved in economic exchanges.

In view of these alternatives, transaction cost theory, for example, has argued that actors tend to coordinate their activities within a hierarchical structure, i.e. within a vertically integrated firm, if the costs of exchange through the market become prohibitive (Williamson 1975, 1985). Therefore, markets and hierarchies provide for two alternative solutions for the acquisition of goods and knowledge. If they are purchased from an external provider it is necessary to define the characteristics of the required good or knowledge on a contractual basis. Alternatively, they will be generated within the firm only if the knowledge is not available on the market or if internal development is more (cost) efficient than acquisition from outside. However, there is also a general trend within vertically integrated firms to move away from a centralized command system and to apply “market coordination” even in the relations with organizational subunits. Nevertheless, even if this is the case hierarchical coordination always is an option within organizational borders.

Obviously, the market as an alternative governance mechanism is also of relevance for the solution of collective problems in the state-society relation. This holds especially for the scope of public services and thus the ratio of government expenditures to the gross

national product. The privatization of large public infrastructures can be characterized insofar as a substantial shift in the governance arrangement from hierarchy to market, because the state does not provide the services anymore, but guarantees their availability through market regulation.

Networks are the third governance arrangement that have increased in recent years both in number and variations. In contrast to hierarchies, actors involved in networks remain autonomous, whereas compared to market coordination there are more complex institutional settings that include decision-making processes at various levels (Hage/Alter 1997: 96). In a sense, network arrangements combine the advantages of market and hierarchical coordination without incurring the deficits. Networks offer more flexibility than hierarchies as they guarantee permanent access to critical resources. There are, however, various kinds of networks that differ in size and purpose. Lindberg et al. have differentiated between obligational networks that coordinate flows of resources among a limited number of actors in order to serve individual interests and promotional networks that are aimed at reducing excessive competition or facilitating cooperation throughout an industrial sector (1994: 18-26). The most common forms of networks, that coordinate for example innovation activities, are joint ventures and strategic alliances. Dependent on their size, aim and their reach within an industrial sector joint ventures and strategic alliances can either be characterized as obligational or promotional networks.

Networks have not only spread in the sphere of economic governance. On the contrary, much of the governance literature in political science has been provoked by the emergence of various kinds of policy networks. The rationale of those policy networks lies in the conviction that “a sharing of tasks and responsibilities” and “doing things together instead of doing them alone” (Kooiman 1993: 1) could be beneficial both for participating actors and for public welfare. Basically, in those policy networks public and private actors coordinate their interests and resources.

Dependent on the respective contribution and interests of the actors, policy networks have specific tasks and characteristics: bi- or multilateral public-private partnerships (Börzel/Risse 2005), for example, facilitate the establishment of large infrastructure projects that are too expensive for the private and public partner(s) alone within nation-states, while they are important means of implementation of international programs beyond the nation-state.

In contrast, neo-corporatist arrangements (Schmitter/Lehmbruch 1982; Streeck/Kenworthy 2005) are based on social groups that are entitled to various forms of

collective participation and self-government (Streeck/Kenworthy 2005: 441). Corporatism has the distinction of generating “institutionalized patterns of policy formation in which large interest organizations cooperate with each other and with public authorities” (Lehmbruch 1977: 92). Interest intermediation in pluralist systems, in contrast, is characterized by competing interest groups which are not licensed or subsidized by the state and which usually do not participate in cooperative policy-making (Schmitter 1979).

Sectoral policy networks, as a third kind, (Marin/Mayntz 1991; Kooiman 1993; Rhodes 1997, Marsh 1998) are, compared to the before mentioned, characterized by a more heterogeneous constellation of public and private actors who act together in order to pool widely dispersed policy resources (knowledge, advice, support). They are often organized around single policy issues and are held together primarily by the informality of communication and coordination and the interdependence of the actors’ interests.

Communities, as the fourth governance arrangement, are to be considered as relatively small, highly homogenous institutional structures in which membership evolves over a long period of time. Members of communities accept common social norms and moral principles while the exchange of resources within communities is voluntary and based on social solidarity and a high degree of trust (Hollingsworth 2000: 610). As such, communities are not only an alternative governance arrangement to the markets and hierarchies, but rather an institutional structure that raises the question “whether government is at all required to resolve common problems” (Pierre/Peters 2000: 21). Proponents of communitarian political theory would approve of that; even so they would have to acknowledge that the governance capabilities of communities are limited to small social groups (like families) or manageable territorial units (Etzioni 1993).

Interaction of actors takes further on place in a fifth institutional arrangement of **associations**. In contrast to markets, corporate hierarchies and networks, associations are comprised of similar types of actors engaged in similar kinds of activities (Lindberg et al. 1994: 26-28). Within associations, the coordination of actors takes place on the basis of formal agreements, which define common goals and interests (Streeck /Schmitter 1985). The importance of associations for the coordination of economic activities varies significantly between economies and nation-states. In coordinated market economies, as they exist to a varying degree in most countries in continental Europe, associations have a strong role in determining industrial relations, whereas in liberal market economies, such as in Britain or the United States, the institutional capacity for collective action is considerably less developed.

2.2 Governance as a process: collective problem-solving by steering and coordination

The third main advantage of the analytical governance term is that it refers to important theoretical traditions in social sciences. In analytical terms, thinking about governance as a process means studying the forms of interactions between institutional structures (Pierre/Peters 2000: 22). In principle, there are two different kinds of interaction that exist between these structures: steering and coordination.

From what has been said so far it is obvious that steering and coordination are two distinct forms of interactions which are both in the centre of the analytical governance term. Although there is solid empirical evidence that the state is today more a coordinating entity than the centre of political steering (Mayntz 2004: 75) it is important to keep in mind that the governance term captures both processes. A notion that can be found in some parts of the literature arguing that steering is the classical modus of government (in terms of hierarchical governing) while governance merely comprises the aspect of coordination is thus misleading. Even in theoretical terms it is hardly convincing that the concept of governance is a further development of the theory of political steering. Rather, steering refers to targeted action of one actor (the steering subject) who wants to direct the activities and development of (autonomous) other actors (the steering objects) in a specific way. As such, the concept of political steering specifically analyzes the capabilities to steer of the steering subject and the degree of “acceptance” of steering of the addressee (Mayntz 1987: 93f).

The concept of political steering has its origins in two phases of policy research which emerged between the 1960s and 1980s, first as a research program that analyzed modern welfare states’ capacities in policy planning and later on in the research of the limits of planning as they became apparent in implementation of those policy programmes.

The theoretical roots of coordination lie primarily in the discipline of economics. Here, traditional neoclassic thinking pointed to the market as the unrivalled mechanism for the coordination of interdependent economic actors. This view was challenged first by Ronald Coase in the 1940s and later on by Oliver Williamson who picked up the “coasian” transaction costs argument which became central for his institutional economics research program. The main argument of this approach can be summarized as follows: the market is not the optimal mode of coordination for each and any economic transaction, because there are other modes of coordination that may produce lower transaction costs. Given these theoretical traditions, the governance concept, and its focus on steering and coordination, is to

some extent a synthesis of two different streams in social sciences that identified the respective limits of their established paradigms.

In a way, meanwhile both scientific disciplines have found a common field of research in the analysis of the basic mechanisms of coordination of political economies. In this context, different modes and dynamics of economic governance have been analyzed in recent years especially in view of three different perspectives: at the macro-level where distinct types of political economies are based on varying patterns of coordination, at the meso-level where economies differ, *inter alia*, in terms of the role of intermediary organizations in the coordination of economic activities, and at the micro-level where firms were forced to adjust their intra- and interorganizational relations (or their modes of corporate governance) in reaction to “institutional discontinuities”, such as the privatization of industries, a significant dynamic towards mergers and acquisitions in some industries, and the liberalization of capital and infrastructural markets (Calderini et al. 2003).

The central assumption of all these approaches is that modern capitalist systems differ to a large extent in the institutional framework conditions and therefore in their incentive structures and restrictions for individual, collective and corporate actors (cf. Hall 1999; Lütz 2003, 2006; Kaiser 2008a). At the macro-level the specific forms of institutional embeddedness have been analyzed in view of the conditions that exist in different systems of production and innovation. Here, the vast majority of the literature claims that even under the pressure of globalization and increasing economic integration those systems conserve their established mechanism of coordination and control (Porter 1990; Berger/Dore 1996; Hollingsworth/Boyer 1997). Moreover, those systems also maintain to large extent specific types of firm organization and innovation strategies. Six of those business systems were identified, for example, by Richard Whitley who associated complex and risky innovation strategies to firms in highly coordinated market economies, in which the state and intermediary organizations play an important role in processes of exchange between economic actors. Anglo-Saxon business systems, on the contrary, are considered to be specialized in innovation strategies that are associated with a high amount of uncertainty, but could lead to the establishment of new industries (Whitley 1999; 2000).

Studies that focus on the meso-level of market economies have analyzed the roles of institutional subsystems, sector-specific governance mechanisms and the role of corporatist actors. Zysman, for example, related the capacities of the state to influence processes of economic alignment to the specific characteristics of their financial systems (1983: 91ff.). But also strong corporatist actors can significantly limit the steering capacity of the

state, as Katzenstein found out with respect to “semi-sovereign” Germany (1987). In some case those actors are entitled to regulate autonomously important aspects of societal and economic development (i.e. technical standardization) and thus establish “private interest governments” (Streeck/Schmitter 1985).

Moreover, due to their role in coordinating the educational and the economic system they also influence the direction of technological specialization. Sorge and Streeck, for example, identified this influence as the main reason why the German industry reached a comparative advantage in the field of “diversified quality production” (1998). Particular governance arrangements exist, however, not only because of sectoral peculiarities or because of specific kinds of actor constellations, but also at regional levels (Saxenian 1999; Cooke 2004; Cooke et al. 2004). Saxenian, for example, showed that the regional industrial systems of Boston and the Silicon Valley differ significantly in terms of firm-types and inter-organizational relations among firms (1999).

As for the micro-level, one of the most (controversially) discussed contribution was presented by Hall and Soskice (2001). In their edited volume on “Varieties of Capitalism” they claim that so-called coordinated market economies, such as Germany, the Netherlands, Sweden and most of the other continental European countries) have – because of their institutional conditions – a disadvantage over liberal market economies (the U.S., Britain, etc.) in the generation of innovation in modern science-based industries. Although this argument has been challenged due to the weak empirical basis of the argument, it is still plausible that firms in different market economies (have to) use different kinds of mechanism to solve similar coordination problems, such as the coordination of vocational training, access to financial means, industrial relations, etc.

Steering and coordination are thus ambitious processes of interaction between economic and political actors who, in principle, can choose between four different kinds of mechanisms for the management of interdependencies: negotiation, adaption, influence and exit (Schimank 2007). What mechanism is in a given situation the most promising one largely depends on the nature of the problem and the kind of actor constellation.

Negotiations are a likely mechanism within the institutional structures of markets and networks. They follow the logic of exchange either in singular occurrence (as it is normally the case on the market) or in form of more durable network exchange relations, where negotiations may lead to negative coordination aimed at inhibiting externalities, or welfare maximizing positive coordination (Scharpf 1997).

Adaption can be characterized as a mechanism at which one or more actors change their behaviour unilaterally or reciprocally either without taking care of the consequences for other actors or because of the fact that they can anticipate consequences and reactions of other actors. Adaption is a likely mechanism of coordination chosen by actors in a situation of uncertainty. Scholars of sociological institutionalism have modelled this situation as “mimetic isomorphism” and thereby explained a specific modus of institutional change that result in the fact that organizations with similar tasks tend over time to implement similar organizational rules and procedures (DiMaggio/Powell 1983).

Influence as a mechanism for the management of interdependencies that either requires specific means of influence (money, power, authority) or a minimum of commonly shared norms and values. That is why influence is, on the one hand, a highly relevant mechanism in the process of steering of societal actors, but on the other hand – as far as common values are concerned – also an important mechanism in the institutional context of communities.

Exit, finally, suggests that one or more actors refuse to further engage in an actor constellation for collective decision-making. As a mechanism, exit is not at hand if actor constellations are based on compulsory membership. Apart from that, exit is only a rational behaviour if the actor has the option to stay autarkic. Therefore, the importance of exit in processes of political and economic coordination lies in the threat potential which exists as long as interdependencies subsist (Schimank 2007: 36).

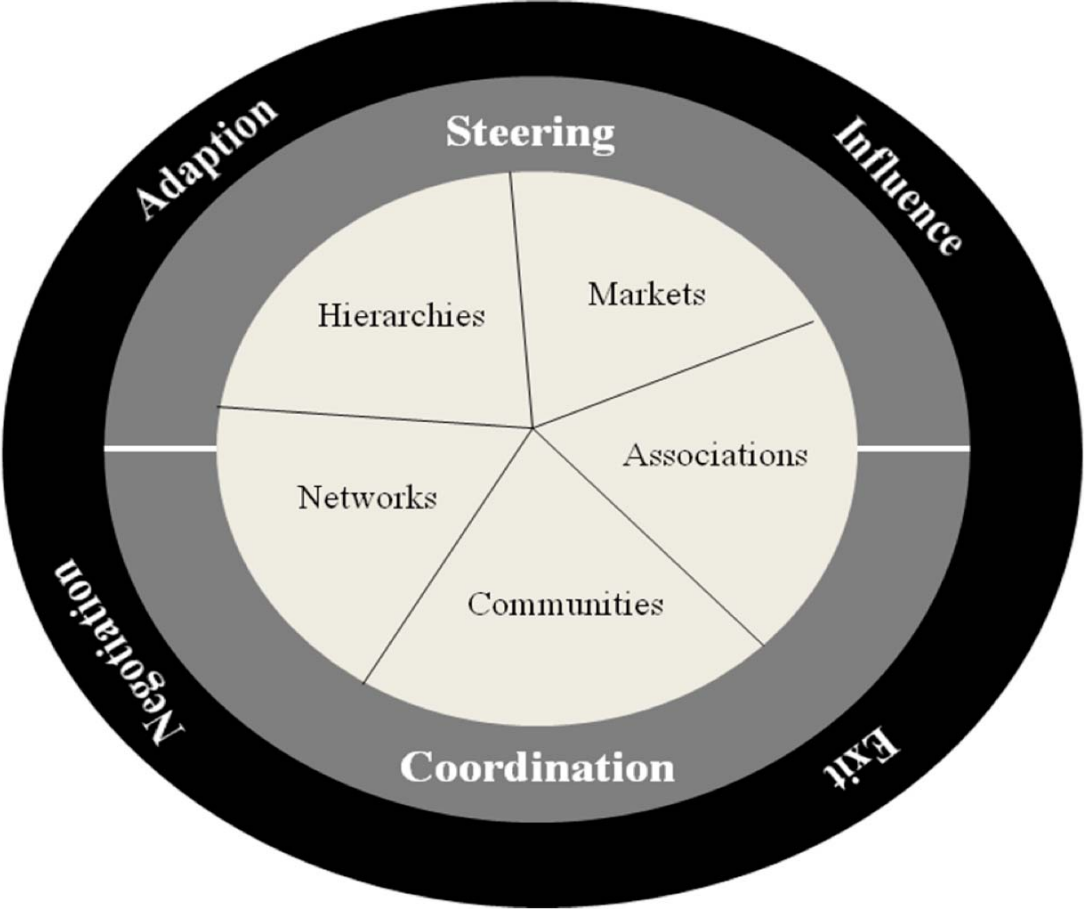
2.3 A working definition of governance as an analytical concept

To sum up, governance can be defined as the aggregate of different modes of collective decision-making, which span on a continuum ranging from social self-regulation over collaborative problem-solving by public and private actors to authoritative rule-making by the state. **Governance thus refers to the processes of steering and coordination of interdependent collective actors within institutionalized rule systems** (Benz 2004: 25). Governance processes are embedded in the five institutional structures of hierarchies, markets, networks, associations and communities. Nevertheless, in real life decision-making processes it is most likely to observe combinations of these institutional structures.

In order to make this point clear one can think of the so-called Barcelona target of the European Union, which claims to increase R&D expenditures to three percent of the member states GDP by 2010 of which two thirds should be provided by the private sector industry. It is obvious that this goal can be at best achieved only partially, as far as public

R&D expenditures are concerned, by a hierarchical decision-making modus. Influencing private sector industry in this direction, however, requires different mechanisms of political steering. Because of that, it is important to take into account the underlying mechanisms for steering and coordination. All in all, the analytical governance term thus contains three interconnected levels: the level of institutional structures as well as the levels of the modes of interaction and the mechanisms of governance which together establish the procedural dimension (see figure 1).

Figure 1: Structural and procedural elements of governance



3. The territorial dimension of governance

As indicated in section 1, many (new) governance concepts address the need to manage interdependent activities of a variety of actors vertically across different territorial levels as well as horizontally across different decision-making arenas (Héritier 2002: 3). Of course, both the vertical as well as the horizontal dimension are of utmost importance for the

understanding of policy-making processes in the European Union. The vertical dimension and thus the territorial perspective of governance is, however, a peculiarity that differentiates the European system of multi-level governance from all the political systems of the member states, even from those that have a federal state structure.¹

Building on the analysis of the European Community's structural policy, the model of "multi-level governance" was first introduced by Gary Marks in 1993 (Marks 1993: 407) and further elaborated in the following years by Hooghe and Marks (2001), Jachtenfuchs and Kohler-Koch (1996), Marks et al. (1996), Peters and Pierre (2001), and Scharpf (2002) among others. Initially, the concept was developed to offer an alternative view on state-centric models of European integration, which basically claim "that policy-making in the EU is determined primarily by state executives constrained by political interests nested within autonomous state arenas that connect subnational groups to European affairs" (Marks et al. 1996: 345).² In contrast to these approaches, a system of multi-level governance reflects "a polity creating process in which authority and policy-making influence are shared across multiple levels of government" (Hooghe and Marks 2001: 2).

Among scholars it is today widely accepted that the European system of multi-level governance consists of three distinct features (Marks et al. 1996; Grande 2000; Hooghe and Marks 2001; Peters and Pierre 2002):

- decision-making competencies are shared by actors at different levels (i.e. a "dynamic" dispersion of authority);
- actors and arenas are not ordered hierarchically as in traditional inter-governmental relationships (i.e. non-hierarchical institutional design);
- consensual or non-majoritarian decision-making among states, which requires a continuous wide-ranging negotiation process (i.e. non-majoritarian negotiation system).

According to the first feature, decision-making competencies are dispersed across territorial levels, i.e. across supranational, national, and regional or local actors, or allocated sideways, to quasi-autonomous agencies or to non-public implementation bodies (Majone 1996; Thatcher /Stone Sweet 2001). Another popular instrument is public-private partnerships for enhancing the capability of public institutions (Börzel/Risse 2005). Moreover, it is argued that the European multi-level governance system is a highly dynamic one, in which "the competencies and functions of the different levels have not been fixed precisely

¹ Parts of this section were published by Kaiser/Prange 2002.

² On state-centric views see e.g. Hoffman (1982), Moravcsik (1993; 1998), Milward (1992).

yet ... and cannot be fixed precisely at all” (Grande 2001: 9). What follows is that European governance is not a stable pattern, “but varies over time and across policy areas” (Kohler-Koch 1999: 32). With regard to aspects of authority relocation it is of special importance that in contrast to federal systems, in a multi-level governance system the interactions between the different levels are not “disciplined” by constitutional norms. As a consequence, the European system of multi-level governance is characterized by a considerable competition for competencies between the different territorial levels (Grande 2001; Mayntz 1999; Peters and Pierre 2002).

This competition for competencies, which contributes to the dynamic character of the European multi-level governance system, can best be illustrated with regard to the functioning of the internal market. While residual or reserved authority belongs to the member states, the principle has nevertheless continuously been hollowed out by an expansive interpretation of the EC’s internal market provisions (cf. Bermann/Nicolaidis 2001: 491). The European Commission extensively used the tool of Article 95 (ex Art. 100a) of the Treaty to propose “measures for the approximation of the provisions laid down by law, regulation or administrative action in Member States which have as their objective the establishment and the functioning of the internal market”.

The idea of the second feature is that actors and arenas are not ordered hierarchically, so that “supranational institutions are not hierarchically superimposed upon the member states; and the member states and their regions are not subordinated to the supranational powers” (Grande 2001: 7). Rather, “political arenas are interconnected rather than nested” (Marks et al. 1996: 346f), which means that subnational actors not only operate at the national, but also at the supranational levels. The consequences of this constellation are two-fold: firstly, in the European system of multi-level governance, actors at different territorial levels form “integrated systems of joint decision-making” (Scharpf 1988), leading to a growing demand for policy coordination and a growing importance of interaction effects between the different levels and arenas of decision-making (Grande 2001: 9f); and secondly, regional and local actors “by-pass” the national level to pursue their interests at the supranational level (Beauregard and Pierre 2000; Peters and Pierre 2002), so that national governments could no longer monopolize the contacts to the European level (Marks et al. 1996: 346; Wallace 2000: 31).

The third point stresses that the European system of multi-level governance is characterized by a non-majoritarian mode of decision-making (Grande 2000: 8f; Moravcsik 2001: 173f). The reasons for this observation can be found in the non-hierarchical nature of

the system of multi-level governance and in the role of national governments. In such a system, hierarchical command mechanisms or majoritarian decision-making would contribute to a lack of legitimacy of decisions and to high costs of implementation (Grande 2001: 8). Moreover, from a state-centric view it can be argued that national governments still play the most important role in the decision-making process of the EU (Moravcsik 2001: 175). Thus, a non-majoritarian mode of decision-making is necessary at least in matters of high importance to represent and enforce established territorial interests. Both the non-hierarchical nature of the system and the still important role of national governments at the supranational level turn the European multi-level governance system into a negotiation system, in which bargaining capacities and skills – and not hierarchical power – determine the outcomes (Grande 2001).

The European system of multi-level governance also provides significant challenges for the subnational level. This holds primarily for three reasons.

Firstly, regions and localities have become directly affected by the process of Europeanization at least if they are responsible for the implementation of EU regulations. In this respect, it has been estimated that about three quarters of EU legislation is implemented today at regional or local levels.

Secondly, with the common market project economic integration took hold of a number of legal competencies for which in federalized or regionalized member states subnational entities are responsible. Since the mid-1980s, those entities have reacted to the deepening of integration by establishing offices in Brussels in order to represent their interests of their own. Later on, the representation of regions (and localities) at the European level was “formalized” with the creation of the Committee of the Regions which was established by the Treaty of Maastricht. As a consulting body for the Commission and the Council the Committee has, however, quite limited competencies while membership in the Committee is heterogeneous comprising both regional and local representatives.

And thirdly, the European Commission has significantly increased its direct contacts to regions and localities even outside the narrow field of regional policy. The Commission, for example, initiated a specific regional innovation policy in the framework of the RIS (Regional Innovation Strategies) and RITTS (Regional Innovation and Technology Transfer Strategies) schemes and thus “forced” some regional bodies in more centralized member states to establish for the first time their own regional innovation strategies and to claim more competencies in planning and pursuing technology and innovation policies. More recently, the European Commission’s White Paper on European Governance repeat-

edly stressed the role of regional and local authorities in the future development of European integration. It has therefore proposed, that „at EU level, the Commission should ensure that regional and local knowledge and conditions are taken into account when developing policy proposals. For this purpose, it should organize a systematic dialogue with European and national associations of regional and local government, while respecting national constitutional and administrative arrangements“ (European Commission 2001: 13).

All these developments indicate that at least in practical concepts of governance the subnational level gains much importance both as the central level for the implementation of EU regulations as well as a source for policy relevant knowledge. Apart from that the White Paper also suggests that the coherence of Community Policies may suffer from a lack of knowledge about the varying institutional conditions that exist at subnational levels. From a more analytical point of view it is therefore most relevant to study the conditions under which subnational levels can influence European policy-making procedures. An important question in this respect certainly is what instruments could facilitate the transfer of policy relevant knowledge across territorial levels. Closely related to both aspects is the question of what capacities different regions have to set up and implement their own programs designed to support the transformation of their economies. As we will see in the next section there is a high amount of variation and heterogeneity with respect to all these aspects. Given this there seems to be a most relevant perspective for comparative research within the EUROTITE project.

4. Variations in governance capabilities at the regional level

These three characteristics of the European multi-level governance system raise the question of the impact of varying roles and institutional capacities for governance at the regional level. Across Europe, subnational entities differ significantly not only in terms of their own budgetary and legislative competencies, but also in view of coordination mechanisms established between them and other public and private actors within the nation-state and beyond. Thus, section three will discuss the consequences that arise from the fact that regional actors are unequally prepared to engage in public policy measures and governance arrangements targeted at the creation of the knowledge economy.

In order to measure the heterogeneity of the subnational level in Europe, the European Commission has taken various steps to categorize the regions along their administrative functions, their economic capacities and their degree of political and fiscal autonomy.

Widely known is the “Nomenclature of Territorial Units for Statistics” (NUTS) that was established by EUROSTAT and has been used for Community legislation since 1988. This nomenclature lists the European regions with regard to their respective population within a NUTS-1 category that is, however, of limited value for the assessment of their governance capacities. In Austria, for example, the NUTS-1 regions are “artificial objects” above the level of the federal states, while in Germany NUTS-1 comprises the 16 federal states. In terms of Belgium, the categorization is neither fully compatible with the regional division nor does it regard the existence of the communities.

The Second European Report on Science and Technology Indicators, published in 1997, classified European regions in a typology according to their economic and technological advance and growth. This report identified four categories of regions: a category of “the most performing form the technological heart of Europe”, a category of regions that form Europe's economic core, a category of regions with a big potential for technology adoption, and a category that includes those where potential technological and economic growth prospects were virtually absent. This report concluded that only a small number of regions dominate the R&D landscape in Europe. “Among them, one finds Baden-Württemberg, Île de France, Rheinland, Bayern and Nordrhein-Westfalen, Vorarlberg, Hamburg, Rhône-Alpes and Alsace. There is a gap between these regions and all the other ones. It could be said that they ‘dominate the European R&D system’” (European Commission 1997). By highlighting the economic strength of a number of regions in federalized countries, the report provides an indication that a certain degree of political and fiscal autonomy may support economic development. It is, however, as the example of the three French regions shows not a sufficient condition.

A third attempt to categorize Europe's region was made by the Commission in 2001 in a report submitted by one of the working groups that prepared the White Paper on Governance (European Commission 2001c). Although it considers only the member states of the former EU-15, this report is until today the most comprehensive discussion of the problem of European governance that has been prepared by one of the EU institutions. Basically, the report defined categories for the involvement of the regions in EU policy-making processes and thus provides preliminary indications about their capacity to engage

in the system of multi-level governance. The main outcomes of this exercise are shown in table 1.

Table 1: Incorporation and participation of European regions in EU policy-making (European Commission 2001c: 8-11)

Element of Incorporation / Participation	Current status for European Regions
Recognition of the right to be a member of the national delegations of the Council of Ministers and the Permanent Representatives (Article 203 EC, former Article 146)	Mainly still symbolic powers since only Belgium, Germany and Austria have incorporated into their constitutions the possibility offered by the Treaty to sit in the Council. Representation of the regions within the Council therefore remains unequal.
Right to take part in Council and European Commission Committees.	Representation in the advisory committees, which depends on the individual states, is still far from uniform (only the German Länder and the Belgian regions are frequently represented)
Participation in European legislation through involvement in determining the national positions	<p>In Austria, Belgium and Germany, the Länder or the regions have the right to be involved in European affairs and, in certain matters, commit the state within the Council of the EU.</p> <p>Bilateral cooperation between the Spanish state and the Autonomous Communities, especially on questions concerning the latter. A sectoral Conference for Community Affairs brings together the Minister for Public Administration and the ministers designated by the Presidents of the Autonomous Communities. The state has to take account of the joint position of the Autonomous Communities when their exclusive competences are affected by fundamental aspects of a Community policy. For the shared competences, there must be a consensus between the joint position of the Autonomous Communities and that of the state.</p> <p>In Italy, the State-Regions Conference, composed of the President of the Italian Council of Ministers, the Presidents of the regions and the relevant ministers, formulates opinions on the general guidelines concerning the development of Community activities affecting regional competencies.</p>

	<p>France: No official channel for regional participation in developing French positions. The regions and local authorities use indirect means to push their interests with the central authorities (Parliament, Senate, special interest groups).</p> <p>Finnish decentralization favors the communes, which do not have any special rights in developing national positions on European matters.</p> <p>Scotland, Wales and Northern Ireland comprise partially autonomous administrations. The United Kingdom local authorities are represented in certain national consultative bodies which deal with European affairs and have established a joint office in Brussels.</p> <p>In the Netherlands, the local authorities can express their point of view on the preparation of national positions in a consultation group.</p> <p>The autonomous regions of the Azores and Madeira are informed and can make their point of view known to the government when the Portuguese positions are being prepared.</p>
<p>Participation of the Regions in the implementation of European laws</p>	<p>The German and Austria Länder participate in the federal legislative application of Community law, in particular matters falling within their legislative competence. It is for the Belgian cultural communities and regions to apply Community texts, together with the State, for shared competences.</p> <p>Spain: The Autonomous Communities play only a limited role in the application of legislation. Only Catalonia and the Basque Country apply and execute Community law directly.</p> <p>Italy: if decisions encroach on the competences of subnational entities, its President takes part in the meeting of the Council of Ministers with right of discussion only. The regions with special status of Trento and Bolzano apply Community directives directly in areas of exclusive competence.</p> <p>The Finnish regional levels have limited involvement in the application of European rules, unlike the communes, which have significant</p>

	<p>powers (energy, transport and environment) and have to apply European legislation.</p> <p>The distinctive legal, political and administrative character of Scotland and Northern Ireland often requires separate legislation.</p> <p>The Netherlands: Indirect role in implementing some directives, in addition to the central authorities' activity.</p> <p>Portugal: In certain cases, the legislative meetings of the autonomous regions of the Azores and Madeira have a role to play in the application of European law.</p>
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From this follows, that regions throughout Europe certainly have different qualitative capabilities to influence multi-level policy processes. To put it in a nutshell, only the states within the federal systems of Austria, Belgium and Germany have become “formal” actors within the European legislative process, although the European treaties do not mention subnational entities at all. Here, participation is guaranteed by national constitutional provisions. Moreover, these constitutions provide not only for participation at the European level, but also for co-decision in the process of formulation of national positions. In Germany, for example, the Länder participate in the formulation of Germany’s position through the Bundesrat. Depending on the legislative competencies concerned, the federal government has either to consider or even to adopt the position of the Länder as the national position if a measure falls within the exclusive authority of the states. In view of their participation both at the national and the European level the Länder, however, had to concede to coordinate their interests through the Bundesrat, which is by definition a federal organ, as a precondition for their involvement in European affairs. In some of the decentralized political systems (Italy and Spain) considerable rights of participation exist only for those subnational units that have a special status of autonomy. In all other cases, however, the degree of involvement depends largely on the willingness of the central state government.

At first sight one would also expect that subnational entities in federal countries should have the most comprehensive autonomous financial and legislative resources at hand to pursue their own innovation and technology programs. Empirical studies have, however, shown that this is not always the case. In Austria, for example, the states play

hardly any role in the initiation of regional innovation policies while in considerably more centralized countries (such as the Netherlands or Sweden) regional and local authorities have been enabled since the 1990s both to implement regional plans for technological development and to coordinate their efforts with the national level. In the Netherlands, the provinces started regional innovation policies in the mid-1990s by designing so-called regional technology plans. The objective of all provincial activities is to build up dense networks between administration, industry, science and intermediaries in order to withstand the growing competition among regions. Additionally, the Dutch provinces also intensified horizontal policy co-ordination at the subnational level as they called on the central state government to provide for more regional competencies in innovation policies.

In Sweden, the central government has applied a regional approach since 1998, when a law on regional growth was adopted. Since then, the twenty-one Swedish counties have established regional growth agreements, which aim at coordinating regional and local policies. Moreover, since 2002 the program 'Regional Growth through Dynamic Innovation Systems (Vinvaxt)' has been targeted at establishing regional innovation systems in order to strengthen the Swedish regions for global competition. However, approaches which concede more competences to the counties can hardly be intensified owing to insufficient administrative capacity and a lack of experience in developing strategies and coordinating policies.

And finally, at least in some EU member states, the "internal" coordination of innovation policies across territorial levels has either increased in recent years or has traditionally been strong. While the Netherlands and Sweden represent the former, Germany is the main example of the latter. Austria, however, is in a way an exception to the general trend, since internal coordination was, despite the existence of a federal structure, relatively weak and has increased only moderately (cf. Kaiser and Prange 2004a).

In view of the considerations made above on the institutional structures of the analytical governance term it is certainly not sufficient to look at the "qualitative side" of formalized participation only. Rather, cross-regional variations in governance capacity appear to be much more critical if one takes also into account the quantitative perspective.

In this respect, the involvement of the German Länder has increased considerably during the last decades. Already in the first half of the 1990s, the Bundesrat was represented in about 330 of the 1,200 committees that existed at the European level. Furthermore, about 270 Länder representatives were involved in other participation procedures as members of committees established by the European Commission or the Council of the

European Union. On a yearly basis, the Bundesrat received more than 4,000 EU documents of which about 150 were introduced in the parliamentary process. This holds true especially for legislative acts originating from the European level. In the year 2000, the Bundesrat was confronted with 37 proposals for new EU directives (Kaiser 2005).

It is also worth noting that subnational governments utilize their governance capabilities not only within the European Union. On the contrary, the German state of Bavaria, for example, has expanded its “presence” in North America since the end of the 1990s by establishing new offices in Palo Alto and Montreal and has thus complemented its inter-regional agreements that already existed with California and Quebec. Moreover, the number of foreign offices established by individual states in both countries relates to the extent to which their regional economies are embeddedness in world markets. Subnational governments tend to invest more resources in the establishment of foreign offices the more their economies become integrated in international markets.

Interregional cooperation is, however, not a most recent development; nevertheless, it certainly gained momentum in the processes of globalization and economic integration.³ This holds true primarily for trans-border regional cooperation as well as for “strategic alliances” between regions in different countries. In view of these special relationships economic complementary matters more than proximity. The German state of Bavaria, for example, signed agreements on economic and technological cooperation with Massachusetts and California which both have, similar to the Bavarian case, a strong performance in the field of knowledge-intensive and science-based industries, such as biotechnology and information technology. An even more institutionalized cooperation exist with its four partner regions Quebec, Upper Austria, Shandong, and the South African region of Western Cape. In February 2002, the Prime Ministers of these regions agreed to establish an enduring partnership for economic, ecological, social and cultural cooperation.

All in all, the diversity of European regions in terms of their resources and governance capabilities raises the question of how they could be more effectively integrated into

³ Inter-regional trans-border initiatives exist in Europe in various forms. Even though many of them have been founded before regional integration programs started or deepened, the EU promoted intensified trans-border cooperation. This holds certainly true for the so-called four “Euregios” which have been established along the border of Germany, the Netherlands, and Belgium. These regional initiatives were heavily funded by the EU’s INTERREG program that co-financed such initiatives in the 1990s with about € 500 million. Other forms of cooperation, especially regional lobbying associations, have also been spurred on by the process of European integration. Such associations exist for European border regions (“Arbeitsgemeinschaft europäischer Grenzregionen”), for regions with strong industrial traditions („Arbeitsgemeinschaft der Regionen mit Industrietradition“) or for regions located around the Alps (ARGE ALP).

in processes of EU policy-making. Since hierarchical order is not an option the coherence of public policies at different territorial levels produces a typical governance problem. The report of the working group on multi-level governance that was already mentioned above passed a damning indictment of previous initiatives taken by the European Union: “The EU must rid itself of the idea that the state is its sole interlocutor. It must recognize that various types of state exist in the Union and that their different characteristics must be taken into account (unitary states, decentralized unitary states, regionalized unitary states and federal states). While Europe is and must remain a union of states, the implementation of Community policies and participation in the European political agenda must associate regional and local players because it is they who put Community measures into action. Consultation, partnership, contractualization, transnational cooperation and coordination are the five essential priorities which are proposed to promote the creation of networks between the different territorial levels in order to produce better multi-level governance (European Commission 2001c: 47).

This critical evaluation is neither surprising nor has it lost its validity. Up to now, the European Union relied almost exclusively on a “new tool of governance”, the Open Method of Coordination (OMC), in order to increase coherence of policy measures taken at the different territorial levels. In the case of innovation policies, the rationale behind the application of the OMC is that public policy actors at the European, the national, the sub-national and even the local levels should become more involved to ensure that their measures taken are mutually consistent. Under this premise, innovation policies implemented at various levels in Europe are expected to become considerably more integrated in a multi-level governance structure.

The open method of coordination in R&D and innovation policies can be characterized as a two-dimensional process that is primarily based on a continuous benchmarking of national innovation policies against best performing countries (i.e. major competitors) in the world. Accordingly, benchmarking firstly serves to identify specific needs that exist for individual Member States or industrial sectors (horizontal dimension). In order to overcome existing deficits of national innovation systems, benchmarking also refers to best practices that have been successfully implemented elsewhere. Secondly, on the basis of the benchmarking results, EU Member States might agree on common European guidelines that have to be translated into specific short-, medium- or long-term targets for national and regional innovation policies (vertical dimension). Consequently, those guidelines concern measures that are designed to strengthen coherence of innovation policies at different

territorial levels and to improve Europe's innovative performance in general. The whole process is accompanied by periodic monitoring, evaluation and peer-review pursued under the auspices of the European Commission.

The responsibility to enforce the method lies both with the European Commission and the Member States. Whereas the Commission is primarily engaged in the establishment of an institutional framework for coordination and the publication of quantitative performance data and qualitative issue-oriented assessments (European Innovation Scoreboard; European Trend Chart on Innovation), the Member States are responsible for the creation of "internal" coordination mechanisms both horizontally between the respective governmental departments and vertically between the national and the regional administrations. This means, that local and regional actors are not directly involved in the coordination process at the European level. As a consequence, vertical implementation of the OMC in innovation policies largely depends on the existence of coordination mechanisms within Member States and the willingness of subnational actors to comply with targets, which have been defined – without their direct involvement – at the European level (Prange and Kaiser 2005).

Both basic characteristics of the OMC thus counter the recommendations of the working group's report in view of the reliance on member states' governments in vertical policy coordination and in terms of the lack of a differentiated approach towards the subnational level that would take into account their different characteristics. In this respect the OMC constitutes a governance failure as it is not capable of inducing the establishment of durable network relations across territorial levels.

5. Governing science, technology and innovation

There are at least three reasons why we can assume that the governance of science, technology and innovation has been changing and is still in a process of change. The first reason is that the state as an important actor in the steering of technological development has not only redefined its role, but has also reacted to the processes of internationalization and globalization by delegating certain competencies to public authorities beneath and beyond the nation-state level. A second reason exists because of new dynamics in science and innovation, both in terms of the internationalization of processes of technological development as well as in view of the emergence of modern science-based technologies and industries. And a third reason is that scientific activities have become increasingly confronted

with diverse demands and expectations from a variety of societal actors. All three reasons have caused a transformation or an emergence of new institutional arrangements for the governance of science and innovation. In the following these developments will be discussed along three specific dimensions of change.

5.1 The actor dimension: the changing nature of the state

Since the 1980s, the role and the nature of the state have changed significantly in many Western European countries. This is primarily due to three interrelated trends: firstly, an “internal trend” marked by administrative reforms that took place under the overall concept of public management reform; secondly, a “functional trend” in the process of market liberalization that is characterized by the retreat of state from areas in which the state traditionally was a provider of public services; and thirdly, a parallel “trend of integration and disintegration” in which the state at the national level delegated competencies and resources to levels above and beneath the nation-state. As we will see in the final section of this chapter, all these three trends have had an impact on the state’s capacity to steer and coordinate processes of technological development.

The internal trend of public management reforms has been initiated, *inter alia*, because of increasing budget constraints, because of the conviction that the state is neither the prime “planning cell” of society nor is the hierarchical bureaucratic organization always the superior mode of coordination, and because of the availability of modern information and communication technologies that were considered important tools to render the provision of public services more efficiently (Jann 2001). Accordingly, public management reforms have been multi-facet developments in which the state has:

- adopted deficit and debt reduction strategies,
- implemented business planning and performance management systems, and
- contracted out public services to executive agencies, the private sector or to new organizations under public-private sponsorship (OECD 2000a).

Budget constraints and public manage reforms also had an impact on the relationship between governments and publicly-funded research organizations. In terms of financing mechanisms, for example, institutional funding was generally reduced in favor of competitive grants schemes, which made many public research organizations more dependent on alternative financiers such as the private sector industry. In some countries, such as the

Netherlands, the state joined forces with the private sector industry in the provision of research grants. In order to promote collaborative research efforts between industry and public research organizations, public investments were made available contingent on private co-investments (OECD 2004: 89ff.). Even if public investments in R&D were not reduced, an increasing part of it was delegated towards new multidisciplinary priority programs or new organizational formats for collaborative research (e.g. Networks of Excellence”). In terms of institutional adjustments, research ministries, on the one hand, often gave public research organizations more autonomy, but, on the other hand, also established an intermediary level of administrative agencies that became responsible for the management of research programs (OECD 2003).

The liberalization of markets in which the state traditionally acted as the monopolistic service provider obviously had an impact on actor constellations and interactions in the respective sectoral innovation systems. In the days of the public telecommunications monopoly, for example, Germany’s centralized public agency – the Deutsche Bundespost – maintained extraordinary close relations with a small number of equipment manufacturers who exclusively developed and installed the telecommunications infrastructure. This cartel-like institutional arrangement, in which the market as a coordination mechanism did not exist and to which foreign manufacturers did not get access, was dissolved only with the liberalization of the telecommunications market. As a consequence, the privatization of the public service provider did not only change the relations to the former cartel partners, but also allowed for the market entrance of various new manufacturers and services providers who coordinated the development and procurement of telecommunications equipment mainly over the market (Grande 2001; Kaiser and Grande 2002; Kaiser 2004).

Finally, in recent years many nation-states in Europe have become subject to parallel processes of integration and disintegration which both had an impact on the capacity to steer science and innovation. In this respect, the ongoing trend of transferring further competencies and financial resources to the European Union certainly had an integrative effect. This holds also for the field of research and innovation policies. Certainly, still the greatest part of public technology and innovation policies is pursued at the national level. In the European Union only 17 per cent of all expenditure on civil research is dedicated to Community initiatives (European Commission 2000). Nevertheless, the European Union has clearly assumed an important role as an innovation policy actor which was not necessarily be foreseeable when this process started at the end of the 1970s with the implementation of a rather limited number of sectoral technology programs.

A certain amount of disintegration in the nation-state's capacity to govern science and innovation can be seen in the valorization of the regional level which has been described in some detail in chapter 4. Apart from that, at least in some member states of the European Union the disintegration went a step further. In Belgium, for example, the constitutional reforms of the 1980s and 1990s led to a situation in which only few competencies in research and innovation policies are left at the central state level. In Britain, the process of devolution initiated a number of innovation policy activities in Scotland which are, however, still funded with a relatively small amount of money. And in Germany, the most recent constitutional reform transferred virtually any competency in educational policy to the federal states.

5.2 The technological dimension: new institutional arrangements for modern science-based technologies and industries

The emergence of new institutional arrangements for the steering and coordination of science and technology also has a technological dimension. In this respect, two developments seem to be most significant: the internationalization of processes of technological development and the emergence of new science-based technologies and industries.

Regarding the first development, Archibugi and Iammarino (1999) have defined a "taxonomy of the globalization of innovation" with which they categorize internationalization strategies of firms. These categories include the international exploitation of technology produced nationally, the global generation of technology, and global technological collaborations. Internationalization processes of the second and third category are confirmed by observations that private research and development (R&D) are increasingly organized globally (Chesnais and Simonetti 2000; ETAN 1998; Meyer-Krahmer and Reger 1999; Patel and Pavitt 1998). The extent to which corporate actors have become integrated into an international system for the generation of innovation can be assessed by the distribution of R&D by national firms and foreign affiliates. In view of manufacturing industries, about 40 per cent of the R&D in Britain was conducted by foreign affiliates in 1996 while foreign firms contributed only 0.9% to the total R&D in Japan. In relatively small EU countries such as Sweden and Finland, in which R&D investments have increased in recent years, more than 80 per cent of R&D was conducted by national firms (Archibugi and Iammarino 2002: 112). The considerable increase in strategic alliances between firms that are engaged especially in science-based industries points to the fact that international scientific cooperation gained importance for the generation of innovations. Between 1980

and 1998, the number of strategic technology alliances more than doubled and reached a peak in the mid-1990s (OECD 2002: 131-135). Apparently, the internationalization of enterprise R&D rests on two main factors: the search for specialized regional centers of excellence in key technological areas, and their presence on important lead markets. Consequently, in coordinating the organizational infrastructure for private R&D competition, and thus the market as an institutional arrangement, has certainly gained importance.

The second development concerns the emergence of new science-based industries. Those industries are mainly characterized by their strong relations to the public knowledge base, especially to universities and non-university research organizations. There have been different approaches to measure the relation of those industries to the public knowledge base. Most of them, such as the measurements taken by Grupp et al. (1995) and Mansfield (1998) came to similar results. Grupp et al. determined the average levels of scientific references per patent applications with the European Patent Office and thereby found out that the industries with the strongest linkages to the science base are the biotechnology, the pharmaceutical and the semiconductor industries. The data provided by Mansfield (1998) are based on a survey in 77 large enterprises and they showed that the industries that are concerned with pharmaceutical and medicinal products, with information processing, and with metal processing maintain the highest degree of interaction with the public science base (see table 2).

Table 2: Relationship to science of different technology areas

Technology Area	Grupp et al. 1995 (cited in: Meyer-Krahmer/Schmoch 1998)	Technology Area	Mansfield 1998
Biotechnology	81	Pharmaceuticals and Medicinal Products	17
Pharmaceuticals	66	Information Processing	17
Semiconductors	61	Metal Processing	9
Organic Chemistry	58	Tool Manufacturing	5
Food Chemistry	52	Chemical Products	4
Data Processing	37	Electronics	3

The emergence of new science-based industries has not only changed the behavior and organizational structure of firms and research organizations, where the typical hierarchical mode of coordination within vertically-integrated firms has been more and more replaced by horizontal network relations among specialized providers of knowledge and technologies. Rather, it has thus also altered the traditional mode of knowledge production. In this

respect, Gibbons et al. have argued that since the mid of the twentieth century there is a mode 2 knowledge production emerging characterized by context-driven, problem-oriented and interdisciplinary research (1994). This would contrast with a former investigator-initiated and disciplinary (“mode 1”) knowledge production where research efforts were taken by autonomous scientists in research organizations and units mainly for the sake of producing new knowledge. However, the mode 2 approach has received a number of critical comments while the basic idea of the emergence of new modes of knowledge production has led to some alternative concepts.

One of the most prominent ones certainly is the triple-helix approach presented by Leydesdorff and Etzkowitz as a model of communication and interaction in university-industry-government relations (1998). This model conceptualizes a network structure between three distinct subsystems in which interactions are aimed at generating synergy among economic wealth generation, technological novelty production, and institutionally organized retention (Leydesdorff et al. 2006: 183).

In conceptualizing regional worlds of production and innovation, Michael Storper went a step further and argued that not the pure existence, but the density of network relations and the capacity to self-organize network interactions within a regional context are the crucial assets that provide for a competitive advantage (1997: 28). This raises the question, what institutional configurations are likely to positively influence the density of such network relations. In this respect, empirical studies point to the importance of intermediaries in the innovation process. Looking at the different research fields that have been concerned with the role of intermediary organizations, Howells showed that those organizations have significant functions especially in knowledge diffusion and technology transfer, in the management of innovation, and in setting-up and stabilizing innovation networks (2006).

5.3 The societal dimension: a new understanding of the role of science and innovation

In recent years, science and innovation have undoubtedly become subject to diverse demands and expectations by different societal groups and actors. In order to shed some light on this societal dimension, this section will summarize at least the main important trends.

A first expectation in this respect is based on the assumption that we are currently witnessing the emergence of a “new economy” in which innovations are of utmost importance for economic growth. Based on an analysis done by the OECD Growth Project it was argued that the divergence in the levels of GDP per capita across OECD member countries

in the 1990s could be explained mainly by the employment of modern information and communication technologies and by the ability to generate innovations in a changing environment in which “innovation has become more market-driven, more rapid and intense, more closely linked to scientific progress, more widely spread throughout the economy” (OECD 2000b: 8). As a consequence, there are specific institutional arrangements that seem to spur the generation of innovations, such as higher market competition, networks for the generation of knowledge and a culture of openness in the dissemination of knowledge, and new modes of capital provision for high risk innovation processes (OECD 2000b: 73, Chesbrough 2003; Kaiser 2008b).

A different expectation of innovation is less linked with economic growth, but with specific societal needs. In this view, there is a demand on scientists and innovative firms to improve the living conditions of certain groups in society even if in this case there is hardly a chance at least for economic actors to generate their return of R&D investments. In recent years, a remarkable example of such a demand concerns the emergence of new actors and actor constellations that lobbied for increasing research efforts in the field of so-called orphan drugs for the treatment of rare diseases. Here patient groups, often in collaboration with pharmaceutical firms, called upon the state to provide for favorable regulatory conditions and public subsidies in order to support the development of orphan drugs. It has been argued that the establishment of complex policy networks comprised of private pressure groups, regulatory authorities and industry point to a variant of mode-2 knowledge production where lay groups do not only have an impact on public opinion on the role of science and innovation, but also directly influence innovation at the scientific and public policy level through multi-actor interactions (Crompton 2007: 200).

A third aspect is that modern science-based technologies and industries have raised new ethical concerns about the possible results and consequences of scientific research. Accordingly, there is today a new normative claim for citizens’ participation which may result in a re-adjustment of the relationship between science, technology and democracy (Bora and Hausendorf 2006; Jasanoff 2004; Kitscher 2001; Kleinman 2000). The relationship of science, technology and democracy has two different, but unrelated perspectives. The first one concerns the legitimization of political decisions on the ethical limits of science and research. In this respect, as the example of new scientific approaches in biotechnology shows, different procedures apply. Societal conflicts over stem cell research, for example, were decided either by referendum (as in Switzerland), by parliamentary decision with the assistance of a “national ethics council” (as in Germany) or by legislative

competition between some jurisdictions that banned stem cell research at all and others that supported it with substantial public funds (as in the United States). A second perspective points to the growing importance of “scientific evidence” for the decision on contentious matters such as the liberalization of trade regulations that refer to globally agreed health and safety standards. Within the framework of the World Trade Organization scientific evidence has thus become the only accepted justification for the restriction of free trade in goods (Gstöhl and Kaiser 2004; Marceau and Trachtman 2002).

A fourth and final aspect concerns a novel trend towards the medialization of science which has led to the establishment of a much closer interaction between the science system and mass media (Lewenstein 1995; Weingart 1998). Medialization not only plays a role regarding the creation of public awareness for the promises of new scientific fields it also shapes the public expectations about the capacity of scientific research to find a solution for societal problems. Accordingly, the science-media relations has become increasingly bi-directional which at least in some instances causes a situation in which typical characteristics of mass media coverage (i.e. the trend towards dramatization of ongoing “stories”) tend to apply in a similar way to “purely” scientific controversies as it has been the case in the controversy among supporters and critics of scientific evidence for climate change (Pearce 1997).

5.4 The changing role of the state in the steering and coordination of science, technology and innovation

The changing role of the state in the steering and coordination of science, technology and innovation can be understood best under a systemic perspective on innovation. Innovation systems can be defined in many ways focusing either on their functional or on their territorial aspects (Carlsson et al. 2002; Malerba 2002; Niosi 2002). According to Galli and Teubal (1997: 345) national systems of innovation are defined as “the set of organizations, institutions, and linkages for the generation, diffusion, and application of scientific and technological knowledge operating in a specific country”. Therefore, such a perspective on a National Innovation System demands, on the one hand, the inclusion of a vast number of organizations and their respective interactions in order to analyse both the system’s overall performance and the capabilities of specific sub-systems (e.g. the education, financial or research systems). On the other hand, it also requires the analysis of the resources provided by the public sector to individual and complex actors and the role of the state in steering the sub-systems of an innovation system. Consequently, a systemic perspective allows for

the evaluation of state action within an innovation system in connection both with changing institutional arrangements in particular sub-systems and new modes of interactions among innovative organizations. From this point of view, public innovation policies are targeted primarily at the improvement of the institutional environment in which innovative organizations are embedded and at the optimization of interactions between those organizations within an innovation system.

Although the concept of the National Innovation System did never expect that those systems are insular units, tensions certainly arise both from processes of globalisation and regionalization. Arguments in favor of the existence of European or even global systems of innovation often refer either to the fact that the effects of national policies are diminishing due to the increase of transnationally organized technologies and businesses as well as to a growing number of innovation related policy areas that are coordinated by the European Union or other regional or international organizations (Anderson et al. 1998; Jacobs 1998: 712). For authors like Caracostas and Soete (1997: 416) the establishment of post-national institutions in the area of the science infrastructure, such as European science funding, innovation and technology transfer, and European programs for education and training, are clear signs to believe in a European innovation system. However, as long as elements of an innovation system are mostly in the competence of regional or national administrations (e.g. research and education policies), it is quite likely that there are limits to the Europeanization of science and innovation policies. Thus, it can be assumed that a “concentration and integration of European innovation policies in transnational arenas” (Kuhlmann 2001: 967) is not likely to come true. Rather, the notion of “a co-evolution of regional, national and European policy arenas” (Kuhlmann 2001: 970), seems to be more appropriate to characterizes those emerging multi-level innovation systems, where political power does not crystallize around one institutional core, one political arena, and one territorial level.

In recent years, much more attention has been paid to the concept of regional or local innovation systems (Braczyk et al. 1998; Cooke 1992, 2002; Dalum et al. 1999; Howells, 1999). The concept of regional innovation systems (RIS) is based on the assumption that the regional level can play a balancing role in the age of growing globalisation (Cooke et al. 2000: 2). Additionally, Cooke (2002: 134) has argued that the national innovation system cannot function well without regional innovation systems “in respect of the enterprise and innovation support infrastructure, specialized human capital, leading edge basic and applied research and the varieties of network relationships that function most effectively in the relatively close proximity of regional clusters”. Indeed it is obvious that

regions within a national innovation system might develop quite differently. Accordingly, it seems obvious that specific regional or local characteristics and structural patterns exist which have a deep impact on the competitiveness of regions. Nevertheless, there is hardly evidence that regional innovation systems exist in which all the necessary components for the functioning of an innovation system are established.

As a consequence, it seems to be appropriate to assume that certain functions of the national innovation system have either been delegated – exclusively or partially – towards the regional/local level or the European/international level or have been supplemented by these levels. In some cases, those functions became part of a multi-level governance system which is characterized by institutional incentives or framework conditions provided by various public actors that share responsibilities across territorial levels. In the latter case, territorial levels above and beneath the nation-state level have not only been assigned with functions formerly provided by the national level, they also have become involved through activities that complement the national framework (Kaiser and Prange 2004b).

As the innovation systems approach also has become a “practical” concept for the design of science and innovation policies (cf. OECD 2005), governance has been considered as a key approach in these policy fields. However, from a critical perspective one has to claim that those concepts seem to trifle with the immediate consequences that arise from the demands for greater policy coherence and stronger horizontal and vertical coordination of policy measures. This is mainly due to two reasons.

Firstly, there is a danger of increasing coordination costs that accelerate – in the vertical dimension – with the number of administrative levels concerned and the degree of subnational autonomy. From a horizontal perspective, it might be too optimistic to assume that actors in traditional policy domains will adopt the spirit of coherence if policy coordination would require adjusting established preferences that are rational from an isolated view of the respective policy domain.

And secondly, those practical governance concepts tend to assume that public research and innovation policies can be easily adjusted to new needs and challenges. Such a perspective lacks at least a “historical understanding” of the development of public policies. In this respect, many empirical studies have shown that over a longer period of time there are indeed “paradigm shifts” in public research and innovation policies. The new instruments, however, have usually not replaced the older ones, but they have complemented and sometimes interfered with those (Gassler et al. 2006). Consequently, the degree of complexity of innovation policies has equally increased as the number of innova-

tion policy actors. With this in mind, one would have to presume that the state capacity to steer processes innovation and technological development has decreased, but not increased. In fact, as the steering capacity has decreased the state's role in coordinating interdependent organizations within an innovation system has certainly gained importance.

6. Governance in the EURODITE context: research questions and hypotheses

In the EURODITE project, governance refers to a knowledge context in which the state (governments, parliaments, and administrative agencies) plays the central role. Although, state actions are likely to impact the production, use, and diffusion of knowledge through regulation, public financing, the provision of a knowledge infrastructure, and the coordination of various private and public actors, project partners should keep in mind that “governance” comprises all forms of collective decision-making, i.e. also private self-regulation and various forms of co-regulation by public-private arrangements. Nevertheless, governance as a knowledge context is of high relevance for regional case study research in WP5 as we can expect that governance activities take place both at the regional level, but also across territorial levels with the involvement of subnational political authorities.

This assumption is in line with the European Commission's communication on “The regional dimension of the European Research Area”. It states that “many European regions today develop their own research, technological development, and innovation policies. These are largely autonomous without being out of step with their national counterparts. They generally involve local leadership, provision of financial and material resources, and priorities aiming at exploiting comparative advantage at regional level” (European Commission 2001b: 6).

Under this perspective, the definition of a region as a territorial unit of analysis should be bound to two important criteria: its internal administrative homogeneity and its differentiation from neighbouring territorial units in terms of specific cultural, political, administrative and/or socio-economic characteristics (cf. Cooke 2000: 55). These characteristics constitute the institutional embeddedness of a region, which largely explains the performance as well as the patterns of economic or technological specialization of such a region. Several theoretical concepts have pointed to the phenomenon of regional institutional embeddedness of which “industrial districts” (Piore/Sabel 1984; Pyke et al. 1990), “innovative milieus” (Crevoisier 2004), “learning regions” and “clusters” (Maskell 2001) and “regional innovation systems” (Cooke et al. 2004) seem to be the most important ones.

WP5 regional case studies should therefore keep a close eye on how regions vary in terms of autonomous budgetary and legislative resources that exist at subnational levels, on regional competencies in the implementation of national and European legislation as well as on established coordination procedures and practices between subnational and national authorities.

This leads us to a first hypothesis on the role of the state in the transformation of regional economies:

Within a multi-level system of governance, state authorities pursue to a varying extent their own policies towards the establishment of a knowledge economy, but they also use different channels of influence and co-decision within the national and the European context.

In order to test this hypothesis relevant research questions should be:

- What kinds of policies are pursued at the subnational levels that aim at supporting the transformation of regional economies?
- Are these policies of mainly regulatory or distributional nature?
- To what extent do these policies require the existence of autonomous budgetary and legislative means?
- What are the formal and informal channels of information and influence concerning related national and European policies and how do they contribute to subnational policies?

We can also expect that the variety of different modes of governance is higher at the regional level than at higher territorial levels. This leads to a second hypothesis on the reach and scope of governance arrangements at the regional level:

At the regional level, public and private actors are more likely to share a common understanding of the specific character of regional problems and possible solutions while proximity provides for “shorter” communication channels and lower burdens arising from distributional conflicts. That is why we find at subnational levels more dense networks of governance arrangements that are established by a larger variety of actor constellations.

Regional case studies to be done within WP5 should therefore be especially interested in:

- the various modes of societal self-regulation (without participation of public authorities, but under the “shadow of hierarchy”),

- different forms of co-regulation by policy networks or public-private partnerships, and of neo-corporatist arrangements, which should be of different importance in different EU member states.
- Apart from that we should also take into consideration that there are still various fields, in which the state still acts widely autonomous, but in which the instruments have nevertheless changed. This regards, for example, to the role of intermediary organizations to which governments may delegate decision-making competencies and through which they transfer resources to private actors.

One central objective of empirical research in WP 6 is to find out what the main internal and external sources of new knowledge are and how the flows of knowledge within firm as well as the between firm and external agents take place. From the literature on economic governance we know that different kind of institutional arrangements are better suited to ensure the inflow of critical resources than others. Accordingly, empirical research should be designed in a way that sheds light on:

- The number and type of actors with whom the firm interacts,
- The rationale for the chosen mode of coordination,
- The relation between different kinds of knowledge and institutional arrangements for knowledge interactions,
- The existing varieties of networks, because networks tends to be a black box category for coordination mechanisms that are beyond markets and hierarchies,
- The role of associations and other intermediary agencies. This is in a sense difficult to evaluate, because intermediaries might play a role even if they are not immediately involved in knowledge interactions.

In terms of the coordination of interdependencies of firms we can further expect that:

Firms are embedded in specific regional institutional contexts that are not only variants of dominant coordination patterns of the national economy, but also constitute institutional peculiarities of a specific region.

Research should therefore take into consideration:

- The degree of peculiarity of the institutional embeddedness and the existence of specific modes of coordination in different regional settings.

- The “degree” to which those regional peculiarities deviate from dominant national settings,
- The degree to which those forms of institutional embeddedness can be characterized as sector-specific.

7. Conclusion

The aim of this report has been three-fold. It firstly presented a differentiation of the various governance concepts that are under discussion both in social sciences as well as in practical policy-making. As a result of this undertaking, it then proposed to project partners to subscribe to the analytical perspective of the governance term.

The major characteristics of this analytical perspective have been presented in section 2. The aim was to show in particular that a common differentiation between government and governance is not convincing as it blanks out a significant part of the governance processes that are at hand on a continuum from private self-regulation over co-regulation of public and private actors to hierarchical rule-making of the state. This part should also have provided sufficient reasons why the EURODITE project is right in assigning a special role to the state, but is nonetheless in danger to overlook other important forms of collective problem-solving if it focuses on the state only.

The third and final aim of the paper has been to provide the ground for a common understanding of both the territorial dimension of governance and of the changes that have occurred in view of the governance of science, technology and innovation. With respect to the territorial dimension the paper aimed at laying the ground for the application of the concept of multi-level governance. If project partners would share a common understanding of this concept, the EURODITE research results would certainly benefit from “connectivity” to current discussions in practical policy-making as well as in political science. Regarding the governance of science and technology the paper tried to contribute to an discussion within the EURODITE project on major changes that have occurred in terms of the role of the state as an important actor in the steering and coordination of innovations, but also with respect to the role of the technological and the societal dimensions of change.

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