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Missing the Lisbon Target? Multi-Level Innovation and EU Policy Coordination

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ABSTRACT

At its Lisbon Summit in March 2000, the European Council decided to apply the Open Method of Coordination (OMC) to innovation policies. The aim is to establish a European Research Area, in which the OMC shall increase the coherence of regional, national and European policies. Until now, however, the OMC has only been applied to a very limited extent. We argue that this development is due to the fact that there are specific conditions for policy coordination in the emerging European multi-level innovation system that have hardly been mirrored by late EU initiatives for a more coherent European Research Area and its new open method of coordination.

The dynamics of innovation systems and the challenge of policy

In March 2000, the Lisbon European Council agreed on a strategy aiming at making the European Union (EU) the most competitive and dynamic knowledge-based economy in the world by the year 2010 (i.e. the 'Lisbon target'). In this so-called Lisbon strategy Europe's technological and innovative performance plays a key role since research and development (R&D) significantly impact the generation of economic growth, employment and social cohesion.[2] As part of the Lisbon strategy the European Council thus initiated the establishment of a 'European Research Area' (ERA) in which EU institutions and member states are expected to strengthen coherence of their activities in a variety of innovation related policy areas. In order to achieve this, the so-called Open Method of Coordination (OMC), which has been initiated by the Amsterdam treaty in the area of employment policy, will also be applied to innovations policies.[3] In the field of innovation policies, as in other policy areas to which the method has been applied, such as education, economic and social policies, the OMC establishes a number of 'soft-governance' instruments that go beyond the initial Treaty provisions.

Although participation in the coordination process takes place on a voluntary basis, those soft-governance instruments are designed to achieve greater convergence of public policy measures taken at different territorial levels towards 'common EU goals'.

The purpose of this article is to show – with regard to innovation policy which is one core policy area of the Lisbon strategy – why it is most likely that the strategy will miss its target. We do this by bringing together two research themes that have been dealt with separately until now. First, we consider the debate about innovation systems (Freeman 1988, Lundvall 1992, Nelson 1993, Edquist and Johnson 1997, Whitley 2000, Malerba 2002, Kaiser and Prange 2004a). In recent years, public innovation policies at different territorial levels have increasingly applied a systemic view on the processes of innovation and technological development. The 'Systems of Innovation'-approach detected that innovative activities of enterprises do not only depend upon intra-firm organizational capacities but are fundamentally shaped by the organisation's institutional environment as well as through specific technological or scientific patterns in which innovation processes are embedded. Thus, national or regional differences in technological performance can be attributed, at least to a significant extent, to variations in the institutional environment (Lundvall et al. 2002: 220). Studies about systems of innovation usually stick either to one specific 'territorial level' (e.g., 'national systems of innovation', 'regional systems of innovation', 'European system of innovation') or to one specific technology ('sectoral systems of innovation'). In order to reveal why the Lisbon strategy is likely to miss its target, we will introduce an alternative approach to this debate, which is the 'multi-level system of innovation' concept.

Second, we will combine our findings on a multi-level innovation system in Europe with the debate about the OMC and its role in European governance (Wallace 2000, De la Porte et al. 2001, Héritier 2001, Hodson and Maher 2001, Scharpf 2001, Regent 2003, Kaiser and Prange 2004b, Eberlein and Kerwer 2004). So far, the OMC has been discussed either more generally under the perspective of efficiency and legitimacy of new modes of soft governance or – with reference to specific policy fields – as a tool of Europeanization in areas in which the European Union lacks legislative competencies. In this article, we follow the second strand of the literature.

By bringing together a systemic perspective on innovation and the debate on new modes of governance in the European Union, we unfold a two-step argument about the missing of the Lisbon target. In a first step, we will argue that innovation systems in Europe are no longer national, regional, or European alone. Rather, certain elements of national innovation systems have been moved upwards to the European or

international levels or downwards to regional or local levels, while others remained national. In Europe, these processes of reconfiguration facilitate in fact the establishment of a multi-level innovation system (MLIS) in which public actors at different territorial levels maintain significant competencies and resources to promote autonomous innovation policies. However, this development has, and this is the second step of our argument, hardly been mirrored by late EU initiatives for a more coherent European Research Area and its new mode of coordination, i.e. the 'Open Method of Coordination'. While the OMC is seen as a central leverage for boosting innovation in Europe, the development towards MLIS renders efforts to greater European coherence in research and innovation policies – as envisaged by the OMC – quite unlikely, i.e. MLIS are counter-productive for closer coordination in Europe.

In the following we will briefly recapitulate the different concepts of innovation systems, which are all bound to a specific territorial level, and present our argument of a multi-level innovation system (section 2). In section 3 we will demonstrate empirical evidence for the emergence of a MLIS in Europe and explain its characteristics. Section 4 analyzes the challenges arising from theses developments and argues that the application of the OMC has not yet fully recognized the consequences of a MLIS for policy coordination. On this basis, we finally pinpoint that actors at different territorial levels have specific functions in this multi-level innovation system and explain the consequences of this for policy coordination in EU innovation policy.

The concept of multi-level innovation systems

Since the mid-1980s, Freeman (1988, 1992), Lundvall (1992) and Nelson (1993), among others, have developed the concept of the 'National System of Innovation' (NSI) in order to study the interrelations between technological development and the institutional embeddedness of innovative organizations (for an overview see Lundvall et al. 2002). 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). However, they all involve the creation, diffusion and use of knowledge. 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'.

Thus, NSIs are characterized by a differentiated set of organizations and institutions. Among the organizations one can, for example, subsume political, administrative, regulatory and economic actors (Galli and Teubal 1997: 346). Institutions can be of 'formal' or 'informal' nature

(Edquist and Johnson 1997: 49): regulations and directives are examples of 'formal' institutions, whereas traditions, practices and norms of cooperation are part of 'informal' institutions. According to Edquist and Johnson (1997: 50), the distinction between 'formal' and 'informal' institutions is of considerable importance since their relation differs significantly, for example, between countries or between sectors within countries.

Since the early 1990s the NSI approach has been diversified by studies that recognized the evolution of autonomous systems of innovation at the local, the regional, the European and even the global level (e.g., Acs 2000, Braczyk et al. 1998, Cooke 1992, Cooke et al. 2000, Dalum et al. 1999, De la Mothe and Paquet 1998, Howells 1999, Mytelka 2000a, 2000b). Whereas a first group of scholars stressed the importance of local institutions and networks, transfer mechanisms, regional labor markets, as well as specific socio-cultural environments, a second group pointed to the internationalization of markets, technologies and corporate activities as well as the ongoing Europeanization of public policies. They both have in common that they called the dominance of national institutions into question and that they emphasized the growing importance of institutional arrangements either below or beyond the nation-state level.

In contrast to that, we argue 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 Europe, those functions became part of a multi-level governance system, which is characterized by institutional incentives or framework conditions provided by various actors that share responsibilities over 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 (cf. Grande 1999). Consequently, the territorial reconfiguration of national innovation systems can be conceived as a process that generates new modes of coordination and new constellations of actors among established or new organizations. Those organizations operate within an innovation system in which the national frame of reference is still important – and may be even prevailing. Nevertheless, the borders of such systems have become blurred, as more and more functions of the institutional environment can be located across various levels.

In the following section we will apply a number of indicators to analyze this process of reconfiguration, which – at least in Europe – led to the emergence of a multi-level innovation system.

Empirical evidence about the multi-level innovation system

In an innovation system, the institutional embeddedness of firms and research organizations consists of a multitude of factors of which the regulatory, the financial, and the research and education systems are the most relevant ones. We will apply these indicators here and – in order to point to the reconfiguration processes that led to the creation of a multi-level innovation system in Europe – also shed some light on public innovation policies and corporate activities.

Market and product regulation

Since the mid 1980s, regulatory activities concerning markets and products have gradually moved away from the nation-state towards organizations of economic integration both at the regional and multilateral level. This does, however, not mean that nation-states have lost their regulatory authority by delegating respective powers to supranational or intergovernmental organizations. Rather they either act together establishing new regulatory frameworks within in a system of pooled sovereignty, as is the case in the European Union, or they define specific conditions nation-states have to meet in the regulatory process, as has happened under the institutional umbrella of the World Trade Organization (WTO).

In view of market regulation, the probably most remarkable example of the dynamics of reconfiguration concerns the telecommunication sector. The liberalization of national telecommunications in Europe since the mid 1990s, for example, was largely influenced by related activities initiated by the European Commission as it was also linked with two agreements on the provision of market access for telecommunications services and equipment negotiated under the roof of the WTO. Both the EU and the WTO have defined obligations to their member states, which not only consider basic principles for market liberalization and market access but also established the framework for sector specific regulatory regimes at the nation-state level. An example of such an agreement is the WTO Basic Agreement on Telecommunications Services, which went into force on February 5, 1998.

Although the international dimension has gained a lot of importance in market regulation in recent years, there is still a crucial role for national regulators. Again, the telecommunications market is an interesting example of how national regulators, even within the regulatory framework set by the WTO and the European Union, seize the opportunity to regulate their national markets in a way that supports the introduction of new technologies more than is the case in other countries. In terms of

modern network technologies, for example the availability and use of Digital Subscriber Lines (DSL), Belgium, Denmark and Sweden have the leading position while the United Kingdom, which had the first liberalized telecommunication market in Europe, is far behind.[4]

Product regulation is more concerned with the protection of consumers and the environment. Regarding, for example, biotechnology regulation national regulatory frameworks have been accompanied by a process of Europeanization (e.g., Salter and Jones 2002). Corresponding with the enactment of the Single European Act (SEA) in 1987 European regulatory policies received a certain dynamic reflecting that the SEA gave environmental policy a treaty basis for the first time. Additionally, the Amsterdam Treaty of 1997 'called upon the Council and the Parliament to achieve high levels of health, safety, environment and consumer protection in promulgating single market legislation' (Vogel 2001: 10). Concerning the field of biotechnology, the European Union introduced respective legislation for the first time in 1990 through Directive 90/219/EEC on activities related to genetically modified micro organisms in closed systems, and Directive 90/220/EEC on the handling of genetically modified micro organisms in field trials and open production systems. Until 2001 both directives have been amended twice.

Apart from regulatory measures on laboratories and field trials, the European Union introduced legislation on marketing authorization for pharmaceutical products. In 1995, a new centralized procedure went into force, which allowed for community-wide authorization of medicinal products. The European Commission grants those marketing authorizations on the basis of a scientific examination by the European Agency for the Evaluation of Medicinal Products (EMEA) established in 1993.[5] Evaluations by EMEA are mandatory for pharmaceutical products, which have been developed by means of biotechnological processes. Additionally, the agency arbitrates in the event of disputes arising over mutual recognition at the national levels through its 'decentralized procedure' (Everson et al. 1999: 190ff). In the European Union, the possibility of parallel national applications for new drugs was abolished in 1998, except for drugs to be used in only one member state.

It is beyond question that today the international level – and especially the European Union – has grown into a central role in regulating products of high technology. In some decentralized states, however, the overall regulatory regime has a strong regional dimension. In Germany, for example, the authority to enforce biotechnology-related regulations rests with the states. State (i.e. Länder) government action is not only relevant at the subnational, but also at the federal level, since amendments to the national regulatory framework require the consent of the

subnational governments in the Bundesrat. Moreover, due to their right to participate in federal legislation, state governments are also entitled to introduce bills implementing European laws.

In sum, market and product regulation in high-technology areas has become organized across various territorial levels and has thus developed typical multi-level characteristics, which means that while the enforcement of regulations still rests with the national (or regional) authorities, the framework for setting those (harmonized) regulations becomes more and more internationalized.

Public technology and innovation policies

The greatest part of public technology and innovation policies is still pursued at the national level. In the European Union, for example, only 17 per cent of all expenditure on civil research is dedicated to Community initiatives (European Commission 2000a). The predominance of the 'national' becomes evident if one compares the total gross R&D expenditures of all OECD countries with the expenditures of the European Union, which is the only supranational organization with a substantial R&D budget. In 2000, total R&D expenditures of all OECD countries amounted to over (PPPs) 551 billion USD while the EU's sixth R&D-Framework Program has a budget of approx. 16 billion USD for the period 2002–2006, which corresponds to the expenditures of Canada or Korea in the year 2000 (OECD 2002: 288). Nevertheless, in recent years several reconfigurations towards the regional and international level can be observed.

First, especially since the beginning of the 1990s, all EU countries faced growing portions of R&D-financing from abroad. The share of R&D-financing from abroad of total national R&D-expenditure doubled between 1985 and 2001, for example, in Germany (1.2%/2.1%), Ireland (6.6%/12.4%), Portugal (2.9%/5.3%), the United Kingdom (8.0%/16.3%), and the European Union (3.7%/7.7%) as a whole. In some EU countries, like Austria, Belgium, Iceland, and the Netherlands, this growth rate was even higher (OECD 2002: 292).

Second, in EU countries, growing external funding is increasingly complemented by regional innovation policies. Recognizing the 'region' as a key proponent for the generation of innovation and economic development has been a joint feature in several OECD countries – and not only in those with decentralized state structures. In Germany, for example, the federal level provides R&D funds particularly as institutional (co-) funding of non-university research organizations and as project funds issued through various thematic R&D programs, whereas the Länder are mostly involved through the financing of the higher

education sector. The perhaps most prominent example of a regional initiative by the federal government was the *BioRegio* program of 1995 aiming at stimulating the creation of biotechnology clusters (cf. Dohse 2000).

Additionally, some of the Länder have initiated their own innovation policy programs already since the mid-1970s in reaction to economic recession and structural change (cf. Scherzinger 1998). However, the engagement of the Länder in upgrading the research infrastructure and the provision of risk capital intensified with the commercial boom of biotechnology during the 1990s. One priority has been given to the formation of clusters and the networking of research between universities, research institutions and business enterprises. Additionally, some Länder follow an internationalization strategy, which includes bilateral cooperations as well as multilateral approaches such as the so-called ScanBalt BioRegion that encompasses regional biotech networks from the Nordic countries, the Baltic countries, Poland, St. Petersburg, Kaliningrad, and Northern Germany (e.g., BioCon Valley Mecklenburg-Vorpommern). As a result, regional innovation policies gained importance as an element of competition and differentiation among the states.

This increasing importance of the regional level in technology and innovation policies is also evident in more centralized states. In the Netherlands, for example, regional innovation policies are part of the Provincial economic policies since the mid-1990s. Until that date, regional innovation policy was considered as a unique competence of the central government and innovation-oriented aspects have not been applied to regional economic policy (Boekholt 2000). The most decisive factor in this new development was the European Commission's regional innovation policy in the framework of the RIS (Regional Innovation Strategies)- and RITTS (Regional Innovation and Technology Transfer Strategies)-schemes that forced the Dutch Provinces to establish regional innovation strategies and to claim more competences in planning and pursuing technology and innovation policies. Finally, France serves as a good example where progressive decentralization started in the 1980s (see e.g., Larédo and Mustar 2001). The activities of the regions are based on multiannual state-region plans (*Contrats de Plan États-Régions*), which organize a regional-national coordination of efforts (Larédo and Mustar 2001: 475). As in the Netherlands, the emergence of genuine regional innovation policies was reinforced by the European regional innovation strategy programs (Larédo and Mustar 2001: 476).

Third, since the early 1980s the European Union has emerged as an increasingly important actor in innovation policies and funding.

Apart from its multiannual Framework Programs, which support R&D in a number of strategic technological fields, the EU has since the mid 1990s refocused its activities towards a regional dimension as well as towards additional actions that have been taken to foster European innovativeness (Borrás 2003, Grande 1999, Kaiser 2003, Kuhlmann 2001, Peterson and Sharp 1998). The financial endowments of the EU R&D Framework Programs grew steadily over time from €3.75 billion for the first Program (1984–1987) to €17.5 billion for the sixth Program (2002–2006, including EURATOM).[6] Moreover, since the fourth Framework Program the Commission began to define strategic technological fields such as biotechnology, information technology, material sciences and telecommunications (Nollert 2000: 210–218).

The European Union has also increased its engagement towards regionalization. Starting with the RIS- and RITTS-schemes in 1994[7], the Union consecutively enhanced its regional activities leading to the so-called 'Network of Innovating Regions in Europe (IRE)', the 'Transregional Innovation Projects (TRIPS)' and the explicit addressing of the regional dimension in its proposal for a European Research Area (European Commission 2000a) as well as in the sixth Framework Program. Additionally, the Community supports innovative actions under the European Regional Development Fund (ERDF) since 1994, and has in 1999 started a new initiative 'to boost the transfer of excellence in the creation of innovative start-ups' in the regions (so-called PAXIS program).

To conclude, especially since the mid-1990s public policies for technological development and innovation have increasingly dispersed across territorial levels. Consequently, innovation systems are no longer exclusively national.

The research and education systems

While nation-states still retain primary responsibility for research and education policies and most universities were founded by states to serve national interests, such national definitions are increasingly under attack not only due to pressures of growing competition and globalization, but also because of international agreements such as GATS. Therefore, we find intensified reconfigurations of research and education systems, first of all, towards the international sphere with regard to, for example, university courses and diplomas, networks, entrepreneurial university activities, and patenting. Often internationalization appears in regional groupings (EU, NAFTA, APEC) rather than in a broad 'global' context (Kameoka 1996).

In 1997, the European heads of states together with the UNESCO's Centre for Higher Education (CEPES) adopted the 'Lisbon Convention on the recognition of qualifications concerning higher education in the European region'.[8] This Convention is no longer based upon strict equivalence but on the concept of mutual recognition. Moreover, in line with the Bologna Declaration of 1999 33 signatory states have started to gradually 'Europeanize' their higher education systems by harmonizing the structure of university degrees. The Bologna Process seeks to establish a European Area of Higher Education by 2010 through a reform process in which national structures might converge. This 'constitutes a dramatic shift away from the generally hesitant and reactive role which the member states of the EU used to play in a political scene of university cooperation' (Reichert and Wächter 2000: 42).

A second point, which hints at the reconfiguration of national research systems, is the growth of European science networks. While collaboration between universities is hardly new, institutional forms of cooperation agreements dealing with various aspects of education and teaching constitute a rather recent phenomenon. Such agreements facilitate international networks also between public and private institutions. Examples for such inter-institutional networks, which try to form around a common sense of identity, are the SANTANDER Group, the UTRECHT, UNICA, COIMBRA and COMPOSTELA networks of European universities.[9] In general, these networks are to be seen as rather loose fora for discussion and exchange of experience. Additionally, multiannual agreements such as the EU-USA or the EU-Canada Cooperation Program in Higher Education (both concluded in 1995 and renewed in 2001) create structural institutional links with an added value to bilateral agreements (European Commission 2000b).

Moreover, universities within the EU and also the OECD world have started to initiate 'strategic alliances' aimed at promoting the commercialization of knowledge and the transfer of technology. Such a strategic alliance exists, for example, between the University of Edinburgh and Stanford University, which cooperate in research and commercialization of knowledge in the field of natural language processing.[10] The internationalization of university research is further mirrored by their patent and publication activities. In order to maximize the likelihood of successful commercialization of knowledge universities are increasingly forced to patent their inventions even internationally. However, in view of the international orientation of scientific publications OECD countries differ significantly. As measured by citations in established international journals, international orientation is highest in the United States, lowest in Japan, Korea and the new EU member countries.

Corporate activities

The territorial reconfiguration of national innovation systems is most significant in view of corporate activities. Primarily multinational corporations and specialized small and medium-sized firms in science-based industries are considerably engaged across various levels – from the local to the international level. This holds especially true for financing and conducting research and development.

The internationalization of R&D can be described as a three-dimensional process characterized by the international exploitation of nationally generated innovations, the international generation of innovations and the increasing engagement of firms and research organizations in international techno-scientific collaborations (cf. Archibugi and Iammarino 1999, 2002). The technology balance of payments is an indicator showing to what extent national innovation systems are able to exploit their domestic innovations on international markets. Between 1981 and 2001, EU member states performed quite differently in this respect (see OECD 2002: 320). This holds especially for larger EU countries. While Germany's deficit in the technology balance of payments increased considerably from 545 to 4,760 million USD Britain was able to turn a deficit of 664 million USD in 1990 into a surplus of 7,173 million USD in 2001.

The extent to which national innovation systems 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 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 per cent 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).

Although internationalization of corporate activities has increased in recent years, especially large multinational companies still play an important role for their home countries. This holds certainly for private investments in research and development. Within the European multi-level innovation system, private R&D investments vary significantly between member states and regions thus reflecting significant variations

in their industrial structures. In recent years, the average R&D-intensity of EU Member States amounted to only 1.9 per cent, while just a few member states came close to the 3 per cent target or even exceeded it, such as Sweden and Finland (European Commission 2003a: 4). Variations are even greater at the subnational level. While at the regional level (NUTS 1) R&D intensity ranges from 0.5 per cent to close to 4 per cent, R&D intensities at the local or subregional levels (NUTS 2) span from 0.2 per cent to more than 6 per cent (European Commission 2003b: 5). Countries with a leading role in R&D intensity have in common that they are relatively small economies, which accommodate research-intensive multinational companies. By contrast, larger economies as well as small economies in which multinational companies do not play a significant role show considerably lower business R&D investments.

The home country also has significance for large companies, as it is still the most important reference framework for corporate governance. Even though there have been a number of measures proposed by the European Commission to harmonize company law national regimes prevailed especially because of industry associations and trade unions, whose strong influence exists at least in more coordinated market economies (see Streeck 2003).

IV. Challenges for Applying the OMC in Multi-Level Innovation Systems

The European multi-level innovation system is characterized by (1) a multitude of actors at different territorial levels who have significant competencies and resources at their disposal to promote innovations, (2) by considerable differences in the ways and means member states apply for vertical internal coordination in innovation policies, (3) by enormous institutional differences regarding member states' publicly funded research systems, and (4) by significant variations in the innovative performance, the industrial structure and the patterns of technological specialization among regions and nation-states. These findings, we argue in this section, are not mirrored in the current EU Lisbon strategy concerning innovation policy and therefore constitute the major challenges for the application of an open coordination to that policy area.

Taking stock of the OMC in innovation policy

Open coordination in innovation policies can be characterized as a two-dimensional process which is primarily based on a continuous benchmarking of national R&D policies against best performing

countries (i.e. major competitors) in the world. Subsequently, the 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 member states' innovation systems, benchmarking activities also refer to best practices, which have been successfully implemented elsewhere. The dissemination of those best practices is supposed to take place through a process of mutual policy learning organized at the European level. Secondly, on the basis of the benchmarking results, EU member states might also agree on common European guidelines, which have to be translated into specific short, medium or long-term targets for national and regional R&D policies (vertical dimension). Those guidelines consequentially concern measures, which 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 (European Commission 2000c: 16).

In this context, the EU Commission and the member states have different functions. Whereas the Commission is primarily engaged in the establishment of a framework for dialogue, coordination and benchmarking, 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 levels. Local and regional actors are thus not directly involved in the coordination process. As a consequence, the success of the OMC in European innovation policy – at least in view of the vertical dimension – largely depends on the existence of coordination mechanisms within the member states and the willingness of local and regional actors to subscribe to targets which have been defined at the European level.

At the European level, the benchmarking process has been institutionalized through the establishment of a High Level Group (HLG) composed of representatives from the member states nominated by the Minister in charge of research. The Commission assisted by the HLG coordinates the work of four expert groups on benchmarking in specific thematic fields. In a first cycle of benchmarking exercises, which lasted from September 2000 until January 2003, activities were concentrated on five thematic issues: human resources, public and private R&D investments, the impact of R&D on competitiveness and employment, productivity in science and technology, and the promotion of a R&D culture. The benchmarking activities especially showed that specific problems have a highly differentiated nature in various member states which can hardly be assessed by quantitative data. Consequently, benchmarking of national R&D policies still suffers from the lack of qualitative

indicators which are suited for illustrating the complexity of the institutional environment in which innovation processes and performers are embedded (cf. European Commission 2001a).

The solution to this problem has been called 'intelligent' or 'practice' benchmarking (cf. European Commission 2001a, Lundvall and Tomlinson 2002), which means that benchmarking is about to adopt a systemic perspective and will therefore be extended in two directions during the second benchmarking cycle.[11] First, it will look at all mechanisms, which have an impact on research policies (e.g., public programs, the education and research system, or financial structures). Second, it will incorporate the wider policy framework taking into account issues such as employment or taxation. It is expected that this renewed OMC results in a situation in which benchmarking will not only include the international comparison of quantitative performance indicators but also the 'use of simple statistical techniques to map causalities and the qualitative comparison of systems' (Lundvall and Tomlinson 2002: 225). Such a benchmarking model is clearly more appropriate to reflect the context-specific characteristics of successful practices in innovation policy. However, it will also disclose that best practices are often based on specific local conditions and on specific modes of interaction between innovative organizations. This would constitute a strong argument in favour of a bottom-up benchmarking process in which organizations, local clusters or industrial sectors compare themselves with other respective units.

Besides the involvement of the Commission and the Member States, participation of stakeholders shall be guaranteed through so-called European technology platforms. Those platforms are organized in a sector-specific way thus reflecting that the framework conditions for successful innovations vary significantly across industries. Through the establishment of those platforms, private sector industry should be enabled to define common agendas and to raise attention for specific burdens for innovation which might originate from regulatory or standardization issues.

Apart from benchmarking of national R&D policies, the application of the OMC in European innovation policies has led so far to the formulation of one strategic goal to be achieved by the member states. The Barcelona European Council agreed in March 2002 to invest at least 3 per cent of the member states' GDP in research and development by 2010 of which two thirds should be provided by private sector industry. Looking at the present situation in the European Union – and especially at the preconditions, which exist in individual member states – this 3 per cent target is a highly ambitious goal. In recent years, the average level was only 1.9 per cent while only a small number of member states came

close to the 3 per cent target. Those countries, especially Sweden and Finland, have in common that they are relatively small economies, which accommodate research-intensive multinational companies. In contrast, larger economies as well as small economies in which multinational companies play no significant role had considerably lower business R&D investments. Thus, there is a strong correlation between business R&D expenditures and the existence of large firms, which are engaged in research-intensive industries, such as telecommunications or pharmaceutics.

Since 2002/03 the Commission has aimed at developing the OMC process further. Firstly, in order to make the process more efficient the Commission called especially on public administrations, to develop a systemic perspective on the various policy dimensions, favouring policy mixes instead of single-solution measures (European Commission 2003c). Secondly, it will more intensively involve the private sector industry as the main producer of innovations in a way which reflects sector specific conditions for innovation. And thirdly, benchmarking will be concentrated on a smaller number of well-established and more targeted topics, thus both minimizing administrative costs of reporting and preventing political actors from initiating short-term policy measures aimed at reducing political pressure through better performance in view of only a few specific indicators (European Commission 2002).[12]

What's so special about European innovation policy? Challenges for the OMC

The challenges for applying the OMC in innovation policy derive from the four specific characteristics of the European multi-level innovation system mentioned in the beginning of this section. First, as we have shown, public policy actors in many countries enjoy a significant amount of autonomy in setting up their own innovation policies. Second, a large variety of internal coordination mechanisms for innovation policy exist within member states. The German Länder are, for example, considerably involved in various joint policy coordination processes with the federal level. Coordination exists especially in research and education policies where several permanent commissions were established. Furthermore, innovation policy coordination is supplemented by various co-financing arrangements that concern all major German research organizations as well as the university infrastructure.

Even in considerably more centralized EU member states, such as the Netherlands and Sweden, regional innovation and technology policies emerged in the 1990s, partly motivated by the EU's regional innovation

measures. Additionally, the Dutch provinces, for example, also intensified horizontal policy coordination 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 applies a regional approach since 1998, when a law on regional growth was adopted. Since then, the 21 Swedish Counties have established regional growth agreements, which aim at coordinating regional and local policies. Furthermore, federal countries, such as Austria and Germany, differ considerably from the more unitary countries in terms of the involvement of their subnational authorities at the European level. In both countries constitutional law provides for participation in EU affairs within the domestic sphere as well as in the Council of the European Union and the Commission. For Swedish and Dutch regions, for example, these channels of representation do not exist.

Third, significant variations among member states also exist regarding their publicly funded research systems. Germany, for example, possesses a highly differentiated and decentralized public research infrastructure with various universities, technical universities and polytechnics on the one hand and specialized non-university research organizations on the other hand. In contrast to Germany, where a large proportion of public R&D is performed outside the universities in large research institutes, publicly funded research in Sweden and Austria is concentrated within universities (European Commission 2001b). In Ireland, Spain and the UK, specialized institutes for applied research hardly exist. The French public research infrastructure is heavily based on national research institutes which are functionally organized around relatively few sectors and technologies like space, defence, railways and nuclear technology (European Commission 2001c).

Notably, recent developments indicate that the diversity of European public research systems tends to increase rather than decrease. France, for example, used pollution-based taxes as a new source to finance research projects on AIDS, the environment, or gene therapy (Senker 1999). In Germany, financial resources that were gained from the auction of third generation mobile communications licenses (UMTS) have largely been invested in research and education. Moreover, Denmark, Portugal and Sweden have separated administrations or funds for basic and applied research to science foundations, whereas Norway and Iceland, which both are associated to the EU (and the ERA) through the European Economic Area, have done the opposite by centralizing responsibilities for these two types of research.

Fourth, there are significant variations in the innovative performance, the industrial structure and the patterns of technological specialization among regions and nation-states. Structural diversities, for example, can

be observed in terms of various indicators, such as the technological orientation of private and public research organizations in different countries. Patent analyses reveal that at least the larger EU member states (France, Germany, Italy and the UK) differ considerably in their technological specialization. Moreover, those patterns of specialization are not only remarkably persistent, they also influence the research activities pursued abroad by European firms as well as of foreign firms acting in different EU member states (cf. Patel and Pavitt 1998; Patel and Vega 1999).

With regard to the output performance of EU Member States, one general trend concerns scientific and innovative strength at the national level. Whereas Belgium, Denmark, the Netherlands, Sweden, Finland, France, Germany and the UK perform above the EU average, there are weaknesses especially in cohesion countries. This trend correlates with data on input performance, such as employment in high-technology industries, public R&D expenditures, and venture capital investments. The total number of researchers within national R&D systems is highest in Finland, Sweden and Denmark and lowest in Italy, Portugal and Greece. The highest R&D expenditures are invested in Sweden, Finland and Germany, whereas Spain, Portugal and Greece rank lowest. However, at least Ireland and Portugal have reached the highest annual growth rates in R&D expenditures since the mid-1990s. The availability of venture capital is highest in Sweden, the Netherlands and Belgium and lowest in Italy, Portugal and Austria. However, Austria has achieved the highest annual growth rate in venture capital since 1995 (European Commission 2000a).

In terms of innovation potential at the regional level, variations are even more significant. A composite indicator of science and technology reveals that especially German regions, some Scandinavian regions and the metropolitan area of Paris have resources at their disposal that are far above EU average. Other Member States' regions reveal certain strengths only in view of individual indicators such as R&D personnel, employment in high-technology sectors, innovation products or number of patents (European Commission 2000a). These data indicate that the existence of subnational innovation policies supports a well-balanced provision of R&D resources at the regional level. Moreover, given the fact that Europe's most innovative regions perform significantly above EU average, it becomes evident that variations in innovative performance can be traced back primarily to different innovation potentials at the regional level. This holds especially for Germany where R&D resources are much more decentralized than in other Member States. Nevertheless, German regions like Upper Bavaria, Stuttgart und Braunschweig perform best in view of all indicators mentioned above showing that

considerable regional disparities exist not only between Member States, but also within best performing countries (European Commission 2003a: 4f).

Conclusions: Policy coordination in a multi-level innovation system

In this article we have developed a two-step argument. First, we have argued that institutions at territorial levels beneath and above the nation-state are of increasing importance for innovation processes. Thus, our concept of a MLIS turns against the attempt to identify autonomous innovation systems at various levels. We showed that certain functions traditionally associated with the National System of Innovation have either been delegated towards other territorial levels or supplemented by those levels forming a European multi-level system of innovation in which institutional incentives and framework conditions are provided by various actors who share responsibilities across territorial levels. This territorial reconfiguration of innovation systems proceeded furthest regarding corporate activities as R&D projects are increasingly pursued by international collaboration. Additionally, the EU gained importance both in product regulation and market liberalization, whereas international coordination in public innovation policies is still rather weak.

In a second step, we have argued that this development has hardly been mirrored by EU initiatives for a more coherent European Research Area and the 'Open Method of Coordination'. This does not mean that there is no room for policy coordination in a multi-level innovation system. However, there are certain preconditions:

First, the significant variations of institutional settings, of innovative performances, of industrial structures and of patterns of technological specialization restrict 'policy transfer' and 'policy diffusion' through a process of mutual learning (Hodson and Maher 2001) to certain areas in which regions or member states share similarities. Specific policy instruments, such as tax incentives for the employment of R&D personnel, may be suited to increase innovative performance in some member states while in others respective deficits originate from a lack of graduates. In order to recognize those similarities the OMC requires indeed more precise benchmarking tools, which allow for the qualitative comparison of different levels of the MLIS.

Second, 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 unlikely that coordination efforts will be successful if they are aimed to 'centralize' certain policies and competences. Thus, relating to Kuhlmann (2001: 967), we assume that a

'concentration and integration of European innovation policies in transnational arenas' is not likely to come true. Rather, we favour the notion of 'a co-evolution of regional, national and European policy arenas' (Kuhlmann 2001: 970), which characterizes those emerging multi-level innovation systems, where political power does not crystallize around one institutional core, one political arena, and one territorial level. As a consequence, open coordination will hardly be effective as a top-down process, but has to be turned upside down. This means that the European Commission should provide the institutional environment in which actors from different levels (arenas) interact according to their resources and competencies.

Third, even if innovation policy coordination abstains from centralization, active participation of national and regional actors is unlikely if coordination efforts intervene into the competition of actors, which exists also among member states. This became quite evident when EU member states thwarted ambitious initiatives by the European Commission to open national R&D programmes for participation of other member states and the European Union. Even within a European Research Area, member states are likely to consider R&D expenditures as critical investments enhancing the competitive position of companies that offer employment opportunities in the member state. Additionally, in contrast to other policy areas to which the OMC has been applied, the actors in innovation policies are mainly private actors, which also compete with each other for globalized resources, such as R&D-investments, researchers, and knowledge. Hence, in this policy area market coordination seems in many cases to be more appropriate than policy coordination in order to avoid 'over-coordination' (Scharpf 1994: 238).

And fourth, the process of open coordination in a multi-level innovation system could be improved if it would reflect the specific functions the different levels have within this system. The functions delegated to the European level are closely related with the so-called European added value in innovation policies. This means that the European Union on the one hand is the adequate level to finance R&D projects that overstrain the resources of individual member states (as is certainly the case in aerospace or nuclear research). On the other hand, it is the main task of the EU to coordinate member states' regulative measures in areas in which the EU is already the main actor at the international level (such as in the protection of intellectual property rights or in technical standardization). Besides that the Community should engage in the definition of strategic goals enhancing Europe's competitive position in general without intervening into intra-EU competition as well as in the establishment of an institutional framework for benchmarking and policy coordination of relevant actors. The member states are primarily

responsible for the framework conditions in fields where the EU lacks competencies (tax policy, education, employment, etc.), while regional authorities – if they own respective resources and competencies – are the adequate level to initiate and finance specific infrastructural measures that respond to the needs of regional employment and research and education. In this context, member states and regions will continue to provide the majority of R&D funds that promote innovations at the national and regional level in fields where an intra-EU competition exists.

These preconditions certainly render policy coordination an ambitious task in a multi-level innovation system. As long as they are not taken into account, the open method of coordination is, as the Kok-Report[13] clearly stated, likely to fall far short of expectations. However, 'praising good performance and castigating bad performance' (European Communities 2004: 43) of member states will hardly suffice if the method's structural deficits are not rectified.

NOTES

1. Views expressed in this article are purely personal and do not reflect the position of the European Commission.
2. However, the impact of R&D on innovation should not be considered as a pure linear path but needs to be understood as an interactive process among actors (see e.g. Lundvall/Johnson 1994).
3. This commitment to the OMC has been renewed with the so-called 're-launch' of the Lisbon Strategy in Spring 2005 (see European Commission 2005a).
4. See 'Broadband Access in OECD Countries per 100 Inhabitants (June 2003)' at www.oecd.org/sti/telecom (September 20, 2004).
5. Before taking its decision, the European Commission must consult one of two comitology committees responsible for medicinal products for human use or for veterinary medicinal products (Committee for Proprietary Medicinal Products; Committee for Veterinary Medicinal Products).
6. In its proposal for a seventh framework program the European Commission indicated a budget of more than €44 billion for collaborative research during the period 2007 to 2013 (cf. European Commission 2005b).
7. Since 1994, more than 100 European regions have received support from the European Commission for the formulation of regional innovation strategies through RITTS and RIS projects (see www.innovating-regions.org).
8. Under the UNESCO roof, the 'Convention on the Recognition of Studies, Diplomas and Degrees in Higher Education in the States belonging to the Europe Region' has already been signed in 1979.
9. These networks were established between 1987 and 1993 and consist of 26 (UTRECHT network) to 57 (COMPOSTELA Group) member universities.
10. The University of Edinburgh (2002), 'Edinburgh research and innovation limited. Annual Review 2001/2002', p. 13.
11. In the future benchmarking of member states' innovation policies as well as innovation policy analysis will be provided through the so-called ERA-WATCH-Initiative. ERA-WATCH, a collaborative project of the Commission's DG Research and the Institute for Prospective Technological Studies (IPTS) of the Joint Research Centre, will provide web-based information about the research systems of member states, associated states, the USA, Japan, and China in order to assist the Commission in her innovation strategy. Moreover, ERA-WATCH will produce analysis and reports about developments in innovation policies in those states trying to qualify quantitative benchmark data.
12. These goals have been reaffirmed recently by the Commission's proposal for a Competitiveness and Innovation Framework Programme 2007–2013 (European Commission 2005c).

13. The so-called 'Kok-Report' was submitted in November 2004 by a High Level Group for an independent review to contribute to the mid-term review of the EU's Lisbon Strategy (European Communities 2004).

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