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Templates of smart specialisation: Experiences of place-based regional development strategies in Germany and Austria

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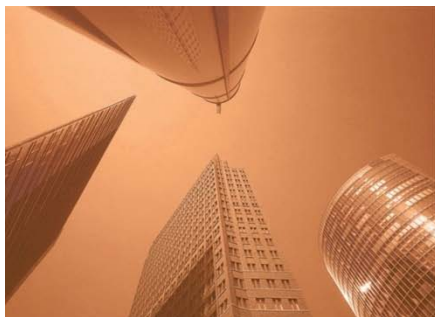
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Templates of smart specialisation: Experiences of
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1 Introduction

The notion of "smart specialisation" is set to become an important policy rationale in the upcoming structural funding period 2014-2020. Although the original academic concept of this policy approach was sectorally oriented and rooted in the analysis of the EU-US productivity gap (e.g. Foray et al. 2009), the concept is increasingly applied to regional contexts. Essential for the application of the smart specialisation concept in a regional context is the fact that regions are often faced with scarce resources and limited budgets which they should allocate according to external influences (e.g. global competition) and inherited structures (sectoral foci, linkages between sectors, innovation infrastructure). Therefore, and in accordance with the smart specialisation strategy (S³), regional governments need to design policies in such a way as to support the most promising areas of present and future comparative advantage in order to foster regional prosperity.

Although the ideas behind smart specialisation are not entirely new on the regional level, the smart specialisation concept is going to expand its influence to regional innovation policy making. Thus, this contribution illuminates the interface between the smart specialisation concept and regional systems of innovation approach, since innovation is going to be a key issue in the next structural funding period. Key arguments for the usefulness of the smart specialisation concept in the field of the design of regional innovation policy making will be collected and three examples are presented in form of case studies.

This contribution aims to demonstrate that the principles of smart specialisation have been implicitly applied in certain European regions for years in form of future-oriented transformation processes. Likewise this contribution aims to illustrate how the experiences from these regions can contribute to policy learning. In doing so, the structure is the following: firstly, existing literature on the smart specialisation concept is revised and secondly, these findings are reconsidered with regard to the regional systems of innovation approach. In particular, if and how the smart specialisation concept will influence regional development processes and potentially regional innovation systems. Three key working theses adopt these ideas and guide the empirical analyses. Methodologically, the paper pursues a case study approach. The policy trajectories of three different case study regions are analysed within the innovation systems approach and conclusions are drawn concerning the smart specialisation concept. Finally, the paper closes with a conclusion, concerning the influencing potential of the smart specialisation concept on regional innovation systems.

2 Potential Implications of the Smart Specialisation Concept on Regional Systems of Innovation

While the terminology "smart specialisation" is relatively new, the underlying ideas have been implicitly applied by certain European regions for some time. The role smart specialisation is going to play in the upcoming structural funding period is new. In a first step this chapter will highlight the smart specialisation strategy in current EU policy, paying particular attention to the choice of core priorities as set out in recent policy documents. In a second step this new policy approach will be considered vis-à-vis the regional systems of innovation approach. The third part of this chapter will bring together the two lines of argumentation by deriving working theses, which can be tested empirically.

2.1 Smart Specialisation: Concept and Implementation of Current EU Policy

Being part of the wider Europe 2020 strategy, the notion of "smart specialisation" is set to become an important policy rationale and an ex ante conditionality in the upcoming structural funding period 2014-2020. It is also a pre-condition for the Research and Innovation (R&I) target, the Information and Communication Technologies (ICT) target as well as for obtaining support from the European Agricultural Fund for Rural Development (EAFRD). Although the original academic concept of this policy approach was sectorally oriented on a nation-wide level, it is increasingly applied to regional contexts (McCann/Ortega-Artiles 2011; Walendowski 2011) by scientists and researchers alike.

Essential for the application of the smart specialisation concept in a regional context is the fact that regions are often faced with scarce resources and limited budgets which they have to allocate according to both external influences (e.g. global competition) and inherited structures like sectoral foci, linkages between sectors or innovation infrastructure. Therefore, it could be beneficial for the economic and social development of regions if regional governments design their policies in such a way as to support the most promising areas of present or future comparative advantage in order to foster regional prosperity. Additionally, intervention from outside, in response to market and governance failures, (in form of EU funds) might bear advantages (Barca 2009).

When analysing recent EU documents (European Commission 2011b; Foray et al. 2012), it becomes clear that the smart specialisation concept has two dimensions: a policy or governance dimension as well as an economic or market dimension. Smart specialisation intertwines both and relies in its argumentation on political and economic

theories in order to take advantage of both lines of reasoning (Barca 2009). In addition, it acknowledges global influences on the economic and social development of regions and implicitly addresses the "grand challenges" as set out in the Lund declaration (Lund Declaration 2009).

Embedded in the greater framework of the Europe 2020 strategy, the European Commission (European Commission 2011a; Foray et al. 2012) perceives national and regional research and innovation strategies for smart specialisation as an integrated, place-based economic transformation agenda by concentrating public investments on key priority sectors, relevant for knowledge-based development over the next few years. From a policy perspective, the S³ pursues a place-based approach with the aim of reducing persistent inefficiencies and social exclusion. The allocation of European funds shall help to trigger regional institutional change, improve well-being and productivity as well as promote innovation – given that the intervention is targeted and tailored to places. Additionally, thematic and general ex ante conditionalities shall ensure that coherent regional and national innovation strategies with clear and measurable targets are put in place and an indicator-based monitoring system shall ensure to monitor the progress and enable policy-makers to undertake impact evaluations more easily.

As highlighted in the Barca report (Barca 2009) on place-based development policies and new approaches in EU cohesion policy such as smart specialisation, core priorities for European regions constitute innovation, climate change, migration, children, skills and ageing, with innovation being the key issue. The rationale for this is the creation of a critical mass of EU policy interventions on a few key areas – large enough to provoke attention and make a difference. Additionally, the strategies should build on regional strengths and competitive advantages and support technological as well as practice-based innovation. Thus, it will become a great challenge for regions to identify exactly those (few) sectors, that can be regarded as crucial for the regions' economic development and bear respective competitive advantages and concentrate a large amount of resources on their development.

Moreover, they should stimulate private sector investment. The involvement of stakeholders is perceived as relevant for innovation. Strategy development should be evidence-based and includes monitoring and the implementation of evaluation systems. Generally, the development of smart specialisation strategies (S³) should ensure a more efficient use of EU Structural Funds as well as the emergence of synergies between policies from different levels.

From a governance perspective the smart specialisation concept addresses the following key aspects:

- to focus on regions for policy implementation and ensure a dialogue between regions and the EU;
- to make innovation a priority in all European regions – as an answer to global challenges and in order to create more knowledge-based jobs;
- to focus investments, to create more value-added and visibility of EU funding and to create synergies between regional, national and EU investments as well as private investments;
- to improve innovation processes by use of qualitative and quantitative evidence and strategic intelligence in order to optimize the (innovation) policy mix;
- to involve stakeholders and local actors and thus ensure that smart specialisation becomes interactive, regionally driven and consensus-based.

Thus, smart specialisation is much more than placing greater emphasis on innovation and focusing on scarce human and financial RTDI resources in a few globally competitive areas in order to boost economic growth and prosperity. It demands a thorough assessment of the (regional) innovation system in order to appreciate and understand the evolutionary nature of regional economies, and also the design of appropriate policy-making.

Despite its advantages it can cause some distress among the innovativeness and economic development in Europe. It poses the threat of technology persistency and a division of tasks among European regions, especially between technology driving regions and technology application regions.

Besides several opportunities, the pursuit of these key aspects of S³ also poses different challenges for agenda setting in European regions: Firstly, the selection of priorities, secondly, the veritable creation of critical mass in certain technological and/ or sectoral areas, thirdly, the mobilisation of additional, private sector investment, fourthly, to implement a regional consensus-based policy mix alongside a dialogue between regions and the EU and finally, the potentially undesired division of tasks between European regions and the threat of undesired persistence instead of convergence.

3 Regional Systems of Innovation Approach and the new (Innovation) Policy Paradigm of Smart Specialisation

To apply the smart specialisation concept in the best possible way, it seems necessary to understand the relevant processes in regional innovation systems. For example, it needs to be understood which actors (alone or in cooperation) determine and influence regional institutions and contribute to mutual learning and knowledge generation. Smart specialisation by design and by the key priority of "innovation" will affect regional innovation systems in Europe, and might even change them over the next years. Smart specialisation strategies implicitly aim at strengthening regional innovation systems, by promoting knowledge flows and spreading the benefits of innovation to the regional economies across Europe.

The systems of innovation approach (Edquist 1997; Lundvall 1992) is based on the idea that innovations are generated in interactive processes between different actors of innovation systems. In this context a system is a set of institutions whose interactions determine the innovative performance. As an ideal type it can evolve spontaneously or it can be built up and supported by the state. In real terms, however, varying degrees of these two ideal types exist (Cooke 1998). The elements may even be in conflict with each other. An alternative way of specifying the "system" is to include all important economic, social, political, organisational, institutional, and or other factors that influence the development, diffusion, and use of innovations (Edquist 1997).

Parallel to the national systems of innovation approach, the regional systems of innovation approach emerged. It explicitly analyses innovation systems on a sub-national level. Regional systems of innovation are distinct from national systems of innovation as mentioned by (Koschatzky et al. 2009): "*Regional systems [of innovation] are not national systems writ small, but respond to different rationales, institutional and governance settings which can be found at the sub-national territorial level*". Moreover, different types of regional innovation systems have been identified (Cooke 1998) along a governance and a business innovation dimension.

As early as 1998, Braczyk and Heidenreich (1998) recognized that economic development paths of regions depend on the central economic areas of focus and the associated technological capabilities, the relative position of the region within the respective fields of technology and the respective governance structures that have developed in a manner complementary to these economic structures. Consequently, the rise of the innovation system approach as well as an advanced understanding of the functioning

of regional systems of innovation has led to the development of systemic, network-oriented instruments in innovation policy-making, leading to the fact that the regional systems of innovation approach are nowadays established in academic and practitioner discourses about innovation and economic development (Uyarra/Flanagan 2010). In this sense, systemic innovation policy instruments can be characterised by a facilitation of the construction of (sub-) systems, the management of interfaces and the provision of a platform for learning and experimenting (Smits/Kuhlmann 2004). Compared to the instruments of classical innovation promotion, these instruments provide certain advantages, for example network-building capacity, enhanced quality control of support projects, an increased reach of the instruments along with fiscal advantages.

If one relates these considerations to the requirements put forward by the smart specialisation concept, it seems obvious that the new type of strategies will affect regional innovation systems across Europe: Firstly, the smart specialisation concept demands a concentration of resources on certain sectors; secondly, the smart specialisation approach may have an impact on regional policy makers' perception of their own role. While classic approaches to policy making have often been based on the notion that governance structures should complement economic structures, the rationale of the smart specialisation approach is that policy makers should actively assist in the adaptation of economic structures to allow regions to respond to global competition.

According to McCann and Ortega-Argilés (2011), the smart specialisation approach is characterised by two distinct features: Firstly, it relates to the fundamental logic of the innovation system, and assumes that context matters for the potential evolution of the system and that the evolution of an innovation system depends on the inherited structures. The second relates to the perceived mechanisms by which the strategy operates.

Thus, smart specialisation is much more than placing greater emphasis on innovation and focusing on scarce human and financial RTDI resources in a few globally competitive areas in order to boost economic growth and prosperity. It demands a thorough assessment of the (regional) innovation system in order to appreciate and understand the evolutionary nature of regional economies, and also the design of appropriate policy-making.

Recent articles with reference to the innovation systems approach stress the importance of identifying systemic problems or failures of innovation systems (Edquist 2011) as a basis for policy design in favour of the innovation system under surveillance. Edquist (2011) explains how systems of innovation may be analysed thoroughly for policy

purposes. Such a '*diagnostic analysis*'¹ can be used for problem identification and should be empirically founded. Further, it needs to be complemented by an analysis of causes in order to understand influencing factors and to be able to design appropriate policy measures.

Consequently, and as a starting point for the formulation of the working theses in the next section, it can already be stated that the smart specialisation concept, by putting more emphasis on evidence-based policy making, stronger stakeholder involvement and interaction bears some potential to influence regional innovation systems across Europe.

3.1 Deduction of Research Guiding Theses

Thus, certain key questions appear: How will smart specialisation strategies (S³) affect regional governance and transformation processes? Do regions have the chance of actually implementing the monitoring processes and the thematic ex ante conditionalities as required by S³?

Based on the brief revision of the two approaches earlier in this chapter, in this section several key working theses are derived with the aim of assessing the potential contribution of smart specialisation towards regional development strategies.

The deduction of the first working thesis relies heavily on the idea of the smart specialisation concept that the involvement of stakeholders and local actors shall ensure an interactive, regionally driven and consensus-based strategy and policy development process. Since interactive processes are a cornerstone of the regional systems of innovation approach, it can be concluded that a more intense involvement of stakeholders will cause more system-oriented regional strategy development processes.

T1: The smart specialisation concept contributes to more system-oriented regional strategy development processes. (Although not entirely new, it may take new forms).

The second working thesis draws on the fact that S³ aim to improve innovation processes by using qualitative and quantitative evidence and strategic intelligence in order to optimize the (innovation) policy mix. This is expected to have influences on regional

¹ The exercise of combining a problem identifying analysis and a causal explanation is called a 'diagnostic analysis', which might provide a basis for an efficient policy design, able to overcome systemic insufficiencies (Edquist 2011).

(innovation) strategy development in such a way, that it forces policy makers to make decisions and impacts more explicit. Consequently, it can be expected that:

T2: Smart specialisation strategies force regions to make their strategy processes more explicit, and to increasingly base them on evidence and involve stakeholders.

Taken together, the first two theses and the consideration of the first two sections of this chapter, a third thesis can be derived. Based on the goals of smart specialisation and an enhanced understanding of underlying drivers of regional development – such as the functioning of the regional innovation system – it can be expected that the implementation of certain aspects of the smart specialisation concept will affect regional development strategies. The third thesis aims at these assumptions.

T3: Implementing (aspects of) the smart specialisation strategy might help regions to better adapt their regional development strategies to regional potentials, resources and challenges.

These working theses lead to a final core question: how will smart specialisation affect regional innovation systems across Europe – always keeping in mind that regional innovation systems depend on a governance dimension and a business innovation dimension that show unique characteristics for different ideal types?

The following chapter will test the theses empirically by drawing on three regional case studies. The case studies will concentrate on experiences from regions which have undergone noticeable transformation processes and, in the course of these, implicitly designed their innovation policies according to those main principles that have recently become officially announced as requirements of smart specialisation. The three cases are selected from the two central European countries of Austria and Germany, which have a sufficiently long tradition of innovation policy-making to provide answers to the questions outlined above. Self-evidently, they are thus precisely not aimed at providing representative statements for EU 27 regions.

4 Empirical Evidence

This empirical chapter will test the three theses on the basis of three different regional development strategies and their regional innovation policy coordination mechanisms as well as their regional policy mixes. Being well aware of the fact that the regional strategies have been formulated under different policy circumstances and not in a way as to actually meet smart specialisation goals in an explicit way, the evidence might nevertheless help to better understand possible implications of S³.

4.1 Methodological approach

Methodologically, the paper pursues a case study approach to analyse policy trajectories of different regions in order to draw conclusions concerning the smart specialisation concept. The regions have been selected since all of them have in the past implemented regional policy approach that contain central elements of what has now become known as smart specialisation strategies. Hence, their experiences could possibly contribute to an empirical assessment of the three theses. In addition, particular attention has been paid to select regions that differ in their initial economic situation and set-up of the regional innovation systems. Against this background, case studies will be developed for Bavaria and Saxony in Germany as well as the region of Upper Austria in Austria.² Again, it should be noted, that all of these regions are situated within a comparatively similar economic and cultural framework, so that the findings cannot be generalised.

The cases are structured along the following aspects, which are closely linked to the smart specialisation concept and the regional system of innovation approach:

- Sectoral features: sectoral foci of the regional economy (past and present, development over time);
- Systemic features: identification of internal (e.g. between sectors or between heterogeneous actors of regional innovation system) and external connections and relations (past and present, development over time);
- Policy characteristics / description of policy mix: development of and priorities in the regional innovation policy mix;
- Coordination mechanisms and priority setting:
 - stakeholder involvement and bottom-up approaches (past and present, development over time),
 - availability and use of evidence-based approaches and strategic intelligence in regional economic and innovation policy making (past and present, development over time),
 - identification of regional investment foci (past and present, development over time) and congruency with regional sectoral development;

² The authors draw on material, in particular on the regional reports that have been prepared for the Regional Innovation Monitor, and which provide detailed information on regional innovation policies for 20 EU Member States. For further information see: <http://www.rim-europa.eu/>.

- Actual and potential contributions of the smart specialisation concept:
 - observance of policy approaches and strategies suitable to accommodate the smart specialisation concept and thus regional economic development (past and present, development over time) as well as
 - reflection of empirical findings and conclusion with respect to the working theses.

The economic and innovation policy approaches in the case study regions enable a discussion of the conceptual and policy related dimensions of smart specialisation and the assessment of the main advantages and draw-back factors of the concept. Policy approaches following the smart specialisation concept can be found in the case study regions in three different dimensions: (i) regional governments' central commitment to allocate resources to key sectors and technologies in which regional potential is already present or in a pre-competitive stage, (ii) the development of investment foci through interactive and participative processes, and (iii) adaption of regional specialisation strategies over time with increasing importance of cross-sectoral linkages, network building and clusters in later stages.

5 The Case of Bavaria

General Introduction

Bavaria has managed the structural change from a traditional agricultural region to a competitive industrial region with an important and growing services sector. Concerning the sectoral structure today, important industry branches are automotive industries (including supplier branches), electrical engineering and mechanical engineering. In addition, Bavaria is one of the leading international regions for high technology fields such as information and communication technologies (ICT) and biotechnology. It is also one of Germany's most important regions regarding the services sector, major branches being insurance and financial services. The strongly high-tech oriented manufacturing sector takes 29% of the whole gross value. The tertiary sector, in detail trade, transport, financial institutions and insurances, other services, state and private households account for 70% in total. Only 1% is allotted to agriculture and forestry today. The share of employment in high-technology sectors as a percentage of total employment amounts to 6.57%, slightly above the national average of 5.16% (2009 data, Source: Eurostat).

For a very long time economic growth rates were above those of Germany and EU27. During the last few years, however, annual GDP growth rates have fallen below the German and the EU27 average and are giving rise to concern. Although the level of

GDP/capita is still above the German and EU27 averages, it will be a challenge for Bavaria to maintain the position as an economic and innovation leader, not only in Germany but also in Europe in years to come. In addition, the German energy transition will pose additional challenges to Bavarian enterprises and the regional economy.

The Bavarian business sector is characterised by the presence of many SMEs. In 2009, there were 614,283 firms with less than 250 employees and only 1,851 firms with 250 and more employees (Source: Destatis). At the same time, many MNEs have their headquarters in Bavaria and internationally renowned enterprises, such as Siemens, Roche or General Electric, invest in R&D in the region. As a consequence, much of Bavaria's strength as an R&D location stems from its enterprise population. Almost 80% of the region's R&D expenditures come from the business sector.

With regard to central indicators of RTDI investment within the region, such as GERD and BERD, Bavaria ranks above the EU-27 average (0.28%/0.24% and 2.21%/1.21% per GDP in 2007). Only HERD remains below the EU average. GERD has steadily increased in absolute terms from €9,615m in 1999 to €12.196m in 2007. With a view to the development of R&D intensity over the last few years, it has to be said that GERD as % of GDP increased only slightly from 2.79% of GDP to 2.81% of GDP and even declined between 2003 and 2007 (cf. Table 1). The regional patent intensity clearly exceeds the European regional average (444.9/115.1 applications per million inhabitants in 2006). This is partially a result of the presence of many enterprise headquarters in the region accounting for a large number of patents. Additionally, two major research organisations (the Max Planck Society and the Fraunhofer Society) have their headquarters in Munich and patents are filed by their central bureaus.

Table 1: R&D expenditure in Bavaria 1999-2007

Year		1999	2001	2003	2005	2007
GERD	Million €	9.615	-	11.333,5	11.610,2	12.196,4
GERD	% of GDP	2.79	-	2.97	2.91	2.81
BERD	% of GDP	2.2	-	2.38	2.3	2.21
GOVERD	% of GDP	0.23	-	0.24	0.25	0.25
HERD	% of GDP	0.36	-	0.35	0.31	0.35

Source: Own table, Eurostat data

Bavaria hosts altogether 24 universities of applied sciences and has a total of 55 higher education institutes. Many of them are located in Munich, Bavaria's capital and economic centre. As regards non-university research, twelve institutes of the Max Planck

Society, several institutes of the Fraunhofer Society and an additional one under construction, three centres of the Helmholtz Association, and five institutes of the Leibniz Association are located in the region. Thus, Bavaria has significant strengths in basic and applied research. In addition to the institutes of the major German public research societies, there are several independent institutes closely connected with, but legally independent from, universities (so-called An-Institute) as well as different research centres at the universities of applied sciences.

Firms are also important actors in the regions' knowledge production and innovation landscape. The Bavarian innovation landscape is rather industry-oriented by German standards. The R&D expenditures of the business enterprise sector amount to 2.21% of the Bavarian GDP in 2007 (Source: Eurostat). The volume of BERD spending has increased over the last few years, rising from €7,566m in 1999 to €9,588m in 2007 (Source: Eurostat). In 2007, the share of regional business expenditure on R&D amounted to 78.6% compared to 70.0% of the national average (Source: Eurostat).

With a view to systemic features, it can be stated that Bavaria hosts many knowledge and technology transfer units throughout the region to foster the transfer of research results. In addition, there are several clusters and research networks, some with an international reputation, located in the region, e.g. in the fields of automotive and aerospace industries, medical technology, and biotechnology. It seems that the interaction and mutual learning between heterogeneous innovation relevant actors has become more intense over the last few years and policy emphasis has been placed on the thematic direction and on the formation of the industry-policy-science relationships.

With respect to the outward orientation of the economy, the overall scope of imports was €131.6bn in 2010, 16.5% of the national total, while the scope of exports amounted to €144.1bn (15.1%) (Source: Destatis). Most of the Bavarian exports go to countries within the European Union. When divided into single countries Austria, the United States of America as well as China are the most important trading partners (Source: Bayerisches Landesamt für Statistik).

Policy - Participation

The Bavarian government defines its regional innovation policy as a major element to strengthen the competitiveness of the regional economy and perceives research, technology and innovation as a corner stone of the societal development and economic wealth (Bayerische Staatsregierung 2011). In doing so, the Bavarian technology policy builds upon a long-standing experience of economic, structural and infrastructure policy as well as regional industry policy. These policies traditionally comprised innovation

oriented elements regarding the promotion of structural techno-economic change. Today, different technologies constitute a key engine of the region's ability to grow and maintain competitive.

The priorities of the Bavarian RTDI policy have changed significantly over the last 50 years. RTDI policy in the 1950s can be mainly associated with an improvement of the transportation infrastructure. During the 1960s this type of policies was concentrated on the development of energy maintenance while during the 1970s efforts were concentrated on the development of the research infrastructure and promotion of high-tech industries. The 1980s brought a focus on microelectronics.

Regional RTDI policies gained momentum in 1993, when the state of Bavaria launched its campaigns to develop high-tech industries for a successful future. Up-to date, the regional government has supported R&D programmes, totalling some €4.2bn. The funding was and is used to improve and extend the state's research infrastructure, and to support the development and deployment of new high-tech technologies (Bavarian Ministry of Economic Affairs 2008). During the 1990s, Bavaria's RTDI policies were directed towards an institutionalized high-technology promotion, including accelerating structural change and the fostering of entrepreneurial activities. Since 2000, RTDI policies have increasingly included the support of start-ups and regional clusters. A recent impetus in this regard has been the "Bavarian Cluster Campaign", which started in 2006, as a successor to the major initiatives "Initiative for Bavaria's future" (Zukunftsoffensive Bayern, from 1994-1999) and "High-Tech Offensive Bavaria" (2000-2005). Its main objective is the promotion of the net-working of and among Bavaria's SMEs (small and medium-sized enterprises). Innovation policy making and consequently innovation policy measures have been adapted continuously to changing economic conditions and emerging technologies. Most recently, the Bavarian government has presented another programme (the so-called BayernFIT programme), which subsumes a variety of different RTDI policy measures to strengthen the regional innovation potential within the next few years until 2020 and beyond.

At present, there are several interconnected funding programmes relevant to regional innovation policy. Major thematic areas of funding are traditional industries (such as the automotive industry, mechanical engineering, plant construction), cross-section technologies (such as laser technology, micro-systems technology, mechatronics and new materials), innovative future technologies (such as biotechnology, nanotechnology, aerospace technologies and information- and communication technologies) and the support of networks and clusters.

The responsibility for regional innovation policy in Bavaria remains with the regional government (Bavarian State Chancellery) and is currently divided principally between two ministries, which are mainly responsible for the design of the strategy and the development of appropriate measures. With regard to horizontal policy co-ordination, it can be stated that a lot of activities, especially between the ministries and the different implementation organisations, recently have taken place in the form of inter-ministerial working groups. Additionally, Bavarian policy makers draw on a wealth of experiences of how to design, implement and adapt policies while involving relevant regional stakeholders like agencies, university representatives, or trade associations to name but a few. Regular monitoring and evaluations are tools frequently used to judge the success or failure of certain measures.

According to the Bavarian government, the formulation of a general RTDI policy framework on the national level is not sufficient to ensure Bavarian interests. Thus, vertical policy coordination between the national and regional level primarily occurs on the basis of concrete programmes or initiatives, whereby the regional RTDI policy activities should – at least in theory – supplement the national (and supranational) RTDI initiatives. In reality, due to different techno-economic performances of the regions, different tax receipts and political priorities, redundancies and problems as regards the "division of labour" between the different governance levels occur occasionally. However, the state government actively integrates support and funding opportunities provided at the federal level into its development strategy, which pursues regional interests. Concerning inter-regional co-operation, Bavaria is involved in a number of cross-border and transnational operational programmes. In addition, it is important to note that Bavaria has profited from federal level and European support in various ways. As all German states, it has full budgetary autonomy and it can access additional funds from national and European sources.

Policy – Focal Areas

With regard to strategy development, the approach and goals of the regional RTDI policy have been summarised in a relatively new policy document of May 2011, entitled "Overall Concept for Research, Technology and Innovation policy of Bavaria" (Bayerische Staatsregierung 2011). This key report was developed on an inter-ministerial basis and was published promptly. The topics covered in this report are manifold. Starting with a critical assessment of the current situation, including the identification of strengths and weaknesses, potentials and issues calling for action in the Bavarian innovation system within the next few years, to the development of strategic goals that guide regional RTDI policy making; and a definition of priorities (sectors, key technologies, research infra-

structure, future industries). This paper also highlights opportunities for improvement as regards strategic policy instrument tools, e. g. the introduction of a technology council to accompany the process of future RTDI policy making.

The range of regional innovation support measures can be considered as rather comprehensive, ranging from the use of policy intelligence tools and comprehensive and coordinated action programmes and reports to the support of business research, clusters and R&D networks, early stage-financing, the stimulation of entrepreneurship, incubators/science parks, innovation in the service sector, support of international co-operation and knowledge transfer, support for new technology-based firms, an enlargement of the research infrastructure, science-industry co-operation, entrepreneurial skills for innovation, support of start-ups/spin-offs, support of universities, and to human resource policies. Some innovation policy measures also address universities and non-university research institutes.

Concerning a sectoral perspective, the Bavarian RTDI policy focuses on the (traditional) manufacturing sector as well as on high-technology and knowledge-intensive service sectors. It is part of the innovation strategy to address all relevant sectors and to also put an emphasis on SME support. Firms, universities, higher education institutes, research institutes and other regional stakeholders alike are addressed by the region's different support measures. The regional government tries to address pressing issues in a complementary way and to fill gaps that are not addressed by measures and programmes from higher levels.

Policy – Smart Specialisation Strategies, Current Situation and Future Outlook

Regarding "Smart Specialisation" in Bavaria, the following can be stated: Starting from a very narrow approach that focused on certain key sectors and technologies, innovation policies today are characterised by a rather broad sectoral approach. However, the sectoral focus is not arbitrary but elaborated according to regional needs and potentials and more importantly, it is revised on a regular basis in order to acknowledge regional economic development and technological evolution. Additionally, innovation policy making and strategy development processes have become increasingly open towards the public and, to a certain degree, evidence based. Today the Bavarian government perceives that "the success of Bavaria in research and technology can be traced back to a diversified support of key technologies and the corresponding fields of science that

are the basis for many fields of application."³ The Bavarian government has several additional policy guiding principles: First, a balanced budget defines the scope for action, secondly, the identification of new key technologies that will gain importance in the future and thirdly, a strong application orientation. Taken together, the overall policy approach seems to be more system-oriented than before, as the current policy orientation (compare earlier in this section) shows. Thus, experiences from Bavaria show that a policy mix that is more or less oriented towards what smart specialisation might contribute to a more system-oriented regional strategy development process.

Evaluations are frequently used to assess and monitor the quality of certain RTDI programmes and projects. With the publication of the key report "Overall Concept for Research, Technology and Innovation policy of Bavaria" (Bayerische Staatsregierung 2011), the Bavarian government contributed towards greater transparency regarding the innovation policy making process, especially, since this document is the outcome of a public discussion. It can be stated that these developments in Bavaria are in line with the smart specialisation requirements, as to make strategy processes more explicit and increasingly base them on evidence. Whether or not this process has been planned in a way as to accommodate the smart specialisation approach cannot be assessed on the basis of the current material. Nevertheless, recent trends from Bavarian strategy making processes show increased transparency and an orientation towards more evidence based approaches.

Although the sectoral focus of the Bavarian policy is rather broad, the region has been working on and according to smart specialisation principles for more than 15 years. Policy changes were stimulated by global competition as well as by national and supra-national policy decisions. Specialisation and sectoral policies are complemented by other forms of support measures without any particular industry or technology focus (e.g. innovation vouchers). In addition, and although industry and technology oriented in its concept, the Bavarian cluster policy aims at an integration of potentials in public research, higher education and industry by revealing synergies. However, despite all these attempts, the regional economy has to react to changes in strategy development on the national level and S³ can contribute little to overcome such frictions. A conclusion would be that implementing S³ can promote the improvement of regional development strategies in a certain way, as it improves the understanding of regional

³ "Der bisherige Erfolg Bayerns in Forschung und Technologie beruht vielmehr auf einer breit angelegten Förderung von Schlüsseltechnologien und der zu Grunde liegenden Wissenschaftszweige, die wiederum die notwendigen Voraussetzungen für viele Anwendungsfelder schaffen." (Bayerische Staatsregierung 2011: 23).

strengths and weaknesses in global competition on a stable path but it has little to offer against policy frictions induced from the national level.

5.1 The Case of Saxony

General Introduction

Notwithstanding positive trends over the past few years, Saxony's economic performance remains below German, and only slightly above, EU-27-average. Over the first half of the 2000s, regional GDP grew at par with the German average and the impact of the 2008-2009 crisis was felt less substantially than in other German regions. In general, the Saxon business sector is characterised by a structurally high employment share of SMEs in the service sector but also in the traditional parts of the manufacturing sector. In 2009, 2,270 firms with less than 250 staff employed 66.9% of the region's industrial workforce, clearly above the national average of 44.4%.

In sectoral terms, important foci of employment and value added can be observed in the automotive, the microelectronics, and the machine-building industries. The share of employment in high-tech industries and knowledge-intensive services amounted to 3.69%, slightly below the national average of 4.25%.

Generally speaking, Saxony is an outward oriented economy in which exports exceed imports by 50%. Nonetheless, its contribution to national exports remains limited (2.5%). For individual sectors with export quotas around 50%, however, international sales are decisive, e.g. in the chemical industry (60.2%), the automotive sector (50.7%), the IT industry (49.3%), and parts of the machine building sector (47.8%).

Over the last few years, regional Gross Expenditure on R&D has steadily increased from € 1.8 bn in 2003 to € 2.4 bn in 2007. Notably, the largest share of this growth was realised in the business sector (€ 0.8 bn - € 1.2 bn).

In broad terms, about three quarters of Saxon business R&D personnel works in the industrial sector. The most important industries from an R&D perspective is the ICT and the machine-building sector that unites about half of local R&D employment and about 40% of local expenditure in the business sector. Most automotive firms, to the contrary, perform their R&D activities outside of the region. In addition to these industries, R&D employment in the service sector has increased by 40% since 2006 and now accounts for another quarter of business employment and expenditure. Accordingly, technological specialisations (as measured by EPO patent applications) can be

identified in the field of electronic components, special machinery, non-polymer materials, measurement and control technology as well as basic chemicals.

With a view to R&D co-operation as evidenced by co-patenting, we find that the Saxon business sector co-operates very actively with the nation's leading regions of Baden-Württemberg, Bavaria, and North Rhine-Westphalia. Co-operations with bordering Eastern German regions like Saxony-Anhalt, Thuringia or Brandenburg, to the contrary, tend to be more limited, as are co-operations with other countries.

Policy - Participation

So far there is no central innovation agency with strategic competences and none is envisaged. At the regional level, policy is shaped by the State Ministry of Higher Education, Research and the Arts (SMWK) and by the State Ministry for Economic Affairs and Labour (SMWA). The former is the key actor in the field of higher education and public research. The latter administers those innovation policy support measures which focus on business sector RTDI development as well as structural funding. Following a change in government in 2009, the directorate for technology policy and technology transfer has been moved to the SMWK thus further differentiating the distribution of responsibilities.

To be able to allow for a co-ordinated policy design under these framework conditions, there is a tradition to maintain a continuous process of co-operation between the two ministries based on working groups. At times, these also bring together representatives of the science and the business sector, as well as at certain times the federal government and the European Commission. Thus, while there is long-term experience and interest in launching activities to ensure the active participation of external stakeholders, no standing council on innovation has yet been established.

As a federal state with an own parliament and own ministries, Saxony routinely performs a number of the functions typically associated with policy intelligence tools by means of internal co-ordination as well as in the framework of general parliamentary activities rather than through the explicit one-off commissioning of studies or consultation activities typically associated with evidence-based approaches.

Nonetheless, the local ministries tend to actively communicate their political priorities as well as new policy measures on-line as well as in regular broad-based reports which they commission to analyse potentials and challenges for the regional economy and the regional innovation system. While no separate, overall regional innovation strategy

has so far been developed, the regional government has invested substantial resources into developing tailor-made operational programmes for the structural funds.

Furthermore, there are a number of enterprise-driven networks which have recently been labelled 'Saxon Cluster Initiatives'. While these networks do not participate in the formation of political strategies directly, they can be considered interest groups through which stakeholders from a particular sector voice their opinion.

Finally, a recent noteworthy approach is the joining together of the Technical University of Dresden and numerous public research organisations under the roof of the initiative "Dresden Concept" that has just succeeded in winning a substantial amount of federal funding from the German academic "Initiative of Excellence". While not directly related to innovation policy in the sense of ministerial decisions, it aims at better orienting the (autonomous) university's activities towards the interests of local stakeholders from arts, science and the municipal government in a participatory manner.

Policy – Focal Areas

From the outset of regional technology and innovation policy in the 1990s, a central focus of regional innovation policy has been on the key structural challenges faced by the local economy.

- Firstly, to support research and development projects in SME.
- Secondly, to link SME to the regionally available pool of knowledge.
- Thirdly, to promote joint projects of public research and private enterprise.

As it is typical for Germany, support instruments are composed of a mix of direct subsidies, credit schemes with favourable conditions and public guarantees for credits. Likewise, substantial funding has been allocated to the creation of technology transfer infrastructure such as science parks and incubators, technology transfer centres, as well as different types of consulting. As a baseline, the regional support policy takes a technology-open approach in that all firms are eligible for the 'standardised measures'.

In contrast to other federal states, Saxony did not draft an explicit innovation policy document defining priority areas throughout the 1990s and 2000s. In general terms, RTDI policy follows the principles and the set of key technology fields laid down in the 1992 "Guidelines for Technology Policy" in which the regional government decided to *focus support on those technology fields that seemed to offer potential to establish a nationally leading position*. At the time, those were energy technology, material sciences, physical and chemical engineering, biotechnology, microsystem technology, information technology, production technology, environmental technology and medical

technology. Quite literally, this document thus formulated the key tenets of the "smart specialisation strategy" about twenty years before the birth of the term.

Following that outline and intensive considerations with industrial stakeholders, the Saxon government has taken action to specifically promote selected technology fields with idiosyncratic support – in part to an extent no longer feasible today. In the course of time, several major initiatives have resulted from this policy concept, among them the association 'Silicon Saxony e.V.' in the IT Sector, the 'Biotechnology-Offensive Saxony' as well as the recent innovation cluster 'Nano for Production'. In principle, the government sought to shift its focus in time from those fields that have gained sufficient momentum to others that still face initial uncertainties and obstacles.

As mentioned above, however, it remains a firmly held belief of Saxon innovation policy makers that their general support programmes should be available to firms irrespective of their sectoral orientation, and thus also the main initiatives currently pursued by the regional government. This aspect of regional technology and innovation policy is considered a central element of *demand-driven SME support policy* which should not be restricted by sectoral quotas and it is actually even used as an indication whether the current mix of support programmes still follows the need of the business actors.

Policy – Smart Specialisation Strategies, Current Situation and Future Outlook

While the last two decades of Saxon regional innovation policy cannot adequately be described as "planned", the process of policy making can certainly be described as conscious and reflexive. While no large-scale overarching strategies have so far been implemented, and it is technically difficult to identify "policy intelligence tools" on the ministries' websites, a continuous process of setting, reconsidering and shifting priorities has been in place, driven by the notion to *support those technology fields that offer potential to establish a nationally leading position*.

With a view to the coming years, however, the reliance on the aforementioned implicit agreements and indirect strategy development is no longer unanimously considered a suitable practice. Not least with a view to the gradually emerging new regulatory framework for the next structural funds support period, the regional parliament called a commission on technology policy with the objective, to allow for a reflection of palpably changing circumstances and develop a more strategic approach. Subsequently, the state government has initiated the drafting of an explicit regional innovation strategy for the time when less non-regional funding will be available than was common practice throughout the last decade. The aim of this process is four-fold and evidently much in line with the main tenets of the guidelines on smart specialisation:

- identify strengths and weaknesses, potentials and issues calling for action;
- develop a set of concrete proposals for measures to strengthen strengths;
- improve the co-ordination between government action and stakeholder needs;
- optimise the allocation of resources.

Arguably as a result of this, the first comprehensive strategy document in 20 years is to be published, probably in late 2012. As its drafting has been prompted by the changed framework conditions of the new support period, it is also referred to as the 'ERDF-innovation strategy'.

Additionally, the Saxon government is planning to explicitly take up another main aspect of the smart specialisation strategy, the relevance of "enabling technologies". While Saxony does not have to focus on multi-purpose-technologies due to the lack of an industrial basis, some of the "key enabling technologies" identified by the Commission are strongly in line with the existing specialisation of the Saxon economy and may thus offer significant potential: Microelectronics, Nanotechnology, and Biotechnology.

In line with this idea of "enabling technologies", the piloting of 'Initiatives for the Future' is envisaged for the end of this ERDF support period. While for the time being technically supported under the provisions for "innovation clusters" under the current SF framework, these new initiatives will set new emphases in that they require a cross-sectoral or cross-technological orientation. Funding will be allocated based on competitive applications from the regions. In line with the "regional challenges" oriented approach promoted under the smart specialisation framework, the measure is intended as a move away from a strictly sectoral orientation and is meant to explore the practical challenges deploying this approach.

Furthermore, the government aims to establish a continuous, structured dialogue based on "innovation fora" to analyse the needs and requirements of local stakeholders and ascertain participation in the process of strategy development. In concrete terms, these are aimed at identifying 'weak signals' as well as receiving hands-on input from practitioners on how to adapt existing measures to the needs of applicants and how to close gaps in the current support portfolio. Up to now, two fora have been organised, with the topics of "financing for innovation" and "knowledge-intensive services".

A similar approach is the "Saxon Innovation Summit" which was organised for the first time at the end of October 2011. It intends to lay the foundation of a new tradition of bringing together the regional drivers of innovation from the business sector and scientific organisations with young entrepreneurs, experts and intermediaries once a year.

Just like the innovation fora, the innovation summit aims to generate new signals and fresh momentum and to keep the government in contact with the relevant stakeholders.

In summary, therefore, it is more than evident that the smart specialisation approach has not brought a new way of thinking about innovation policy to Saxony. Quite the contrary, Saxon policy makers were among the first to explicitly formulate a related approach in the early 1990s. Nonetheless, however, the concrete stipulations that are currently being implemented for structural funding under the new support have added momentum to a number of additional, complementary activities in the sense of the smart specialisation approach. Importantly, however, it would be a mistake to understand all of them as being directly prompted by European regulations as such. Instead, it was existing regional political capacity and experience that enabled the decision to prepare for upcoming changes.

5.2 The Case of Upper Austria

General Introduction

Upper Austria is characterised by a strong position in the cultural and leisure industries, in agriculture and in manufacturing. The Austrian federal state has high manufacturing dynamics, economic stability and the highest export rate of all Austrian federal states. Upper Austria thus plays an important role in the manufacturing, technology and export sectors within Austria. The region has low unemployment rates and a high number of patent applications. In terms of population, it is the third largest Austrian federal state. Upper Austria's regional GDP in 2009 (€ 46.29 bn) accounted for 16.8% of the Austrian GDP, the regional GDP/ capita was 99.7% of the national average and 139.6% of the EU-27 figure. Remarkably, the growth rate of regional value added was about 4.5% in 2007/08 and thus above the national figure (3.3%), but moved to -3.4% in 2008/09 which is slightly above the national level of -3.1%. In the intra-Austrian comparison, Upper Austria ranks in fifth position concerning the regional GDP/ capita (behind Vienna, Salzburg, Tyrol and Vorarlberg). The most important sectors are automotive, mechanical and plant engineering, machine building, metal production and processing, food, polymers, and medicine technologies. In 2009, 1.7% of regional value added was produced by the primary, 38.6% by the secondary and 59.7% by the tertiary sectors. In 2009, the economically active population in Upper Austria amounted to 730,400 persons, 6.9% of whom worked in the agricultural, 30.3% in the manufacturing and 62.8% in the service sector (Source: Statistik Austria).

Turning to research and development activities in Upper Austria, Table 2 shows that the gross expenditures on research and development (GERD) steadily increased between 1998 and 2009 and reached 2.45% of the regional gross domestic product in 2009. Research and development is clearly dominated by the business sector. BERD (in terms of % of regional GDP) is above the national average (2007: 1.77%, 2009: 1.85%), while regional higher education expenditures on R&D are below the national average (2007: 0.6%, 2009: 0.71%). On the other hand, government expenditures on R&D were below the national level (0.13% in 2007 and 0.15% in 2009). In summary, the Upper Austria innovation regime is clearly business-oriented with further potential in public spending on research and development, i.e. in research, knowledge production and qualification.

Table 2: R&D expenditure in Upper Austria 1999-2009

Year		1998	2002	2004	2006	2007	2009
GERD	Million €	392.3	599.2	713.8	964.9	1,044.6	1,134.1
GERD	% of GDP	1.27	1.68	1.87	2.27	2.28	2.45
BERD	% of GDP	1.08	1.44	1.65	2.06	2.06	2.18
GOVERD	% of GDP	0.05	0.04	0.04	0.04	0.04	0.04
HERD	% of GDP	0.15	0.2	0.18	0.18	0.19	0.23

Data Source: Eurostat

In 2008, 3.14% of regional employment was in high-technology manufacturing and knowledge-intensive service sectors. This figure is below the national level of 4.04%. However, when differentiating between high-tech manufacturing and high-tech service sectors, Upper Austria has an above-average share of employment in high-tech manufacturing sectors while its employment share in high-tech services is below the national average. This again points to the high importance of the manufacturing sector in the region and its technological orientation. On the other hand, Upper Austria's knowledge-intensive service sector orientation seems to lag behind the national average.

In 2009, Upper Austria had 816 R&D performing companies. Only Styria (821) and Vienna (1329) had higher numbers of R&D units. More than 50% (51.9%) of total R&D expenditures are spent on experimental development, 37.6% on applied and 10.5% on fundamental research. Compared to the national figure, the regional focus on application-oriented research and experimental development becomes obvious. On the other hand, the importance of basic research – measured in terms of R&D expenditures - is below average compared to the Austrian figure (19.1%) (Source: Statistik Austria).

In 2009, 34.0% of the active population is classified as Human Resources in Science and Technology (HRST), which is slightly below the national figure (36.5%). In 2001, the respective shares were 27.7% in Upper Austria compared to 30.0% for the national level. Upper Austria's R&D personnel (total, full-time equivalent) amounted to 8,958 persons in 2009. This corresponds to 1.26% of the total employment; 1.11% of the total employment is in the business sector (Source: Eurostat).

Concerning patent applications at the National Office, Upper Austria was clearly in first position in 2010. The federal state was able to confirm its leading position of the preceding years, and even report growing application figures compared to 2009. Upper Austria is thus considered as the most innovative of the Austrian federal states. When relating the number of patent applications to regional populations, Upper Austria is on second position behind Vorarlberg. Patent applications at the European Patent Office (EPO) show a similar picture: In 2009, Upper Austria was with 166.74 applications in first position among the Austrian federal states. In terms of patent applications per million inhabitants, the region takes the second position (118.22 applications) behind Vorarlberg (278.45 applications) (Source: Österreichisches Patentamt, Eurostat).

To summarise, measured in terms of expenditures on research and development and patent applications, Upper Austria has above-average figures concerning business spending on R&D and innovation output. Research and development in the federal state is largely realised in private businesses while public sector expenditures (national and regional) are below average.

Upper Austria has a rich university and non-university research sector, as well as a large number of technology transfer institutions. The Upper Austria Innovation Network connects regional institutions active in research and education, clusters and networks, "Impulszentren", and consulting/ internationalisation agencies. Upper Austria has a network of 21 technology and impulse centres as well as 10 clusters that shape the regional technological infrastructure.

Policy - Participation

As a federal state of the Republic of Austria, Upper Austria has a government, an elected parliament and a governor. Generally, the federal level is responsible for research policy in Austria. However, since the 1990s Austrian federal states have increasingly engaged in innovation policies. In Upper Austria, the directorates for education and society as well as for regional planning, economic and rural development are responsible for innovation policy that is based on the pillars "Innovation through cooperation and competence". Implementation and coordination of policy is supported by

further actors such as the Council of Research and Technology, the *Technologie- und Marketinggesellschaft* m.b.H. or the *Clusterland Oberösterreich* GmbH. The *Technologie- und Marketinggesellschaft* TMG is an important actor in the development and coordination of the strategic economic programme and accompanying activities. TMG is also responsible for developing research, knowledge and innovation structures and manages innovation-related infrastructure investments. TMG forms with *Clusterland Oberösterreich*, CATT Innovation Management and the incubator for high-tech start-ups tech2b the regional government's economic agency TMG Group. TMG thus has a central position in economic development, innovation and technology in Upper Austria, and is an important actor in the economic pillar of the Upper Austrian Innovation Holding. This latter was founded in 2011 as a strategic coordination platform of education, research and the economy.⁴ As an economic agency of the federal state, TMG fulfils the function of a "One-Stop-Shop" for (national and international) companies that wish to locate to or to extend their location in Upper Austria. In addition, TMG manages the "Upper Austria International" network and is finally responsible for the management of "Innovative Upper Austria 2010plus" (see below). Thus, TMG is considered as a network for location development, innovation and cooperation in the federal state. The (broader) innovation network of Upper Austria complements the technology network by cooperative research, innovation facilities and impulse centres. TMG as a regional agency is the coordinating actor in this network and focuses its work on identifying and presenting existing potentials as well as to better use synergies between participating actors.

Until the end of 2005, TMG also managed the Upper Austrian clusters and networks. Since the beginning of 2006, *Clusterland Oberösterreich GmbH* – owned by TMG, the Upper Austrian Chamber of Commerce and the Federation of Austrian Industry – has been in operation. *Clusterland's* main activities cover communication, qualification, cooperation, marketing and internationalisation. CATT Innovation Management GmbH offers its services in innovation management and supports regional companies in the implementation of their innovation projects. CATT offers consulting and advice in all phases of the innovation process.

Policy – Focal areas

TMG also played an active role in coordinating the regional government's innovation strategy process. The strategy was elaborated in a process that integrated all relevant

⁴ See also Standort- und Technologiebericht Oberösterreich 2012, http://www.tmg.at/media/130308_TMG_ST-Bericht_DE-Ansicht.pdf.

stakeholders, as well as the Research and Technology Council. "Innovative Upper Austria 2010plus", the current strategy programme in the federal state, covers the period from 2010 to 2013. It refers to 14 strategies, 137 measures and 120 projects. Five thematic fields are considered pertinent for Upper Austria: Research and Development, Education and Career, Networks, Economic and Technology Location Upper Austria and EU Networking. "Innovative Upper Austria 2010plus" has a total budget of €450m for the whole period of which €300m are co-funded by third parties, mainly business partners. The underlying missions and guidelines are (i) to strengthen existing strengths and to further develop potentials, (ii) to achieve leverage effects and sustainable value added, (iii) to transfer ideas and research finding to the market, and (iv) to review and benchmark objectives and achievements. The strategy's predecessor, "Innovative Upper Austria 2010" foresaw total investments of €600m in the period from 2005 to 2010, specifically addressing R&D, science-industry cooperation in mechatronics, ICT, life sciences, innovative materials and logistics. Furthermore, the strategy envisaged the stabilisation of clusters, their internationalisation and infrastructure development. It finally focused on human resources, qualification and vocational training with 18 strategies and 43 measures.

Upper Austria's strategy building process started in 1998 with the "Strategic Programme Upper Austria 2000+" (1998-2005). It was a mid-term strategy to foster regional research, both in the public and private sectors. In this context, cluster initiatives were initiated (leading to the foundation of the '*Clusterland*' agency in 2005), a network of technology and innovation centres was established, as well as competence centres (also co-funded by industry and federal funds), and the establishment of the public research organisation 'Upper Austrian Research'.

Clusters and networks are an important element of Upper Austria's innovation policy. Regional clusters have been developed since 1998 in automotive, plastics, eco-energy, furniture and timber construction, food, health technology, mechatronics and environmental technology, complemented by inter-sectoral networks in human resources, design and media, logistics and energy efficiency. Cluster management is a responsibility of *Clusterland Oberösterreich GmbH*, and cluster support is one of the focal areas in the federal state's technology and research support. The main objectives of Upper Austria's cluster policy are (i) to improve companies' competitiveness and innovation performance, (ii) to support small and medium-sized enterprises, and (iii) to support innovation through cooperation. Another important field is network support: Innovative projects, cooperation, networking and knowledge transfer are supported in human resources, design and media, logistics, and resource and energy efficiency. Further areas of support relate to inno-

vation assistants, innovative energy technologies, energy efficiency projects, as well as specific support for regional SMEs. Regional R&D projects are an important area of support for the regional programme "Innovative Upper Austria 2010plus" (see above). In this context, national R&D funding (granted by the Austrian Research Promotion Agency FFG) is supplemented by regional funds.

In July 2012, Upper Austria was selected by the European Commission's Enterprise and Industry Directorate-General as one of six model regions which are to demonstrate the "transformative power of service innovation" in support of emerging industries and the modernisation of traditional manufacturing industries.⁵ From 2013 onwards these regions will receive support from the forthcoming European Service Innovation Centre for designing and implementing regional strategies that build upon service innovation as a catalyst for structural change.

To summarise, since 1998 innovation and technology policies have contributed to the techno-economic success of Upper Austria. The regional economy is characterised by strengths in technology and innovation, as well as in exporting activities – these characteristics are supported by the regional policy strategies and measures, their technology and network-oriented focus and future-oriented view. The systemic component is fostered by networks, interlinkages and clusters. Furthermore, the recent strategy building process can be described as participative and systematic. Upper Austria's policy has a broad understanding of innovation and has been adapted to changing framework conditions.

Policy - Smart Specialisation Strategies, Current Situation and Future Outlook

The outlined strategy pursued by the federal state government of Upper Austria during the last 15 years can be classified as a process towards smart specialisation. Strategy building on innovation policy and support as well as the establishment of a well-functioning regional innovation system has been introduced since the end of the 1990s: Besides the above-mentioned strategy-building processes, Upper Austria for instance realised the "RIO" (*Regionales Innovationssystem Oberösterreich*) measure in 2004/05 (co-funded by ERDF means). The federal state aimed to foster the development and competitiveness of the whole region through stimulating innovation. This was realised in five thematic fields in which all regional companies were able to participate. Key actors were members of the technology network Upper Austria (such as competence cen-

⁵ Cf. <http://www.proinno-europe.eu/episis/newsroom/six-model-demonstrator-regions-service-innovation-selected>.

tres, cluster organisations, technology centres, research institutes, technology transfer agencies, public actors, etc.) that establish contacts to regional companies. Besides precise cooperation projects and networks, information and exchange fora took place in the frame of this project and could raise awareness of innovation issues. Three networks were pursued in the strategic programme "Innovative Upper Austria 2010".

Furthermore, the regional cluster and network-related policy approach should be mentioned: Here, the regional government focused on key specialisations in fields with existing regional potentials. Linking and relating industry with research and development institutes in clusters, competence centres or network structures became an important line of regional innovation support. Further evidence for smart specialisation lies in policy measures oriented towards knowledge spillovers between regional companies.

Generally, the Operational Programme "Regio 13" corresponds to the above-mentioned processes and further develops regional priorities in innovation strategy and policy-making. It defines the following priorities for Upper Austria: (i) Knowledge base and innovation (referring for instance to research, technology and infrastructure, competence centres and application-oriented research; innovation-related investment in companies and infrastructure; clusters and networks; business sector research and development, as well as company foundation, development, and takeover); and (ii) Attractive regions. This priority refers to sustainable spatial development of the locations; innovative cultural flagship projects; and city development Linz. Priority 3 refers to technical assistance.

Finally, the interrelation of regional and global levels plays an important role in this export-oriented region. Cluster support, for instance, in a first phase was targeted at cluster constitution and later became also oriented towards international activities. This documents the awareness of the local-global paradox and shows its reflection and transfer in distinct measures. "Key enabling technologies" are identified in life sciences and new materials.

Last but not least, Upper Austria's successful application in the European Commission's call for Expression of Interest for demonstrator regions is a further step towards smart specialisation: Here, Upper Austria formulates the goal of stimulating service innovation both in the service and in manufacturing sectors in order to maintain regional competitiveness and wealth. This ambition builds on the existing regional strengths and aims at defining ways to further develop them for the benefit of the whole regional economy.

5.3 Conclusion

The case studies presented illustrate that the three regions in question have implicitly implemented key elements of the strategy now rolled out as "S³" for a long time, even though in an idiosyncratic, non-standardized way. This however, is not surprising, given the heterogeneity of their policy framework conditions and economic trajectories. To the contrary, it is fairly obvious that the evidence-based focus on certain priority areas is not a novel element at all in many regions with a long tradition of regional innovation policy. Furthermore, there is ample evidence that 'entrepreneurial processes of discovery', i.e. participatory processes of stakeholder involvement, have played a significant – even if not always the central – role in establishing focal points areas of intervention. Table 3 summarises the findings for the three regions in five dimensions we conceived as dominant for a comparative view on smart specialisation in the case study regions. The main objective is to illustrate the implementation status in the regions considered.

Table 3: Empirical findings at a glance

Key aspects of S ³ as set by EU	Bavaria	Saxony	Upper Austria
Dialogue region – EU	Representation of the Free State of Bavaria to the EU	Saxony Liaison Office in Brussels	Liaison Office of Upper Austria to the European Union
Priority on innovation	Support for technology has been an element of Bavarian policy since the 1950s. Focused attention has been paid since 1993 when major additional investments were made into new technologies. Today, innovation policy remains a major element of regional policy effort.	Technology policy has been a central focus of Saxon policy since the early 1990s and has always been fairly business, i.e. innovation, oriented. It is planned that innovation remains a key topic in the ERDF OP for the next funding period.	Technology policy focus of Upper Austrian policy since the 1990s: Strategic Programme Upper Austria 2000+; 2005 continued by Strategic Programme Upper Austria 2010 / Innovative Upper Austria 2010plus.
Focus of investments	Developed over time: starting in the 1980s with micro-electronics, in the 1990s complemented with biotechnology and first industrial networks, today regional cluster policy with 19 different focal areas. Explicit regional "concept for research, technology and innovation policy of the Bavarian government" (2011).	Directly after Reunification 1992 "Guidelines for Technology Policy": focus support on technology fields that seemed to offer potential for a nationally leading position. Currently, a novel explicit innovation strategy of the Free State of Saxony is under development (to be published in 2013).	Since 2005 defined in Strategic Programme Upper Austria 2010 / Innovative Upper Austria 2010plus: mechatronics, ICT, life sciences, innovative materials, logistics, since 2010 additionally: automotive, eco-energy, furniture, timber, food-technology, health, environmental technology design and media.
Evidence-based policy making	Evaluations are frequently used to assess and monitor quality of RTDI programmes and projects.	Evaluations are used to assess the adequacy of selected RTDI support measures. Monitoring studies are commissioned to enable evidence-based policy making.	Strategic processes rather through integration of stakeholders than outsourcing to scientific institutions. Monitoring of strategic programmes (by TMG, Research and Technology Council, further actors and institutions). Evaluation of "Strategic Programme Upper Austria 2000+" served as basis for successive programmes.
Involvement of stakeholders, interaction	Recent increase in public discussions to improve transparency of regional innovation policy making, in particular since 2010.	Regular dialogue between regional government and potential beneficiaries established since 1990s. Recently, the government has initiated the drafting of a regional innovation strategy involving actors from industry, science, culture, government and administration. A continuous dialogue with the public to be established based on so-called innovation fora.	Large experience in design and implementation of innovation policy. Network-oriented focus in regional policy approach; participatory strategy process regarding the design of innovation policies ("legitimation by negotiation").

Source: own compilation

Concerning the two aspects proclaimed to be most important for the "S³" strategy, namely the "priority on innovation" and the "focus of investments", Table 3 underlines that the case study regions in fact already display a long tradition with regard to such approaches. In the two German regions a strong priority on innovation can be observed from the early 1990s onwards, while the definition of investment foci on certain most competitive sectors and/or technologies in part date back even further. Upper Austria picked up those ideas somewhat later, following the example of Bavaria at the end of the 1990s, while giving the similar general approach of investing revenue from privatisation a specifically Austrian character. From that time onwards, Upper Austrian strategies clearly state a desirable sectoral and/or technological focus of investments – which was narrow at the beginning and has broadened somewhat over the last few years, without however becoming randomly broad.

In recent years, however, an increasing dynamic has developed which can – at least partly – be attributed to the up-coming need to develop explicit S³ strategies and document processes of stakeholder involvement. One good example is that the governments of the regions examined in the case studies try to improve transparency in their policy making and strategy development processes. Additionally, there has been a trend towards a higher emphasis on evidence-based policy making. Although evidence-based approaches in a broader sense often date back to at least the 1990s, a systematic approach to e.g. the evaluation of the regional policy mix or the development of regional roadmaps has only gained momentum during the past decade.

The dialogue between the region and the EU, in contrast, remains somewhat un- or underdeveloped in all cases. Although channels of communication are established in all regions, their actual impact of this exchange on regional strategy building remains of an indirect nature – in particular in those regions where regional innovation policy is not primarily funded by EU sources. Against this background, it will remain a challenging task for the next years to improve the coupling between the central considerations of the European Commission and the actual developments in the regions.

The findings can be summarised as follows:

T1: The smart specialisation concept contributes to more system-oriented regional strategy development processes. (Although not entirely new, it may take new forms).

On the one hand, the improved documentation of place-based regional policies which is stipulated in the framework of the S³ approach will offer increased learning options for regional governments and regional development agencies across Europe. More importantly even, its pronounced emphasis on the evidence-based and stakeholder-

oriented definition of regional areas of strengths may help regional policy makers to focus on what is actually important for their constituency and in the future enable them to avoid falling for "policy fashions".

On the other hand, the implementation of S³ is no guarantee for prolonged regional economic success. As the case studies show, a permanent readjustment of regional strategies is needed to keep them in line with the evolution of the regional innovation system. Against this background, the increasing degree of monitoring and control that comes with the S³ stipulation has to be regarded with a certain degree of scepticism. Inevitably, developments in the national economy and the local business sector will influence the adequacy of individual regional policy specialisations even during the support period for which they have been defined. Accordingly, targets should arguably be agreed upon in a more flexible manner than currently proposed.

T2: The smart specialisation strategy obliges/forces regions to make their strategy processes more explicit, increasingly base them on evidence and involve stakeholders.

This thesis can be confirmed by the developments in all three case study regions. While all of them had already and still have been open to S³ related ideas for a number of years, they have typically only done so implicitly. To an extent, all regions have taken relevant steps from idiosyncratic, internal and working-group based decisions to more open processes of consultation with a broader range of stakeholders.

T3: Implementing (aspects of) the smart specialisation strategy might help regions to better adapt their regional development strategies to regional potentials, resources and challenges.

All three case study regions have improved or maintained a good economic performance based on a competitive and balanced sectoral composition that is capable of meeting current and future market demands. The fact that regional economic and innovation policy-makers have paid a lot of focused attention to the development of those sectors which are most important for the respective regional innovations system has undoubtedly added to the momentum available in them.

Nonetheless, all regions also display elements of a non-discriminatory support policy that allows new firms in not yet well-established fields to apply for public funding i.e. that help the entrepreneurial dynamics of the system to bear fruit. Our case studies illustrate that most successful regions have not replaced thematically open support policies with focused policy support entirely but have practiced both approaches in parallel and complementary to each other.

In brief, we do not find evidence that regional policy can actively change structures of regional innovation systems. All case studies suggest that moving from regional innovation policy to straightforwardly shape regional economies would arguably be too much – even in institutionally highly developed governance systems such as Germany and Austria. Instead, the focus of policy makers should in most cases be understood as reflecting and supporting the transformation of structures or at least niches already present in the regional economy.

6 Conclusion: The potential of the S³ approach to improve regional innovation strategies

In general, the S³ approach as launched by the European Commission should be seen as an opportunity, but one on which several caveats have to be placed.

Firstly, our cross-regional comparison has demonstrated that technologically-focused regional innovation policies are as such nothing new and have proven their potential to strengthen strengths and build on existing potentials. They have, however, often been applied in a complementary rather than proactive manner. At times, focused policies have been successful in supporting regional economic transformation but they have hardly ever been able to create new specialisations where there were none. Against this background, care should be taken with the S³ notion of 'creating critical mass'.

Secondly, the regional case studies support the notion that focused policies are most effective when they are designed based on in-depth analyses of the actual status quo. Political decisions, however, have to be legitimised and in this process of negotiation tend to fall for the temptation to support a too broad number of fields – if only to please all parties. It should thus be recognised that evidence-based analysis and stakeholder involvement may yield contrary results and that their joint application as suggested by the S³ approach may present a more substantial challenge than sometimes suggested.

Thirdly, there is merit to the S³ prompted tendency to make priority setting in regional innovation policy more transparent and more explicit – not least as the participatory processes launched to develop strategies can help to solve the above-mentioned conundrum of political negotiation and evidence-based decisions. The case studies, however, have illustrated that all strategies will have to continue to evolve in line with the regions' socio-economic situation. Regional strategies, therefore, should encourage flexibility instead of rigidity and not require policy to answer to rigid target systems.

On the one hand, it is thus laudable as such that the European recommendations for policy learning have been adapted from a generic outward-looking to a place-based approach. Ultimately, of course, this cannot prevent everybody from taking ill-informed decisions at implementation level. Nonetheless, the S³ approach adds much needed legitimacy to efforts aimed at (re)considering regional strengths as well as at leveraging additional momentum through stakeholder participation. On the other hand, there is a real danger that the S³ approach could be misunderstood as a one-time exercise aimed at mechanistically developing priority lists and fixed monitoring systems – which until the end of the support period relieves policy makers from reconsidering their objectives. Put in a nutshell, this paper argues that this would in fact eliminate much of its potential – and that any S³ approach must remain inherently dynamic.

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