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Innovations in innovation policy: reconstructing the emergence, legitimation and dynamics of cluster policies in Germany

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Cluster policies are but one of the most well-known policy tools to steer innovation in the realm of science and technology policy. While there is much research on the effects of cluster based funding for innovation and scholarly strategies, little is said about its emergence, its legitimation and its situatedness in societal discourses and professional practices. This article applies an ‘instrument constituencies’ perspective on cluster policies in science and innovation. Drawing on the case of Germany, it is argued that these policy instruments are not only legitimated by an academic literature but that their introduction also depended on very specific national constellations shaping the uptake of the instrument. It is also shown that the construction of the instrument cannot be separated from its implementation, thus contributing to the emergence of new communities of practice.

Keywords: policy instruments; innovation; science and technology studies; funding instruments

Introduction

Innovation is one of the most widely used terms to legitimize and to orient policies of states and enterprises. The term has become so fashionable that scholars even speak of an *innovation imperative* not only in the economic but, also in the social and cultural realm. Innovation has also become a particular relevant issue for policy making. Since the 1980s, a novel set of innovation policies complemented existing science and technology policy (Edler and Georghiou 2007; Lundvall and Borras 2005, 612).¹ These ‘systemic’ policies (Edquist 1997) are targeted at changing institutional and organizational contexts in order to boost technological activity. Technology centers, research-industry collaborations, and specific funds aiming at changing incentive structures were intended to ‘modernize’ the economy by means of ‘strategic science’ (Rip 2004; Grimmer, Kuhlmann, and Meyer-Krahmer 1999). Given their differences to hitherto established policies for the governance of science and technology (Lundvall and Borras 2005, 602), they were widely held to be innovations in policy making (Cooke 2002; Cooke, Boekholt, and Tödtling 2000; Dohse 2000b). In this contribution, I aim to reconstruct the justification, emergence and expansion of a specific policy innovation in federal STI policy, that of cluster policies, taking Germany as an example. I argue that the success and expansion of cluster policies as a

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widely established policy instrument can be linked to specific narratives of innovation as a solution to an increasingly broad list of societal challenges (Pfothenauer, Juhl, and Aarden 2019, 897). Following Michael Howlett (2005, 34), cluster policies can be regarded as ‘substantive’ policy instrument, as they are ‘designed to alter the mix of goods and services provided and available in society’

Defining characteristic of these ‘policy tools’ is that funding is not granted to an individual organization (a company or a single research unit), but to a network of actors acting within a specific region. Its aim is to strengthen collaborative activities among network partners, and, ultimately, to spur innovative activity. Cluster policies can be different in scope and design, but they commonly refer to a specific model and conceptual repertoire rooted in innovation studies (Koschatzky 2000; Koschatzky and Kroll 2007; Scheuplein 2002). Hence, they rely on a ‘functional model of governance’ established in scholarly literature. Today, these kinds of policies can be regarded successful in terms of global diffusion, they can be found anywhere across the globe (Fritsch 2005). The gain attention in the scholarly realm, as the scientific and professional literature assessing effects of cluster policies has grown rapidly (Mejlgaard et al. 2012; Uyarra, Ribeiro, and Dale-Clough 2019; Uyarra 2007).

Yet, little is said about as to how these funding instruments have emerged, how they were legitimized and how they changed. This is because policy instruments in science, technology and innovation policy (hereafter, STI policy) are often regarded as relatively stable set of measures, following rather predefined policy problems (Flanagan and Uyarra 2016). Yet, an emerging body of research shows that policy instruments are rather dynamic entities. They can be different in different countries, different regions, and different contexts. As I intend to show, cluster policies are striking in this regard. In order to trace and understand this dynamic in the innovation policy instrument’s establishment and expansion, I employ the concept of instruments constituencies developed by Voß and Simons (2014). Voß and Simons tackled the dynamics of policy instruments by exploring the practices and mutual interactions of specific communities engaged in their establishment and evolution. In complementing this perspective, I intend to reconstruct the legitimation of these policies by analyzing the way how specific framings of scholarly communities lend authority to the basic ideas of the funding instruments. While there is a growing body of research devoted to the analysis of instrument constituencies in different policy domains (Simons and Voß 2018; Zito 2018; Béland and Howlett 2016; Campano and Lippi 2016), STI policy has so far not been object of study in this respect.

In order to reconstruct the emergence of STI cluster policies, I focus on the case of *federal* policy in Germany. German federal STI policy to a large extent relies on regional funding measures (Koschatzky and Kroll 2007; Fritsch 2005). Moreover, as I aim to show, federal cluster policies in Germany have been applied to rather different contexts and with specific changes in the allocation of funds, making it difficult to speak of a coherent or stable policy tool. The strategy of following the funding model into its various transformations and expansions therefore may allow for gaining more insights in the changing modes of legitimations and organizational practices related to this policy instrument.

The article is structured as follows: In the first part, I will provide a theoretical framework, referring to the concept of instrument constituencies. Subsequently, I present the methodological approach and the data used, drawing on a heterogeneous sample of documents. The main section deals with reconstructing the modeling and implementation of regional collaborative funding schemes for innovation (cluster policies) in the German policy context. I will particularly elaborate on how the concept of regional funding schemes was justified and transformed. In the final section, I discuss these developments, referring to ongoing debates in innovation and policy studies.

Theoretical framework

I draw on a social constructionist framework (Berger and Luckmann [1969] 2013) in order to explore the emergence and establishment of the funding instrument. Funding instruments, as I have outlined before, are perceived here as policy instruments, that is, specific modes by which the government intervenes in the social cultural or political life (Campano and Lippi 2016; Béland and Howlett 2016). Therefore, policy-instruments can be distinguished from rather abstract policy principles which do not interfere directly with markets or the social world. Michael Howlett (2005) distinguishes between ‘substantive’ policy instruments, aiming at changing the provision of goods or services and ‘procedural’ policy instruments, that is, instruments ‘intended to alter policy processes’ (Howlett 2005, 34). Following these distinction, cluster policies need to be viewed as substantive policy instruments. Yet, how does policy scholarship conceptualizes change and innovations in these rather technical domains of policy making?

Traditionally, rationalist policy analysts assume policy instruments to be tools of the government responding to a recurring problem (Howlett 2005). In this conception, tools will change when new problems emerge or are articulated. This ‘tools’ perspective of the government, however, views policy instrument as rather stable and invariant entities, as they are perceived to be a solution to a rather stable or at times predefined policy problem (Flanagan and Uyarra 2016). Yet, policy instruments themselves can change, as they are transferred to other settings, other countries or domains. As Flanagan and Uyarra (2016) argue, policy instruments do not work ‘consistently over time and space’. There can be differences between the idealized design and what is actually happening due to the implementation styles and practices.

Such positions resonate particularly well with the concept of instrument constituencies (Voß and Simons 2014; Simons and Voß 2018). In tackling discontinuities of policy instruments, this perspective focuses on the heterogeneous communities shaping the emergence, transformation and implementation of policy instruments (Voß and Simons 2014, 738). By carving out specific mechanisms of how these communities co-evolve with the policy instruments at hand, Simons and Voß (2018) aim to provide a novel perspective on policy change. Different to rationalist conceptions of the policy process, the concept of instrument constituencies holds that policy instruments ‘live a life of their own’ (Voß and Simons 2014, 742). They develop and emerge in specific contexts (often in socially or spatially restricted sites), they can change in form, because they are driven by rather heterogeneous professional and technical experts (Simons and Voß 2018). Thus, policy instruments are perceived as dynamic and interrelated socio-technical entities. I argue that this perspective is particularly useful for analyzing STI policies, because this domain is perceived to be a multi-actor policy field with many different expert communities providing knowledge (Grimmer, Kuhlmann, and Meyer-Krahmer 1999). Moreover, the approach of instrument constituencies provides a complementary approach to theorizing funding policies in STI policy studies. In approaches pertaining to STI funding instruments hitherto established, funding instruments are often perceived as merely as stable, isolated items, embedded in idealized relationships between the funding agency and the grantee. Funding instruments in the STI policy field have been conceptualized using the principal agent model, where the state (as principal), the funding agency (as intermediary), and the grantee (as the agent) form a rather stable relationship (Braun 1993; van der Meulen 2003). Changes to the funding design as a process of interaction between policy and scholarly communities and other organizational or social influences in this model are not systematically taken into account.

Contrary to that, the concept of instrument constituencies captures the many interactions between scholarly communities and policy actors, and questions the model of a rational policy process, where actors are perceived as rather passive (Flanagan and Uyarra 2016, 178). Instead, Simons and Voß (Voß and Simons 2014; Simons and Voß 2018) hold that there are different phases and practices with mutual interactions between the different knowledges of scholarship and policy. In the so called modeling phase, experts establish the basis for the basic mechanism of a policy instrument. Hence, they are concerned with the funding instrument as an ‘functional model of governance’ (Simons and Voß 2018, 19), that is, an abstract specific generalizable way of how the instrument functions in the social world, based on mechanisms described, tested or conceptualized in the scholarly world (its paper appearance). In the case of cluster policies, the basic funding mechanism established be termed a regional collaborative funding scheme (see Section 5). Once a pilot of the instrument is established, the involvement in further testing of the instrument bounds the instrument constituency together as community of heterogeneous albeit interested actors (for either economic or political reasons) (Voß and Simons 2014, 739). Simons and Voß have called these practices of testing and probing, the implementation practices of the instrument. Following these ideas, in this contribution I deal with the implementation and expansion of cluster policy in various stages of work devoted to this instrument. Seen in this light, evaluation exercises of the policy instrument are fundamentally related to confining the means, ends, and designs of a policy instrument (Voß and Simons 2014, 739). Practices related to implementation of the policy instrument – e.g. its monitoring – can further influence its modeling, while abstract concepts ‘may guide the formulation’ of policy strategies. Hence, both practices of modeling and implementation mutually reinforce each other evolving (Simons and Voß 2018, 19). As a result, policy instruments can expand, that is, they can be applied to other domains, and other regions, other countries, enforced by these endogenous dynamics. I argue that these mechanisms of expansion can be also observed in the realm of STI policy, and particularly in the case observed here.

Yet, while the concept of instrument constituencies captures changes and transformations of the instrument by focusing on the social dynamics of its constituent communities, there appears to be less focus on as to how a policy instrument is justified and legitimated in the realm of policy making. According to Simons and Voß (Voß and Simons 2014, 739), ‘functional and structural promises’ of an instrument can gain support or legitimacy for a given instrument (Simons and Voß 2018, 21). Functional promises are perceived as referring to policy goals, while structural promises are being inscribed or ‘implied’ in the future policy world the policy instrument is seen a part of (Voß and Simons 2014, 739). For instance, a policy instrument may be imagined as leading to changes of competence between different ministries. Yet, there may be other additional forces legitimating the instrument.

In this contribution, I argue that epistemic communities, that is, scholarly and professional communities are particularly engaged in the establishment of policy narratives, legitimating science policy institutions (funding agencies, ministries of research, etc.). I use the term of legitimation in the sense established by Berger and Luckmann as second order objectivation (Berger and Luckmann [1969] 2013, 98) shaping the meaning of a given institution (Berger and Luckmann [1969] 2013, 66). According to Berger and Luckmann, these legitimations are linguistic devices often engaging narratives, tales, or theories (Berger and Luckmann [1969] 2013, 101). Based on the case presented here, I argue that a specific narrative of innovation (innovation as a process being influenced by social institutions) becomes the medium of legitimation for novel STI policy related measures.

Innovation, in other words, becomes a way to change or expand the meaning of STI policies; it allows employing different forms of steering and different actors initially not tied to public governance in this domain. These legitimations, however, are not free floating, but bound to specific communities establishing credible problem frames, certified by scholarly and professional knowledge. In policy studies, ‘epistemic communities’ (Adler and Haas 1992) with shared beliefs and expertise are perceived to be engaged in the articulation of problem frames granting legitimacy. We find, for instance, scholarly communities being particularly active in establishing problems of climate policy. Recent research (Pfothenhauer, Juhl, and Aarden 2019) has argued that the ‘lack of innovation’ established by scholarly and professional communities, functions as a narrative to legitimize existing STI policy instruments (see also Blümel 2018a, 2018b). Following these ideas, I aim to explore legitimations of STI policy instruments by analyzing how and in what ways narratives of professional communities are mobilized to authorize policy interventions. That also allows for differentiating between the functional model of the policy instrument, that is, its basic mechanism (regional collaborative funding schemes) and the intellectual concept legitimating the policy intervention (for instance the cluster as an analytical concept), as the instrument is introduced to new fields or domains.

Finally and closely related to that, funding instruments as functional models can have performative effects onto the social world they aim to improve. The notion of performativity has been particularly shaped by Michel Callon (1998) arguing that our models established in science and technology have constitutive effects on our social world. Economics, for instance, does not ‘describe an existing external economy, but brings that economy into being: economics perform the economy, creating the phenomena it describes’ (MacKenzie and Millo 2003). In this perspective, the implementation of funding instruments does not only intervene in the social and material world by incentivizing a specific behavior through grants or subsidies; ‘with the implementation of the instrument, its underlying ontology becomes installed as a cultural infrastructure of political interaction’ (Simons and Voß 2018, 18). Novel organizational entities are created by the policy instrument, which fundamentally relate to and are backed up by scholarly concepts. Such interactions between scholarly knowledge and policy implementation practices shaping the policy instrument will be explored by referring to the case of federal cluster policies in Germany, whereby the methods used are described in the next section.

Material and methods

In order to reconstruct the emergence and establishment of cluster policies (or regional collaborative funding scheme) as an innovation in policy making, I refer to the case of German *federal*² STI policy making. Yet, before describing in more detail the material used, I need to define the domain of STI policy, and explain why the funding instrument at hand can be perceived a change of policy in this regard. Science, technology and innovation policies cannot easily be distinguished from each other, but rather represent different perspectives and historical developments (Lundvall 2002). While according to Lundvall and Borrás (2005, 604), the concept of science policy fundamentally ‘belongs to the post-war era’, where the state governs through budgetary decisions on (institutional) funds; the concept of technology policy emerged in the 1970s, referring to active steering policies of the state for specific technologies being defined as strategically relevant for economic growth (Lundvall and Borrás 2005, 608). Finally, innovation policies, particularly those policies established as ‘systemic innovation policies’, emerged in the early 1980s (Fagerberg and Verspagen 2009). They are defined as policies systematically improving the

institutional frameworks for innovation (Lundvall and Borras 2005, 612) by changing the competencies of innovation actors to use and process knowledge (Smits and Kuhlmann 2010). Against these conceptual and temporal distinctions, the period studied covers the policy changes from technology to innovation policy in Germany. Cluster policies are only one, but maybe a particularly important ‘substantive policy instrument’ (Howlett 2005) employed in the realm of innovation policy. Other ‘substantive’ policy instruments in this realm are tax cuts to firms active in research and development or the foundation of governmental laboratories for applied research.

Why does the analysis focus on federal policy making in this domain? The analysis focuses on policies from the federal government, because national or federal governments are perceived as being particularly active in science and technology policy making (Barben 2004; Drori, Meyer, and Schofer 2003), while regions or smaller administrative entities only recently became more engaged in this policy domain. Germany is a special case in this respect, because the federal level after 1945 had little no legal competencies in this realm (Bartz 2007). Based on its constitution, the states (the ‘Länder’) are entitled to govern higher education and research. Since federal competencies could be only acquired by providing additional resources for organizations outside universities, federal policy making in this realm concentrated on orchestrating institutional funding for extra-university research organizations (Stucke 1993), being less engaged in active steering (Lax 2015). Yet, after the 1970s, similar to other countries, Germany started to systematically steer specific fields of technology, thereby widening the policy domain to economic policy making (Lütz 1993). In this period, federal policy was particularly resonant for discourses established by organizations at the transnational level. In particular, the OECD promoted specific policy models for the *national level* (Lundvall and Borras 2005, 603), referring to scholarly concepts such as the ‘National Systems of Innovation’ (Albert and Laberge 2007). The policy analysis therefore covers the ‘innovation journey’ (Voß 2007) of cluster policies as a specific form of *federal STI* policy making.³ The analysis aims at tracing the establishment and changes to the ‘functional model’ of cluster policies (what I have termed regional collaborative funding scheme) and its legitimations over various application contexts, from high technology fields, to the field of Eastern German Transformation policy, and from the fields of international cooperation to university reform.

In order to analyze the emergence, uptake and the diffusion of cluster policies, a corpus of round about 90 documents consisting of funding calls, decisions, monitoring analyses, conference papers, evaluation reports, has been established. Qualitative analysis of legitimization practices and policy framings has been exercised by establishing iterative steps of deductive- and inductive coding (Kuckartz 2010, 2014), taking stock of computer aided qualitative data analysis tools (MAXQDA). Accounting for the influence of scholarly knowledge as source for credibility, reference analysis of policy documents have been additionally conducted. Such analyses increasingly attract the attention of scholars who aim at dealing with conceptual influence on policies (Simons 2016). These steps enabled to present an analysis of the discursive uptake, the establishment, legitimation and diffusion of the instrument through various instances. Following the concept of Simons and Voß, I now aim to establishment of the policy instrument by accounting for different phases, that of the modeling (Section 4), implementation (Section 5), and expansion phase.

The emergence of regional innovation: modeling a regional innovation instrument

The idea of steering innovation at the regional level has certainly many roots. Yet, it was only in the beginning of the 1990s that scholars were taking up the idea of steering

innovation at the regional level from the perspective of national policy (Porter 1990). This branch of knowledge integrated diverse literatures of geographic location theory, economic development, and the philosophy and sociology of knowledge (Braczyk, Cooke, and Heidenreich 1998; Cooke 1992; Cooke, Heidenreich, and Braczyk 2004). With respect to the instrument constituencies approach (Voß and Simon 2014), theoretical, conceptual and empirical work in this realm can be considered as modeling activities of the instrument constituency. As various policy documents (funding calls, administrative reports, evaluation reports) of the German cases reveal (DIW 2006; BMBF 2006a, 2006b, 2007c, 2009; Staehler, Dohse, and Cooke 2006; Kaiser 2003), scholarly contributions were influential in shaping the conceptualization of STI policy instruments. It can be argued that what made them influential in the policy realm was the combination of two lines of thinking: first, the conception of innovation as a collective endeavor, and, second, the concept of a region as a result of social, cultural and economic activities.

Following the approach of institutionalist innovation (Freeman 1974, 1987), regional innovation scholarship conceptualized innovation as a product of collective agency, emerging from interactions and collaborations of organizations and actors of different types (firms, research institutes, public agencies, professional organizations) (Cooke 1992). It was asserted that regional systems strongly relied on social and spatial proximity as a necessary condition for trust and cooperation (Saxenian 2001). Based on such interactions, spatial proximity lowers the barriers for exchanging knowledge, particularly for those types of knowledge which Michel Polanyi had termed implicit and tacit knowledge (Polanyi 1985). It is such knowledge which was regarded relevant for innovation processes (Pavitt 2005). These ideas have been tested empirically in various local ‘spillover’ studies of technological capacities. In particular, Jaffe, Traitenberg, and Henderson (1993) found that such increased cooperation and spatial proximity is for spillover effects of knowledge and competencies (Jaffe, Traitenberg, and Henderson 1993). Hence, Jaffe’s works can be traced back as one of the main arguments for the later articulation of the functional model of cluster policies which can be also termed as regional collaborative funding schemes, i.e. that collective agency rather than individual actors should be addressed in order to increase innovative activities (Braczyk, Cooke, and Heidenreich 1998; Cooke, Boekholt, and Tödtling 2000).

Second, the regional innovation framework is based on a specific conception of a region which has evolved over the last decades. Increasingly, branches of regional scholars have faded away from the definition of a region as a predefined spatial entity where boundaries are clearly defined with defined implications for individuals or objects tied to or living in that region. Administrative regions, for instance, fall into that category, as every single individual within its boundaries is subject to administrative jurisdiction of a specific agency (for a limited but defined set of actions, such as the notification of birth). Scholarship in regional studies, however, has insisted that regions do not necessarily be predefined, but emerge from social interactions in time and space (Keating, Loughlin and Deschouwer 2005). In economic geography, these definitions were perceived as preconditions for the regional concentration of specific economic activities. Hence, regions were rather perceived as social constructions based on functional affordances (what needs to be delivered in order to manufacture a given product).

Based on these conceptions and basic mechanisms (the concept of a functional region, and the mechanism of knowledge spillover resulting from co-localization and learning), Michael Porter (1998, 1990) subsequently shaped the concept of a regional cluster as an accelerator of regional economic success: According to Porter, regions with concentrations of scientific organizations and enterprises in *one* industry over different instances of the

value chain that maintain relationships with each other benefit from knowledge exchange and cooperation (Porter 2000, 15). As a result, these clusters appear to be technologically specialized, economically active, and (globally) visible. Hence, regional innovation in Porters view was closely linked to the idea of technological specialization. It is this idea of Michael Porter, which became the main reference not only for the functional model, but also for the justification of a funding instrument devoted to the technological development at the regional level in Germany (BMBF 2007e).

Hence, there are the different intellectual sources which can be perceived as conceptual underpinnings of the policy instrument under consideration. Yet, it is not that science and technology policy simply followed these ideas as a readymade academic solution. Rather, the conception of regions as loci of innovation steering has emerged as both policy and scholars have learned from the experiences of the policy intervention described further below. Modeling activities (conceptualizing entities and mechanisms relevant for the funding instrument at hand) and implementation can thus not be seen as unrelated processes. In the next section, I will in more detail elaborate on how the first implementation of cluster policies on the federal level further influenced its subsequent modeling.

The implementation of regional innovation policy instruments in Germany

The initiation: the BioRegio contest as a blueprint

In the German science policy debate, the cluster concept resonated well (Sternberg 2004; Dohse 2000a; Fritsch 2005; Eickelpasch and Fritsch 2005). There was an ongoing debate of how to steer the economy by incentivizing activities through technology policy (Holland, Kuhlmann, and Meyer-Kraemer 1995). This was because federal policy making since the 1970s has been influenced by transnational discourses for technology and innovation policy arguing for a stronger role of the government (OECD 1971, 1980, 1999). These debates also affected the design and scope of science and technology policy in Germany, particularly at the newly founded ministry for science and technology (BMFT). With the launch of a department called ‘Emerging Technologies’ in 1972 (Stucke 1993), a new type of instrument and intervention oriented policies emerged specifically dedicated to technology development (BArch, B 196). Similar to other agencies worldwide (Rip 2004), the ministry aimed to ‘strategically’ define specific technology based sectors (biotechnology, information technology, pharmaceutical industry, chemical engineering, environmental technologies) supposed to contribute to economic recovery. Yet, by the beginning of the 1990s, it was held that Germany lagged behind particularly in these emerging technologies (Krull and Meyer-Kraemer 1996; BMFT (Bundesministerium für Forschung und Technologie) 1993). Compared to the US, the UK and other European countries, there were only few active companies active in this technology field. In addition, it was argued that an alleged gap was the result of specific institutional frameworks in Germany (Kaiser and Prange 2004; Casper 1999). Therefore, novel funding concepts and policies were demanded, aiming at altering existing institutional capabilities.

As later official documents reveal (PtJ Projektträger Jülich 2010), these were the main arguments in favor of a new funding initiative marking the beginning of cluster policies in Germany. As Dohse (2001, 446) has argued, regional policy already in the 1980s started moving into the direction of innovation steering, but federal innovation policy became regional only in the 1990s with a much more systematic effort. An initiative named BioRegio was introduced in 1995 by the federal ministry of education and research which

particularly focused on biotechnology (BMBF 1996). Reconstructing the emergence of STI cluster policies in Germany it can be held that this initiative was its ‘blueprint’ (Simons and Voß 2018, 19). Yet, at the time these attempts were being made, ‘cluster’ was a rather analytical concept (Scheuplein 2002), and there was little experience with policy instruments for directly incentivizing technological activities at the federal level in Germany – albeit with the prominent exclusion of the so called research industry collaboration scheme (Lütz 1993). What is more, an initiative targeting institutional coordination within regions would have to justify its intervention against a community of economists with specific reservations against such steering from the state. Hence, the first federal funding initiative can be surely perceived as a rather risky endeavor. According to the representative of the research executive agency, they were ‘in completely uncharted waters’ (PtJ Projektträger Jülich 2010), at the time the initiative was being publicly acclaimed.

It is maybe against that background that BioRegio combined the goal of fostering regional collaborations with a contest on the federal level (Eickelpasch and Fritsch 2005). As various documents reveal, the initiative followed the ideas of Michael Porter (Porter 1990) in restricting the conditions for receiving funding to ‘best regions’ (Dohse 2001, 447; Staehler, Dohse, and Cooke 2006). Hence, only regions with already existing structures in biotechnology were allowed to apply. Preconditions were the existence of large pharmaceutical enterprises, hospitals, extra-university and university research facilities as well as a plan for long-term cooperation within the regional network (BMBF 1996).⁴ Moreover, the funding initiative was based on a specific concept of a region (Dohse 2001). Regions in the sense defined by the funding agency were not regions defined by administrative responsibilities or with confined geographic physical boundaries; instead applicants themselves were to deliberately define the boundaries of the respective region. As a manager responsible of the funding program explained: ‘in managing funding projects, we perceive regions to be functional, as instrumental cooperation between enterprises, research institutes, free lancers and (...) public agencies’ (PtJ 2010, 13).⁵ Taking these different elements into account, the funding design can be termed a regional collaborative funding scheme, because funding was only provided on the precondition that a consortia of regionally co-located organizations was formed.

Based on these ideas, the funding call for biotechnological contest was published in 1995. 17 regions or regional entities participated in the contest presenting their ‘regional strengths’, of which finally three regions were awarded with 50 Mio D Marks each to be spent in five years between 1996 and 2000 (Staehler, Dohse, and Cooke 2006). According to Dohse (2001), this funding design had two advantages for the ministry: First, it allowed for identifying key centers of technological activities in this realm. Second, it was set out in order structure funding for the ministry, as the selected regions were automatically considered a priority in subsequent funding programs for biotechnology between 1997 and 2001 (Dohse 2001, 447). It comes as no surprise that the reaction of successful applicants was positive. A spokesman of the regional network ‘Rhein-Neckar’ stated ‘the start of the initiative was a right decision though it ‘cannot make failures of the past unhappen’ (Universität Heidelberg 1996), thereby referring to the narrative of a technology gap which legitimated the initiative.

Reflecting the organizational practices constituted by the funding instrument (see theoretical section), the BioRegio initiative comes with several organizational innovations. Each regional network had to establish an organizational entity with the task of organizing collaborations among regional partners. In addition, every of the regions participating in the contest founded new organizations for regional technology transfer, which contracted

management tasks to novel consultancies and other services (Universität Heidelberg 1996). Thereby, the federal ministry of education and research gained new information about the information flow between local authorities, enterprises and research institutes. Moreover, the foundation of these organizations contributed to the further growth of the cluster policy instrument constituency, as their members identified and engaged with the roles of regional cooperation. Members of these offices perceived themselves as facilitators. Their self-characterization was particularly visible when the ministry aimed to change the conditions for funding in subsequent initiatives. As an evaluation document reveals, changes were perceived ‘as a weakening of the enterprises based in the region and of their role [the role of the local offices] as local promoters in biotechnology’ (reported by Licht et al. 2012, 61).

Yet, it would be certainly wrong to perceive the impact of the initiative simply as a sort of lobbying. At the contrary, there are many different reasons why the initiative was perceived as a success. First, the success of the program was related to the broad participation of more than 17 regional consortia applying for funding. Though only few of these consortia were funded by the funding initiative, many of these regional collaborations persisted even several years after the funding model (Scheuplein 2002; Dohse 2000b). According to scholarly observers of innovation, this behavior was related to a dedicated ‘boom’ of the cluster and network idea in German media after 2000 (Kaiser and Prange 2004; Kaiser 2003). Many different biotechnology clusters and cluster programs were set up throughout the country. Second, the funding initiative was perceived as a success because of its (attributed) impact on the development of the German biotechnology landscape. The number of biotechnology companies has grown throughout the funding period from around 75 in 1995 to approximately 300 in 2003 (PtJ Projektträger Jülich 2010, 15). At the beginning of 2004, with 360 dedicated biotechnology firms (including public companies), more enterprises were established in Germany than in the UK (Kaiser and Prange 2004, 397), hitherto the leading country in biotechnology in Europe so far. Although these numbers did not translate directly into economic success (Stahler, Dohse, and Cooke 2006), the high number of companies were perceived as a major success of the funding initiative (PtJ Projektträger Jülich 2010).

Because of this success and the initiation of a novel set of actors concerned with the promotion of high-technology, the BioRegio Initiative has been integrated in the narrative of a ‘new German technology policy’ (Dohse 2000b). Only in the early 1990s, several scholarly observers argued that high-technology sectors cannot prosper in the country because of the country’s institutional set up. Yet, since the early 2000s, science and technology policy has been fueled by expectations of economic development in high-technology sectors particularly through the implementation of BioRegio. With the successors BioProfile and BioChance, funding programs in biotechnology prevailed, as was the existing organizational infrastructure of the BioRegio consortia (Stahler, Dohse, and Cooke 2006).

BioRegio thus soon became a model for a new ‘funding philosophy of technology policy’ in Germany (PtJ Projektträger Jülich 2010, 17). Several other funding initiatives followed the approach of funding regional networks of co-located enterprises and research institutes. In 2001, an initiative competence networks (Kompetenznetze) for photonics was launched, with the goal to further advance existing specializations in this field. And in the same year, a similar funding initiative aimed at improving the conditions for medical technology with a budget of more than 60 mio Deutsch Marks (DM). All these initiatives share the idea of supporting regional consortia specializing in a particular technology with substantial technological capacities already existing within that region.

Against that background, attempts were made to further expand the new technology policies of the ministry to other policy problems. The biggest challenge for the country was the sluggish socio-economic transformation of Eastern Germany. That new program for Eastern Germany needed to be designed was particularly apparent, as consortia from Eastern Germany were not able to compete in funding initiatives focusing on existing technology competencies (Scheuplein 2002). As the next section aims to show, this situation marked a change in the development of the cluster policy instrument, as it was actively marketed to adapt to the Eastern German situation.

The second birth of regional innovation funding: the Inno Regio initiative

The Eastern German policy context and the state of transformation

At the beginning of the new millennium, the InnoRegio initiative of the federal ministry of education and research targeting Eastern Germany was perceived as a second birth of the cluster policy approach in German STI policy, while the BioRegio initiative were its first (Dohse 2001, 2000b). Yet, these (imprinting) initiatives were targeting rather different policy goals: different to programs focusing on biotechnology, the goal of the new federal cluster policy of the ministry was to contribute to the economic development of structurally weak regions in Eastern Germany (Günther, Nulsch, and Wilde 2010, 77). Again, it would be too easy to say that high-technology cluster policies were easily transferred to the new domain. As the policy documents reveal (BMBF 2001a, 2001b, 2002; CDU/CSU-Bundestagsfraktion 2001), two debates were particularly relevant for mobilizing support of initiative which culminated in the mid-1990s.

The first debate was the debate on a crisis of policies targeting socio-economic transformation in Eastern Germany (Treuhandanstalt 1994; Böick 2018). Different to other Eastern European countries, the authorities aimed at creating a market economy by rapidly privatizing the existing organizations of the former socialist economy (Böick 2018). In particular, large industrial conglomerates, so called ‘Kombinate’ were sliced into many smaller units, and subsequently offered to potential investors (Ther 2019, 79). Due to the large supply of similar companies needing investments⁶, many of the privatized enterprises had to close down, while few remained, yet with significantly lower numbers of employees⁷ and with little chances to win new markets due to bad financial and technical capacities (Holland, Kuhlmann, and Meyer-Krahmer 1995, 5). At the same time, the federal government had followed an economic strategy which focused particularly on attracting direct private investments from the West or foreign countries (Treuhandanstalt 1994). As a consequence, large state subsidies were granted to companies at (only few) prominent locations.⁸ These companies, however, were only branches of their Western or Western European counterparts, and research and development activities were conducted elsewhere (Meske 1993). What is more, the effect of these settlements was quite small on economic development and employment. After all, the policies and the transformative shock of the economy led to a deindustrialization of this part of the country. The number of employees in Eastern Germany shrank from almost 10 million 1989–5.9 million in 1992 (Meske 1993, 14), and industry employment, which provided 3.6 million jobs before 1990, shrank to just 885.000 in 1995. The result of this process was a landscape of very few isolated and dependent production sites and many small and medium sized companies (Schröter 2008, 43).

Yet, the process of privatization did not only affect industrial capacity – which dramatically fell due to the fading Eastern European demand.⁹ It also affected the capacities for

research and development. Most of the large industrial conglomerates which formerly accounted for the lion's share of research and technology capacities were closed and trained personnel became unemployed (Kuntze 1995). Moreover, those companies investing in the East did so in order to expand production facilities; while research and development sites in Eastern Germany were soon closed down (Meske 1993). As a consequence, the working force engaged in research and development decreased from estimated 85.800 full time equivalents in 1989 (Kuntze 1995, 25) to approx. 12.000 in 1993 (Holland, Kuhlmann, and Meyer-Krahmer 1995, 5).¹⁰ By the mid-nineties, existing policies focusing on economic recovery in Eastern Germany were perceived to be in crisis (Treuhandanstalt 1994, 606–607), and the research and development landscape was in danger of losing ground (Meske 1993, 16). Moreover, it was argued that the loss of technological capacities would impede the subsequent modernization of the economy (BMFT 1993). New policies were demanded publicly which would more directly support innovation and technology development (Günther, Nulsch, and Wilde 2010, 76).

At this point, second debate apparently was influential for the transfer of cluster policies to the transformation context: the debate about research and technology policies in Eastern Germany (Schröter 2008; Meske 1993; Günther, Nulsch, and Wilde 2010). In the first years after reunification, the ministry of research (BMFT) had implemented specific policies for this part of the country, of which most were simply expansions of existing programs to the territory of Eastern Germany (Günther, Nulsch, and Wilde 2010, 73). Moreover, funding instruments in the beginning of the 1990s aimed at lowering the reduction of personnel in research and development capacities of East German firms and provided resources for this reason (Personalförderung Ost and FuE Personal Zuwachsförderung). Funding to enterprises for employing R & D personnel was granted without any conditions. Hence, the goal for industrial research capacities was 'simply to survive' this phase of transformation (Günther, Nulsch, and Wilde 2010, 76). Yet, technological and research activities still remained low due to the disastrous economic situation with only few firms being active in product development (Schröter 2008). Evaluation reports reveal that companies themselves demanded a more active and steering policy from the federal government (Hinze and Grupp 1995). The low endogenous economic potential, the loss of industrial research, and the crisis of hitherto existing instruments for economic transformation allowed for claiming that alternative STI policies targeting Eastern Germany are needed (BMBF 2001b, 2002).

Against that background, a new funding program called InnoRegio was launched in 1999. It was particularly targeting Eastern Germany and it marked a shift in the research and technology policies dedicated to this part of the country (Günther, Nulsch, and Wilde 2010; Günther 2004; Eickelpasch and Fritsch 2005). Within the funding logics of the ministry and its executive agency, the InnoRegio is perceived as a successor of the BioRegio initiative (Licht et al. 2012; Koschatzky 2000). Similarly to BioRegio, the targeted consortia were free to define the boundaries of their respective region (Bundesministerium für Bildung und Forschung 1999). Yet, different to BioRegio, the new initiative was completely open to any kind of innovative activity (Bundesministerium für Bildung und Forschung 1999). The aim was not to identify and strengthen, but to establish economic capabilities among the East German regions:

The goal of the funding program InnoRegio is to create new jobs through bundling existing potentials of educational- and research institutes as well as economy and administration. New marketable products and services shall be developed by means of strengthened cooperation. (BMBF 2001b)

Clearly, the funding initiative targeted goals related to regional structural policy (Dohse 2001, 449), which according to the German constitution falls into the remedy of the states (the *Länder*), not the federal government (Schmalholz 2005). Hence, the implementation of the policy instrument can certainly be interpreted as an expansion of the ministries responsibilities. There is indication that the ministries' ambitions faced criticism, but the (East German) states accepted its implementation, simply because only federal resources were involved (Scheuplein 2002, 149). What is more, the legitimization of the policy instrument was backed by scholarly knowledge as the next section aims to show.

The legitimization of InnoRegio

InnoRegio was a novel funding scheme which was being perceived as rather atypical for the federal agency because it aimed at systematically improving the conditions of regional enterprises to develop new products by co-funding industrial research (Eickelpasch and Fritsch 2005). At the political level, such interventions of the federal states demanded specific political justification, particularly against reservations being made by economists arguing that the government should not intervene in market processes. According to Scheuplein (2002), however, this intervention appeared to be justified due to the problematic existing structure of cooperation in the new federal states (e.g. only limited industrial research capacities). But the patterns of legitimization were more complex, involving particularly the authorization through scholarly knowledge (Dohse 2001, 2000b; Scheuplein 2002). By promoting the initiative, the ministry referred extensively to the intellectual heritage of Porter. In the glossary of the funding initiative provided by the ministry, we find his work referenced and explained (BMBF 2007e) including the frames and narratives employed by him. In particular, the notion of 'regional success' was employed in order to establish a relationship between the scholarly concepts and the main mechanisms of the funding instrument, yet with a slightly different meaning.

A region can be regarded successful, if a network establishes that merges capabilities, experiences, and key technologies of a region in such a way that something new can develop.' (BMBF 2007e)

Here, we find that the main ideas and mechanisms described leading to regional success were slightly changed in comparison to Porter. While Porter claims regional specialization to be the main mechanism for regional success (Porter 1998), the outline of the funding call holds that 'novel and creative ideas prosper best where people from *different* backgrounds, disciplines, and industries meet each other' (Bundesministerium für Bildung und Forschung 1999, Translation CB). Hence, we can see a change of ideas employed to legitimize the cluster policy instrument: While in the case of BioRegio, the idea of technological specialization allows for legitimizing a policy intervention focusing on the 'best' region (Scheuplein 2002), the ministry now employed the idea of an hitherto undiscovered 'regional innovation *potential*' (BMBF 2007a; Bundesministerium für Bildung und Forschung 1999). Such potential could be exploited, if only people with different ideas within regions would sustainably collaborate. This would allow for addressing the huge transformation deficit of Eastern Germany (BMBF 2001b). In other words, a close connection is drawn between heterogeneous collaboration, innovation and 'catching up'. This claim was widely accepted,¹¹ because the very idea of innovation as a social process, influenced by social institutions was already established in public policy¹² and accepted among scholars involved in this process (Dohse 2000b). Following Berger and Luckmann (1969) this new frame can be

perceived as a new legitimation mode of cluster policies, a change in the meaning of the policy instrument as an already established institution in this new situation.

Beyond these linguistic devices, the novel initiative was supported by an established organizational landscape and a funding model already considered successful. Responding to the BioRegio initiative, many Eastern German federal states had established organizations for regional transfer, some of which were already engaged in promoting regional innovation: In Mecklenburg Vorpommern, for instance, cluster initiatives established in 1996, leading to the foundation of BioConValley GmbH as a public enterprise in 2001. In Saxony, the foundation for innovation and employment Saxony was founded with the aim to support regional initiatives for collaboration (Scheuplein 2002, 156). Many of these organizations, both at the regional and the federal level, conceived InnoRegio as a continuation of the model of governance established by BioRegio (Dohse 2000b). What is more, these organizations expanded their activities due to the above mentioned changes in concept to branches not covered by technology policy, such as tourism, local administration, and social welfare. As will be shown in the next section, the implementation of InnoRegio further reinforced this social dynamic, as new organizational entities were created enforcing the basic ideas of the initiative.

The implementation of InnoRegio – and its effect on the instrument constituency

The implementation of InnoRegio took place in two iterative steps. In the first phase, selected consortia from East Germany were invited to develop their proposals to confine the goals of each (regional) network. The second phase comprised the actual implementation of these networks goals in concrete projects at the regional level (Bundesministerium für Bildung und Forschung 1999). As mentioned above, the ministry made no restriction to any kind of technology, making the initiative as open as possible to any regional effort. The participation was broad and already praised as ‘a success’ by the ministry (BMBF 2001b). More than 440 projects participated in the contest, and more than 25 regions could be selected for the first phase, the development phase, lasting from November 1999 to October 2000, of which 23 finally started the implementation lasting about five years. Table 1 provides an overview of these successful regional consortia. The selected 23 regional consortia (InnoRegios) comprised 678 participating organizations, of which 467 were enterprises, 98 university institutes and 40 extra university research institutes (almost of which were members of the Fraunhofer society) (DIW 2006, 19). The companies were mainly confined to the production sector (60%), of which machinery and tools industry dominated (Berger and Luckmann [1969] 2013, 66).

The selection of regional consortia demonstrated that the ministry employed a wide concept of innovation; successful applicants were not confined to high technology sectors. The initiative also funded a region in Saxony called the MusiconValley scattered around the small town of Markneukirchen, which is known for specializing in handcrafting musical instruments since almost 300 years (Graf 2002). Not even the haunts of socialism had destroyed this industry. Moreover, the selection demonstrated the ministries’ ambition to *turn* initiatives *into* clusters, rather than focusing on developing *existing* structures. For instance, an initiative on recycling technologies in Brandenburg was funded which at the time the initiative was being set up was little more than an idea. So the basic idea was not identify and to push existing clusters, but rather to build them. As Dirk Dohse (2000a) had put it, the ‘software of the project’ (its collaborations, its originality) was perceived to be ‘more important than its hardware’ (e.g. its turnover, companies, market position etc.) for the ministries’ approach.

Table 1. Overview of regionalized funding programs for Innovation in Germany (own compilation).

Year(s)	Title of funding measure	Granting authority	Goal
1993–2007	Bio Regio	BMBF	Enhance Biotech industry
1999–2006	Inno Regio	BMBF	Accelerate regional Growth
2000	Competence Clusters	BMWI, BMBF	Contribute to regional technology development qualification
Since 2001	Innovative Regional Centres for Growth	BMBF	Improve Economic Development
Since 2001	Regional Innovation Platforms	BMBF	Develop regional Technological Capabilities
Since 2002	Centres for Innovation Competence	BMBF	Infrastructures for Sourcing and Promoting knowledge
Since 2005	InnoProfile (part of the Program family regional enterprise)	BMBF	Creating potentials for technological capabilities at the regional level
2007	Innovative Centres for Regional Growth WK Potential	BMBF	Regional Technological Capabilities, Innovative Potential
Since 2006	High-tech Initiative (regionalized component)	BMBF, BMWI, BMG, BMU	Regional Technological Capabilities, Visibility

Source: Own compilation.

The implementation of the funding initiative again led to the formation of new organizational entities at the regional level. Each of the funded consortia had to establish a managing unit, responsible for communication within the region and with the research executive agency (a specialized agency contracted by the ministry for organizing research funding). The regional consortium FIRM, which was granted funding by the ministry, established a unit at the local technical university in Wildau. ‘Based on research expertise of the Technical University for Applied Sciences Wildau, the innovation potential of local enterprises and the expertise of local administration, a network was conceptualized which focuses on the development of high-tech materials (...),’ (Herzog and Erxleben 2005, 8) In other words, these units became facilitators for regional collaboration and they were ‘interested in constantly enlarging the scope of actors within their region’ (DIW 2006, 26). As a consequence, novel organizational practices constituted by the funding instrument were established at the regional levels which were not taking place without the funding instrument. ‘Local enterprises (...), a manager said, were not capable’ [to do so] (...), ‘this is the work of a network manager’ (Graf 2002). As Licht et al. (2012) have pointed out, the practice of establishing new organizational entities is specific to cluster policies (Licht et al. 2012). Similar to BioRegio, these entities soon became promoters of the funding concept: The above mentioned FIRM initiative, for instance, praised InnoRegio ‘as one of the few successful approaches for resurrecting Eastern Germany’ (Herzog and Erxleben 2005, 8).

In the so called implementation phase of InnoRegio, the managing units were given the opportunity to develop project ideas within the scope of the funding initiative, being subsequently reviewed by the executive agency (Bundesministerium für Bildung und Forschung 1999). Whether or not regional consortia were able to spend the budget granted to them depended on the ability of those regional offices to prepare successful proposals. Evaluation documents reveal (DIW 2006, 15) that there were several problems in preparing these documents. In a parliamentary discussion, a representative of the conservative party complained about the inefficient ‘bureaucratic and cost intensive procedures of the funding

initiative' (CDU/CSU-Bundestagsfraktion 2001). Also the initiators of the FIRM network admitted: 'that the phase of project development were lasting over several months' (Herzog and Erxleben 2005, 9). Hence, problems emerged apparently due to the complex architecture of the funding process. While the ministry explained that problems would have arisen from exaggerated expected funding rates of the proposal writers (Bundesregierung 2001), media reported about strong conflicts in this proposal review process, 'when novel products were questioned regarding their economic potential' (Graf 2002).

These challenges in implementing the funding instrument also affected the bureaucratic apparatus. In particular, the agency now needed to react to a situation where the recipients of funding were little experienced (DIW 2006, 15). Responding to the novel situation, the ministry and the executive agency Projektträger Jülich (PtJ) established novel forms of coordination (Karschuck 2012). On the level of the project consortia, so called project review boards were announced which supported the local offices with monitoring the capacities of the funding grant (Bundesregierung 2001). The executive agency also changed its mode of operation by consulting other executive agencies of the federal ministry in order to gain complementary expertise, covering different domains and technologies (DIW 2006). Finally, the ministry set up a funding management team, responsible for speeding up the funding process of individual projects (Bundesregierung 2001). Summarizing, the implementation of the funding instrument was perceived as a 'mutual learning exercise' (Voß and Simons 2014), a process in which grantees, executive agency and ministry had to adapt to unforeseen challenges.

Hence, the implementation of the funding initiative marked also a change of organizational expertise of the executive agency. The launch of InnoRegio fell in the period of parts of the agency moving to Berlin in order to be closer to new customers in East Germany (Karschuck 2012). At its new site, the executive agency developed new identities referring particularly to its role as a facilitator for transformation and regional technology development¹³: the agency, being already involved in the BioRegio contest, now aimed at further developing regional structural development into its core assets (PtJ Projektträger Jülich 2010). In this process, the executive agency, initially established as an intermediary between the ministry and the grantee, was increasingly shaping the further organizational set up of InnoRegio. New competencies were acquired and the agencies' role was changing from organizing review processes to mediation, coordination and monitoring of project related activities (DIW 2006), gaining a more independent profile (Karschuck 2012, 81). For instance, the agency was engaged in consulting the regional consortia to develop funding proposals, or to establish and monitor the goals of the regional network (DIW 2006, 19). Such a more independent role was exactly what the executive agency was striving for. After initial problems to acquire these competencies, the agency subsequently engaged in shaping these tasks. That closely relates to what Voß and Simons (2014) have termed structural promises supporting the instrument constituencies being 'implied in particular structural features of (...) what an instrument is to bring about, especially with regard to the roles and positions this world offers for different actors' (Voß and Simons 2014, 739). For the executive agency, the widening of its responsibilities and its independency can be perceived as a structural promise in this sense. For the ministry, however, the implementation of InnoRegio improved its position in relation to other agencies, as the initiative was praised as a 'particularly successful endeavour contributing to a general catching up process in Eastern Germany' (BMBF 2002).

Because of the aforementioned change of policy goals which federal cluster policies are targeting since the introduction of InnoRegio, novel criteria and novel evaluation

schemes had to be developed. This ‘push’ of professional of scholarly activities dealing with the policy concept, also further facilitated the ‘modeling’ practices of the cluster policy instrument. Different studies dealt with evaluating and testing the main tenets and conceptual building blocks of the InnoRegio initiative (Eickelpasch and Fritsch 2005; Koschatzky 2000; Koschatzky and Kroll 2007; Brenner, Emmrich, and Schlump 2013). In particular, studies were conducted focusing on the aspect as to whether the initiative had affected collaborative innovation behavior of Eastern German enterprises and research institutes (Eickelpasch and Fritsch 2005; Schröter 2008; Günther 2004). The underlying model of regional innovation systems (Cooke 1992) presupposes that increased regional collaboration leads to increased innovation capacities and productivity gains within a region. In the case of collaborative funding instruments, scholarly debates about collaboration rates functioned so as to strengthen the main building block of the instrument, even though the effects of collaboration on regional development discussion were unclear: while an increased rate of collaboration in Eastern Germany was confirmed (Schröter 2008, 45), the increased cooperation did not yield the desired economic effect.¹⁴ A similar observation was reported by the evaluators of the InnoRegio initiative (DIW 2006). Yet, it was rather utilized as an argument for demanding additional support: more knowledge, it was argued, would be necessary in order to understand the effects of the initiative which would then demand the prolongation of the funding initiative (DIW 2006).

These accounts reveal the argument of Voß and Simons (2014, 739) contending that evaluation activities can be seen as part of the policy innovation process. The evaluation report of InnoRegio in this respect further established the more general idea of regional collaborative funding schemes at the federal level (DIW 2006, 9). A more general trend in technology and innovation policy was established referring to the commonalities between BioRegio and InnoRegio in course of evaluation activities. Both initiatives, it was argued, would follow the same model of policy albeit with different emphasis (Dohse 2001; Eickelpasch and Fritsch 2005). The elements of such a more general funding design, which I have termed the regional collaborative funding design were now more clearly defined: a collective instead of individual grant provision, the model of a contest between different regions as a federal policy instrument, the confinement of regional boundaries based on the applicants’ perspectives, and the foundation of regional organizational entities with the goal of increasing collaboration.

This general funding design was regarded positive, even though skepticism was articulated as to whether such an approach would lead to the catching up of Eastern Germany, in other words ‘similarly valuable living conditions’ in all German regions (DIW 2006). What is more, the support in favor of the instrument also originated from so many different actors in the science policy interface dealing with issues pertaining to this policy instrument and its intellectual ideas: the executive agency dealing with new mentoring roles in reaction to the InnoRegio initiative (PtJ Projektträger Jülich 2010), the ministry dealing with an unprecedented number of proposals and new competencies in economic policy (BMBF 2002), the States (the Länder) with activities adapting to the funding instruments¹⁵, and the evaluators, consulting agencies, and management professionals with new demand and a number of changes in evaluation design and consultancy. This resulted in increasing efforts for further articulating complementary aspects of the regional collaborative funding scheme, for instance, by developing new evaluation criteria, or foundational conceptual works of how to design cluster policies for novel fields of application.

Expansion: the journey of the funding instrument to other contexts

In the years to follow, cluster policies became increasingly established as a funding design being used in different domains of activity of federal STI policy (see [appendix](#) for an overview) with differing purposes but similar designs (BMBF 2006a, 2007b, 2007c, 2007d, 2009, 2014b). In particular, as funding documents reveal, the success of the InnoRegio program (success in the terms explained above) played a major role: The attention the initiative had generated in terms of press coverage and scholarly debate (Mejlgard et al. 2012), but also in the organizational dynamic through the introduction of new practices and procedures, has led to the decision to further employ the design and concepts of cluster policies for further programs targeting the socio-economic transformation of Eastern Germany.

This development can be particularly revealed with regard to a whole funding program ‘Unternehmen Region’ (BMBF 2006b), convening many different funding initiatives targeted at increasing innovative activities of either research institutes or companies in Eastern Germany. Even more so, these subsequent initiatives focused on more closely connecting the idea of combining innovation activities with growth related measures. The subsequent initiative called ‘Centres for Regional Growth’ (BMBF 2001a) for instance, more directly focused on market demands. Applicants responding to that initiative needed to demonstrate their ‘unique selling position’ in national or international markets (Berger and Luckmann [1969] 2013, 66). This idea seems to resonate more with the cluster concept than InnoRegio,

Initiatives that followed from 2005 onwards (within the same funding program mentioned above) seemed to focus more closely on adapting to capabilities within the regions, the approach being somewhat similar to institutions of development in the global south. The idea was to identify and develop economic potential particularly by supporting ‘early phases of innovation processes’ (BMBF 2007e) with differing emphasis on research or technological capabilities. The initiative ‘Centres for Innovation Competence’, for instance, focused on small units of regionally based research groups with the goal of increasing the visibility of research in the respective region, while the program ‘InnoProfile’ explicitly funds research groups in dedicated projects with local industry in order to spur product development.

Yet, in all these different initiatives for Eastern Germany between 2001 and 2006, the basic design, the functional model of grant provision (the funding design) appeared to be very similar. The conditions of collective grant provision, regional orientation, as well as the close alignment of funding provision with technology transfer, prevailed. Moreover, the states in Eastern Germany, the ‘New Länder’ were adapting to these funding policies and created agencies to more smoothly organize grant application on the regional level (Schmalholz 2005). The Eastern States also set up their own cluster policies with goals being closely related to those of InnoRegio, to further develop regional capabilities by triggering innovation processes. The functional model of the funding instrument (in the sense described in the preceding section) thereby expanded at least to another policy level, e.g. from the federal to the state level. By dealing with these different initiatives, a scholarly debate about cluster policies at different policy levels gained prominence (Schmalholz 2005; Koschatzky and Kroll 2007). The authors put particular emphasis to the question as to whether clusters can be intentionally shaped by policy making and as to whether this is appropriate from the perspective of economic policy (Scheuplein 2002; Semlinger 2008). In other words, activities which according to Voß and Simons (2014) could be termed as modeling practices of the instrument constituency gained prominence as more knowledge about the implementation of the funding design was available.

The narrative of regional economic development disappeared in the most recent implementations of the functional model, that is, in the most recent funding programs labeled as cluster policies. Now, the experiences the government has made in the realm of regional structural policy for Eastern Germany were put to the national level (Günther, Nulsch, and Wilde 2010). These recent initiatives are mostly driven by interests in strengthening international standing and excellence of research. These measures, however, still relied on the functional model of cluster policies, that is, the regional collaborative funding scheme (BMBF 2014a, 2015). In 2016, a measure towards the internationalization of cluster initiatives was launched with the claim that ‘regionalized innovation networks would need to cooperate with international partners’ in order to keep up with the innovation pace (BMBF 2016). Although there is a broad claim of combining regional networks and international orientation, the program is not directly related to academic concepts which lend authority to the initial programs for regional innovation policy. The functional model of regional collaborative funding was even used as a model for achieving ‘Excellence’ in research in the most recent suggestions for the continuation of the German excellence initiative (Imboden Kommission 2016). The high level expert group specifically suggests more strongly focusing on organizational strategies towards regional network building. Regional cooperation structures thus have been, at least rhetorically, also promoted as a policy solution for research excellence. A view on the most successful funding proposals in the second round of the German excellence initiative shows that concepts with regionalized cooperation structures appeared to be particularly highlighted.¹⁶

These examples show how the cluster concept was employed for different purposes and domains, some of which even reached beyond STI policy. As I have shown, these initiatives still referred to the concept of the cluster, and they also relied on an established funding design (a regional collaborative funding scheme), but they deterred from the proposed mechanisms underlying the analytical concept of clusters. In this way, the functional model of governance, the regional collaborative funding scheme, could be applied to ever more contexts and domains. It appears that the narrative of innovation (in the sense described in this paper) being inscribed into the funding instrument supported this transfer. In other words, supporting cluster policies would mean to support innovation. Many of the organizations funded or established adapting to the policy instrument were identifying with these ideas because of a dominant ‘innovation imperative’ (Pfothenauer, Juhl, and Aarden 2019). Cluster policies therefore are now considered to be a particularly visible expression of this ubiquitous narrative, as they are implemented for many different policy purposes, but referring to innovation as the ultimate solution.

Conclusion and discussion

Cluster policies can be perceived as a successful policy instrument both in terms of global diffusion and scholarly attention. The recent literature in innovation studies considers it to be one the most relevant policy instrument in the domain of science, technology, and innovation policy (Uyarra, Ribeiro, and Dale-Clough 2019; Scheuplein 2002; Koschatzky and Kroll 2007). Yet, cluster policies can be very different in terms of scope and the goals attached to it. Drawing on the case of federal policies in Germany, I reconstructed how a particular type of federal regional collaborative funding was established, legitimized, and transformed (and in what ways maintained its meaning).

This type of policy is held to be an innovation in German policy making (Dohse 2001). Yet, the diversity and dynamics of this policy instrument were rarely covered. Referring to the concept of instrument constituencies (Voß and Simons 2014; Campano and Lippi 2016;

Béland and Howlett 2016), I traced changes and dynamics of this policy instrument by reconstructing the practices of *modelling* (the conceptual and empirical work focused on cluster analysis and policy) and those of *implementing* the policy instrument and their mutual interaction. In line with Voß and Simons 2014, 2018), it could be shown that the expansion of the policy instrument to different subjects in German federal policy (from high technology policy to structural policy), was drawing from emerging communities involved in its implementation, some of which the first federal funding measure of its sort had constituted, the imprinting BioRegio initiative. Local organizations, for instance, were founded, which were responsible for adapting to or implementing the funding measure, which sustained and engaged in promoting the main ideas of the cluster policies as a functional model.

In reconstructing the emergence of federal programs and initiatives, I attempted to show how the functional model of governance, the regional collaborative funding scheme, was applied to many different policy contexts while the meaning of the concept of a cluster changed. Initially established to foster high-technology fields such as biotechnology (BioRegio), dedicated ‘cluster policies’ were also implemented in the field of regional structural policy, a field where the federal ministry of research and education in Germany was not active before. The case of the federal program InnoRegio shows that the implementation of cluster policies for Eastern Germany was an important step for widening the ministries’ policy context. I argue that this was because of the increasing relevance of innovation as an important medium to legitimize policy institutions. In the process of policy instrument development, implementation and expansion, the existing academic literature on clusters and regional innovation provided policy designers with the narratives necessary to adapt legitimations to rather distinct policy contexts such as the East German transformation. Only recently, Pfothenauer, Juhl, and Aarden (2019) established by referring to cases in different countries that a narrative of an ‘innovation deficit’ allows to address an increasing large list of social issues.

These findings have some implications for the study of funding instruments in science and technology policy, for science and technology policy in general, and for innovation studies. For the study of funding instruments in science and technology policy, the study implies that funding instruments should neither be perceived atemporal nor in isolation (Flanagan and Uyarra 2016), because of the mutual interactions between those communities that develop, organize, implement or even receive funding over time and space. In the case presented here, the implementation and expansion of cluster policies has contributed to the emergence or expansion of organizations both at the federal (the executive agency) or the local level, with organizations emerging who promote regional innovation and engaging in pursuing the funding model. Thereby, the perspective of instrument constituencies turns attention to an organizational context only rarely covered by the principal agent model. While the principal agent model, though undoubtedly suited for a number of questions related to science and technology policy, usually assumes an analytical separation between the principal and the agent (Braun 1993; van der Meulen 2003), the presented case shows that such a separation might not cover all relevant aspects in this process, where scholarly works of the agent shapes both the development of the instrument and its implementation.¹⁷

For STI policy studies, the case study implies that policy analysis should devote more attention to those technical aspects of policy making, such as expert debates over policy designs, evaluation criteria, and implementation plans. There is still little knowledge about how STI policy instruments are set up, because often they are treated as rather stable items following established policy problems (Béland and Howlett 2016). Yet, as

this case has shown, these rather technical aspects of policy-making involve heterogeneous professional communities, which are bound by and engaged in further establishing and confining the policy instrument. As the case shows, affordances and challenges of a policy instrument may even lead to changes in the role and position of organizations involved in implementing policies. Thus, analyses pertaining to these organizational aspects may be a fruitful avenue for analyzing policy dynamics.

For the study of instruments constituencies, the study provides another case that reveals how policy instrument development crosses different domains of policy makers. Stabilizing Voß and Simons' arguments (Voß and Simons 2014, 738), the case shows how modeling and implementation increasingly enforced each other, with evaluation work further confining the basic design of the policy instrument. Yet, the case also shows how world-views and dominant narratives of innovation are not only employed to legitimate the policy, but are inscribed into the implementation of the funding design, such as the concept of innovation as a product of local institutional frameworks brought into being by local collaboration agencies. Moreover, the case of cluster policies seems to indicate that narratives and intellectual heritage remains important for authorizing and legitimating the application of the policy instrument to rather different domains. Hence, more emphasis could be drawn on establishing relationships to those other communities involved in policy making, particular those termed 'epistemic communities' (Adler and Haas 1992; Zito 2018). The question of how policy instruments expand may demand more explorations into the patterns of legitimation and the conceptual or empirical work involved.

Finally, it can be argued that the study of cluster policies has some more general implications for how the innovation narrative influences society. As the article aimed to show, regional collaborative funding schemes were able to expand their domains because the narrative of innovation allows convening increasingly heterogeneous and sometimes contradicting imaginaries of the social good. Such is particular visible in the way the policy instrument was promoted as a solution to the socio-economic transformation of Eastern Germany, which at the time the measure was being introduced was perceived in crisis. Being heralded as the official federal policy targeting the aim of 'catching up', the case shows how structural policy and STI policy converge drawing on the narrative of an innovation deficit. Regional development, it appears, for now can now only be formulated as innovation policy.

Notes

1. For a definition of and a distinction of the different aspects of science, technology, and innovation policy see the methods section of this article.
2. While there are different and specialized science and technology policy settings in Germany some of which are depending on specific agencies, such as the ministry of health, the current article focuses on the science and technology policy discourse in Germany organized around the ministry of education and research (BMBWF, former BMFT), as it is responsible for setting the frame of federal STI policy.
3. At the regional level, regional innovation policies were already existing (Dohse 2001, 446).
4. Hence, the funding mechanisms had the effect of strengthening strengths with the consequence that only regions from the West were selected in the final stage, the region of Jena in Eastern Germany was granted 'a special vote' as best East German region and also received funding.
5. Dirk Dohse (2000a) explains that this conception of a region can be best conceived with the concept of Functional, Overlapping, Competing Jurisdictions (FOCJ) coined by Frey and Eichenberger (1995). In that conception, regions are defined based on specific fields of activity or functions of a social system, be it, economic, social or cultural activities. These are not

- predefined, but emergent, responding to specific problems on the local level. Second, FOCJ regions are overlapping, as boundaries are not clearly defined and a specific actor can cooperate in one field of activity with partners within the region, on another occasion with another actor. These spatial jurisdictions are further competing, because they compete for market shares or capital provided from the state (Frey and Eichenberger 1995).
6. Within the timeframe of only 2 years, more than 10,000 companies had been privatized and sold in this rather small territory, (Böick 2018).
 7. The structure of Eastern German companies from 1990 to 1994 completely changed. While in 1990, the majority of the employees were employed in large enterprises with more than 1000 workers with a minimal share working in small enterprises, the structure in 1994 was reverse with only few bigger companies remaining (Ragnitz 2020).
 8. Large investments with government support were made at locations in Jena (optical industry, Carl Zeiss), Dresden (semiconductors, Siemens), or Leuna (chemical industry, Total) which became known as the industrial cores in Eastern Germany. Today, these agglomerations are also those regions regarded most successful.
 9. Eastern German production prices were growing by more than 400% due to the introduction of the Deutsch Mark according to the currency translation rate of 1:1.
 10. These figures for Eastern Germany before the fall of the wall are already adjusted numbers to Western statistical standards. According to Hinze and Grupp (1995), official numbers regarding research and development activities tended to over reporting.
 11. In parliamentary and governmental speeches and releases dealing with the funding initiative, the basic idea of exploiting the innovation potential is always closely related to the transformation discussion of Eastern. In a media report in Deutschland Radio Heinz Jörg Graf says that the transformation policies hitherto implemented were ‘chances not used’, which can be different for now, ‘the magic word being: collaboration’.
 12. As various documents for the design of cluster policies by the OECD suggest.
 13. After the unification, the executive agency was perceived as a kind of development organization ‘visiting Eastern German research institutes, searching for potential grantees and asked them to apply for funding’. Furthermore, the agency actively aimed at providing employees of the former ministry of research and technology of the GDR with the knowledge necessary for administrating and governing funds (BMFT (Bundesministerium für Forschung und Technologie 1993).
 14. Günther (2004) found Eastern German companies engaging in innovation collaboration, did not gain advantages in productivity (unlike collaborative firms in Western Germany).
 15. Responding to the new funding initiatives, the new federal states established new organizations with the task to organize and consult regional initiatives applying for federal funding. In Saxony, Saxony-Anhalt, Thuringia and Mecklenburg-Vorpommern, new agencies were found (Scheuplein 2002, 151).
 16. Such a regionally networked argument for research excellence has been proposed for instance for the universities of Munich (LMU), Heidelberg, and the Technical University of Dresden.
 17. A similar argument is made by Klerkx and Leeuwis (2008).

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Appendix. Overview of regional consortia in the InnoRegio contest (1999–2005).

Name	State	Domain	Funding (res.)
Berlin-Buch	Berlin	Health	5.1 Mio €
FIRM	Brandenburg	Tourism	5.1 Mio €
BioHyTec	Brandenburg	Biotech	8.1 Mio €
RIO	Brandenburg	Automotive	4.1 Mio €
DISCO	Meck.-Pomm.	Health	10.1 Mio €
Maritime Alliance	Meck.-Pomm.	Maritime Industry	15.9 Mio €
Nukleus	Meck.-Pomm.	Machine/Tools	11.2 Mio €
Kunststoffcenter	Meck.-Pomm.	Machine/Tools	11.2 Mio €
MusiconValley	Saxony	Instruments	9.2 Mio€
INNtex	Saxony	Textile industry	15.8 Mio €
InnoSachs	Saxony	Tools industry	17.9 Mio €
RIST	Saxony	Tools industry	5.1 Mio €
KONUS	Saxony	Media	9.2 Mio €
BIOMET	Saxony	Biotech	20.5 Mio €
IAW	Saxony	Automotive	9.2 Mio €
NinA	Saxony-Anhalt	Agriculture	10.2 Mio €
REPHYNA	Saxony-Anhalt	Pharmacy	11.2 Mio €
InnoPlanta	Saxony-Anhalt	Biotech	20.5 Mio €
InnoMed	Saxony-Anhalt	Health	5.1 Mio €
MAHREG	Saxony-Anhalt	Automotive	10.2 Mio €
MicroMacro	Thuringia	Real Estate	3.1 Mio €
Barrierefree	Thuringia	Tourism	7.2 Mio €
Inprosys	Thuringia	Production tech	5.1 Mio €
Total			230.5 Mio €

Source: DIW (2006) abridged by CB.