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Cluster Competence for Higher Resilience -

A Neo-Institutional Perspective on How Firms from the Lusatian Energy Cluster Cope with an External Shock

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Abstract

In former studies cluster firms have hardly proven to be more resilient to shocks than non-cluster firms. Yet, there is a lack of research on how cluster firms can achieve resilience. Based on a qualitative study of firms in the Eastern German Lusatian energy cluster we found that after a shock - a sudden decision on energy policy changes of the German federal government - cluster firms have replaced pre- by post-shock institutional logics. Studied firms put more emphasis on further utilising core competences and demonstrate more openness to communicate inside and outside of the cluster. In essence, cluster firms change institutional logics for strengthened T-shaped cluster competences, which subsequently lead to higher resilience of cluster firms and clusters. By linking institutional logics to cluster resilience via cluster competences we provide a new perspective on how cluster firms can be resilient in the face of a shock.

In früheren Studien haben sich Cluster-Firmen kaum als widerstandsfähiger gegenüber Schocks erwiesen als Nicht-Cluster-Firmen. Dennoch gibt es einen Mangel an Forschung darüber, wie Clusterfirmen Resilienz erreichen können. Basierend auf einer qualitativen Studie von Firmen im ostdeutschen Lausitzer Energiecluster haben wir herausgefunden, dass nach einem Schock - einer plötzlichen Entscheidung über energiepolitische Änderungen der Bundesregierung - Clusterfirmen die institutionellen Logiken vor dem Schock durch die nach dem Schock ersetzen. Die untersuchten Firmen legen mehr Wert darauf, ihre Kernkompetenzen weiter zu nutzen und zeigen mehr Offenheit, innerhalb und außerhalb des Clusters zu kommunizieren. Im Wesentlichen verändern Cluster-Firmen institutionelle Logiken für gestärkte T-förmige Cluster-Kompetenzen, die in der Folge zu einer höheren Resilienz von Cluster-Firmen und Clustern führen. Indem wir institutionelle Logiken über Clusterkompetenzen mit der Resilienz von Clustern verknüpfen, bieten wir eine neue Perspektive darauf, wie Clusterfirmen angesichts eines Schocks resilient sein können.

***Key Words**: neo-institutionalism, cluster resilience, cluster competences*

***JEL classification:** L14, L29, O43, R11*

1. Introduction

On April 12, 2019, the Prime Minister of the German State of Brandenburg symbolically started the flooding of the former brown coal open pit Cottbus-Nord that, with a total of 1,900 hectares, is supposed to become the largest artificial lake in Germany. This seminal construction project is supposed to be an integral part of the further regional development of the Eastern German area of Lusatia which is in the midst of a radical transition: As a result of large natural lignite reserves and centralised industrial policy during times of the General Democratic Republic (GDR) Lusatia is economically still depending on coal mining and power generation as of now. A strong industrial cluster of firms and other institutions like universities, research institutes or industry associations has developed around this theme. Overall the region still counts around 24,000 coal-dependent workers and an annual value creation of about 1.4 billion € in terms of salaries and local contracts from this sector (BMWi 2019: 74). Recently the German federal government has decided for a fossil-fuel phase-out in power generation – a further acceleration of the so-called 'turn around in energy production' (Energiewende) – in order to meet Paris Climate Agreement commitments for environmental sustainability so that the former coal pit will become a recreational area in the future.

From the perspective of the mining region of Lusatia, this policy intervention poses a major challenge for the development of its regional economic system. It can be regarded as the case of a cluster, which has to prove resilient in the face of an external shock. Cluster resilience is 'an adaptive capability that allows a cluster to make changes to overcome internal and external disruption and still function with its identity as a cluster within a particular field' (Østergaard and Park, 2013: 2). The basis of cluster resilience is the resilience of cluster firms. Past research however shows how difficult it is for cluster firms to be resilient. Researchers mainly even have doubts about the resilience of clusters and cluster firms in times of crises (Behrens, Boualam, and Martin 2018) for reasons of technological lock-in and exit of key cluster firms (Østergaard and Park 2013) – possibly as a result of international relocation (Elola, Parrilli, and Rabellotti 2013) – and the dependence of cluster participants on leading firms (Martin, Mayer, and Mayneris 2013). It appears that 'negative disturbances may propagate more easily and, therefore, be amplified by the connectedness of firms within a cluster' (Behrens, Boualam, and Martin 2018: 2). We strive to investigate how it can be possible for cluster firms to achieve resilience.

Following Martin and Sunley's process model of regional economic resilience (2015: 13) which contains steps and determinants of resilience from a pre- to a post-shock regional growth path and taking a neo-institutional perspective we aim to analyse the prerequisite of cluster resilience on the firm level by describing the replacement of pre- by post-shock institutional logics for sustaining firm growth. Institutional logics are essentially influencing the priorities, strategies and practices of an organisation (Ramus, Vaccaro, and Brusoni 2017: 1253). Therefore, we argue that when cluster firms experience a shock, like firms in the Lusatian energy cluster due to the 'Energiewende', established institutional logics within these firms are challenged. Institutional logics, which have served the firms well over a long period (pre-shock), may be difficult to be maintained in a completely new situation (post-shock). In addition, shocks may alter the relative influence of different institutional logics within organisations (Almandoz 2012) such as collaboration becoming a more important element of institutional logics as a reaction to shocks (Ramus, Vaccaro, and Brusoni 2017). We argue that essential changes in institutional logics are antecedents for fundamental changes in firms and thus contribute to higher cluster resilience.

The development of institutional logics within cluster firms, which are faced with an external shock, is under researched so far. We aim to make a contribution in this context by answering the question: How do institutional logics in cluster firms change in the face of an external shock in the pursuit of resilience? To this end, we will study the case of the Lusatian energy cluster and analyse how respective cluster firms strive for resilience towards the upcoming end of lignite mining and energy production ('Energiewende') by adapting institutional logics.

Based on a-priori sampling (Flick 2007, Patton 2002) of Lusatian firms, research organisations and public representatives, ten focus group interviews with over 80 interviewees were conducted from summer 2017 to the early months of 2018. Those interviews aimed at collecting data about business-related topics, which quite naturally were discussed in the light of the ubiquitous presence of the mentioned external shock. In general, the interview material allows for the identification of regional businesses' broader perception of this shock. However, our contribution focuses only on those 30

interviewees, which represent 13 Lusatian energy-sector firms. For seven out of these 13 firms the interviewees' narrative contributions were rich enough to draw up a differentiated transition picture from pre- to post-shock institutional logics. We have chosen firms in this sample, which have more than 50 employees, consist of a complex organisational structure, are relevant players within the cluster and can be directly attributed to lignite exploitation and related energy production. Hence, they are heavily exposed to potential consequences of the fossil-fuel phase out in German energy production. The interview data were analysed by qualitative, structured content analysis following Mayring (2014, 2010). Identified codes were eventually aggregated on the narrator's firm level to identify the organisation-specific transition of institutional logics.

The resulting patterns of transition suggest that in the presence of the shock to the Lusatian coal mining industry the sample firms started to reinforce hitherto growth-relevant institutional logics in order to strengthen those practices that have already contributed to their growth in the past, such as the awareness and use of core competences of the firms. Other institutional logics were replaced or adapted. such as the replacement of hardly any to open and more communication and cooperation with other firms in the region. As a core result of this paper, especially those institutional logics are on a tear, which shape the competence to participate in and benefit from cluster activities. Hence: In face of the described external shock, which is a fundamental shock to the whole business cluster, institutional logics change and may subsequently lead to increased firm-specific cluster competences from which the cluster as a whole may benefit. This points to higher levels of resilience induced by the shock. It is, however, not yet clear if this higher resilience is sufficient to eventually survive, neither for the Lusatian energy cluster nor for individual cluster firms.

This paper is structured as follows: Section two provides the general institutional setup in Lusatia by giving history and current state of the analysed cluster. In section three an overview of existing research on cluster resilience is provided and embedded into the current state of cluster literature. Thereafter, we set out the perspective of neo-institutionalism on firm responses to external shocks like the one experienced in Lusatia. Section five describes the sample and methodological approach. In sections six and seven results are presented and discussed. Section eight concludes.

2. The Region of Lusatia and the Lusatian Energy Cluster

Lusatia has been a late comer amongst the mining regions in Germany, starting with industrial exploitation of lignite only in the 1880s. The sector grew in two major expansion waves, one in the first half of the 20th century, but the major growth occurred when Lusatia was to become the so called 'energy district' (Energiedistrikt) of the GDR. German re-unification in 1990 and the subsequent de-industrialisation weakened or eliminated other traditional industries of Lusatia – like aluminium production, steelworks and the important textile industries. In spite of the closure of four fifth of the mines operating in 1990, the relative importance of the energy sector for the region was highlighted by the strategic move to make the lignite-based electricity production an 'anchor of stability' in the post-reunification years. During the privatisation, mining activities where regrouped in 1993 into LAUBAG (Lausitzer Braunkohle AG). Its headquarters were moved from Senftenberg to Cottbus, the headquarters of the East German utility VEAG (Vereinigte Elektrizitätswerke AG) were moved from Berlin to Cottbus in order to create a national utility champion on eye's level with the other major German utilities. The companies LAUBAG and VEAG were sold in this process to the Swedish, state owned utility Vattenfall by 2001 in a move to further internationalise the East German economy. The power plant fleet was completely modernised and expanded well into the second decade of the 21st century. Lusatia saw an increase from 55 Mio. t of lignite output in the year 2000 to 62 Mio. t in the year 2016 – representing 36% of production in Germany in 2016 as a total (RWI 2018) which corresponds to 10% of electricity production in Germany. Direct employment in the lignite-based electricity production grew from 7,081 (2000) to 8,281 employees (2016), and the share of Lusatia in the lignite mining work force in Germany increased from 36% to 42% over the same period.
As a result, Lusatia is today still a region highly specialised in the energy sector – and indeed highly dependent on income from this sector. The high value creation in the lignite-based electricity generation is due to the comparatively high transport costs of this fossil fuel and therefore the concentration of a near complete value chain reaching from land preparation, mining, recultivation over transport to power plant engineering, operation and waste management.

In several studies over the last years we have found different approximations of the set of firms which belong to the Lusatian energy cluster. Table 1 summarises different classifications of firms, as members of the energy sector ('Energiewirtschaft'), the lignite area ('Braunkohlerevier Lausitz'), the cluster energy technology ('Cluster Energietechnik'), companies related to energy generation from lignite ('Braunkohleverstromung'), mining generation technology companies ('MinGenTec') and companies which belong to the supply chain of the two core companies of lignite mining and lignite-based power generation in Lusatia (LAUBAG and VEAG).

Study	Label	Source/Approach	Total of firms
A	Energiewirtschaft	RWI (2018): macro-economic data	n.a.
B	Braunkohlerevier Lausitz	Prognos (2013): company classification	n.a.
C	Cluster Energietechnik	MWE (2019): company classification	6.547
D	Braunkohlever-stromung	Prognos (2008): company classification, expert interviews	1.400 – 2.000
E	MinGenTec	own analysis	50 - 200
F	Supply chain analysis of lignite cluster Lusatia	Own analysis and data from the studies reported in Markwardt/Zundel (2017)	70 (28)

Table 1. Classifications of firms in the Lusatian energy region.

In our view the Lusatian energy cluster is bounded by a wide macro-economic perspective (upper bound, see for example MWE (2019)) and a strict perspective on commercial interrelations (lower bound, see Markwardt/Zundel (2017)). The macro-economic analysis and company statistics lead in general to a large number of firms. The Prognos study of 2013 for example covers the energy sector in general, which comprises also firms in the fields of renewable energy and transport as well as distribution grid operators. This broader understanding of the energy cluster clearly deviates from a stricter concept that focuses on lignite-related companies only. Another challenge is the localisation of the firms in the different studies. From the perspective of supply chain analysis there is a number of international and national firms, which have little commercial ties with other companies besides the two largest and major purchasing companies in the energy sector in Lusatia (LAUBAG and VEAG). In the Prognos 2008 study, a distinction has been made between local (about 25% in terms of firm count, about 50% of sales share) and other firms. Focusing on firms of a certain size and direct commercial links to the two core companies of lignite mining and lignite-based power generation (the largest local purchase volumes in Saxony and Brandenburg) this number boils down to 70 firms. From these, study (F) in Table 1 provides detailed insights into about 30 of them (by restraining the regional focus further to Lusatia – Eastern part of Saxony and South Eastern part of Brandenburg). This sub-population represents 500 Mio. € of turnover with the two key cluster companies – between a third and half of a typical annual total supplier contract volume.

For our study, we started the empirical cluster description from a macro standpoint by using data from the Saxon and Brandenburg offices of statistics covering all Lusatian companies in the energy sector and restricted it to firms with more than 50 employees. This left us with a limited sample of 91 companies. Out of those, 13 were present in our focus group interviews. Although not each one in this group of 13 can be attributed to the 30 lignite-related firms mentioned above, the final 7 firms can (for those the interview material was rich enough to conduct a detailed analysis). Hence, we believe that the results drawn from those 7 companies have explanatory power with regards to the Lusatian lignite-based energy cluster.

Looking at the context and time window of the interviews in this study, the perceived and experienced shock is dated to the year 2016. In spring 2015 the federal government in Germany proposed the so called 'Baake-Plan' which threatened to lead to a fast exit from coal in power generation within a few years. A compromise negotiated with major utility firms led to a reduced measure with the closure decision of 2,7 GW (decision in 2015, closures 2016 – 2020) and the announcement of a federal task force, called the 'Coal Commission' (decision in 2015, installed in summer 2018). The 'Coal Commission'

proposed a phase-out date for coal based electricity generation in 2038 in a final report, which was issued in May 2019 – well after the expert interviews. In this paper, the shock is subsumed under the term 'Energiewende'. In Lusatia, the firms working in the supply chain and value creation network of lignite experienced a major shock with the shut-down of 1 GW of power plants and its respective mines in 2016 which led to an immediate nose dive in contract volume and revenues – a shock which is reflected in the interviews which we analysed.

3. Cluster Resilience as a Topic of Cluster Research

We will promote the idea that resilience is driven by cluster competence which may be applied to the whole cluster as well as individual participants and may serve as the linking pin between the relational and resource-based view of cluster analysis (Hervas-Oliver, Sempere-Ripoll, and Boronat-Moll 2014).

Since Suire/Vicente called the resilience of clusters still an 'embryonic topic of research' (2014: 142) in 2014, it has gained popularity in the meantime, as can be seen from respective publications (e.g. Edström 2018; Edström et al. 2018; Hannigan, Cano-Kollmann, and Mudambi 2015). 'Resilience', which stems from the Latin word 'resilire: to leap or spring back, to rebound, to recoil or to shrink (back again)' is a characteristic of a system in the face of a shock. Three main types of resilience may be differentiated (Martin and Sunley 2015: 3): Resilience as 'bounce back' from shocks, resilience as 'ability to absorb shocks' and resilience as 'positive adaptability' in anticipation of, or in response to, shocks. We adhere to the last, widest interpretation of the concept. In this sense, "(r)esilience thinking embraces the ideas of adaptation of the current system, and also transformation to a different kind of system when the existing one is in an irreversibly undesirable state, or on a trajectory towards such a state" (Maru et al. 2017: 1).

Most of the relevant scholarly debate has gathered way around the term 'regional economic resilience'. In this context Martin defines resilience as 'the capacity of a regional economy to reconfigure, that is adapt, its structure (firms, industries, technologies and institutions) so as to maintain an acceptable growth path in output, employment and wealth over time' (2012: 10). He further states that regional economic resilience 'is conceived as a multidimensional property embracing not only recovery from the shock and resistance (the ability of regions to resist disruptive shocks in the first place), but also re-orientation (the extent to which the region adapts its economic structure), and finally renewal (the degree to which the region resumes the growth path that characterized its economy prior to the shock)' (Martin, 2012; cited from Bristow/Healy, 2014: 924). The latter refers to the above-mentioned broad interpretation of the concept of resilience.

The definition of cluster resilience may also be applied to the firm level, in which case it is an individual firm, which has to recover, resist, re-orient and renew to be called resilient. Behrens, Boualam, and Martin additionally differentiate between strong resilience of a firm – to remain active in its industry – and weak resilience – to survive by switching to another industry (Behrens, Boualam, and Martin 2018: 3). Simmie and Martin (2010) reject an equilibrist perspective and argue for an evolutionary view on regional resilience. Martin and Sunley hence suggest a process model of regional economic resilience which contains determinants of resilience of regional economies along a process from a pre- to a post-shock regional growth path. Among these determinants are for example 'economic openness', 'export concentration' or 'external relations and linkages' of a region and its firms (2015: 13). The authors state that 'the notion of regional resilience is necessarily context- and place-dependent', but they call for research on 'general principles concerning its definition, measurement and explanation' by conducting 'case-studies of specific regions' (Martin and Sunley 2015: 36). In the same realm, Boschma and Martin claim more specifically that 'research on clusters would benefit greatly from more process-oriented qualitative methods' (2010: 235). In this line of thought we propose to study the resilience of the Lusatian energy cluster as the development of firms on the basis of our qualitative methodology. That is, we analyse interviews with cluster firm representatives on the changes within and of their firms in connection with the external shock of the 'Energiewende'.

In former studies cluster firms hardly appeared to be more resilient than non-cluster firms. Behrens, Boualam, and Martin (2018) studied the resilience of plants in Canadian textile and clothing clusters between 2001 and 2013 in the face of dramatic changes and did not find any evidence that textile plants

in clusters are more resilient than those outside of clusters. Østergaard and Park (2013) investigated the wireless communication cluster in North Jutland, Denmark; they found mixed results with the degree of entrepreneurship having a positive effect on cluster resilience. The results regarding multinational companies are even more mixed. Although they bring in new resources to the cluster, which is regarded as being positive, they are prone to being quick to withdraw from a cluster in times of crisis. A strong dependence on such firms as leading firms can then be a reason for other firms in a cluster to be less resilient to shocks and crises than non-cluster firms as Martin, Mayer, and Mayneris (2013) found on French exporters. In general, globalisation is supposed to have mixed effects on cluster resilience, often negative ones as Elola, Parrilli, and Rabellotti (2013) found on Basque companies in the wind energy industry. The resilience of cluster firms seems to depend on their flexibility and ability to act in the international arena. In this context Hannigan, Cano-Kollmann, and Mudambi confirm by analysing the case of the Detroit automotive cluster 'that innovation in clusters can increase in spite of a long-term decline in manufacturing activity (e.g. by the) growing connectedness to global centres of excellence' (2015: 613).

There are studies in the U.S., which indicate a positive effect of clusters on their participants' resilience (Delgado and Porter 2017). The business-sector diversity of a cluster seems to be important in this context: Clusters in which firms belong to a set of related industries (versus the specialisation of firms in one narrow industry) have been found to be more resilient, even if resilience of a cluster also does not mean resilience of all firms (Delgado 2017). The 'adaptive capacity' of clusters finally appears to be strengthened by 'flexible' firms with regard to their product and service offerings as well as 'appropriate institutional forms of coordination', elements of regional agglomerations which have been found already decades ago (Storper/Christopherson 1986). In sum, there is still a lack of empirical studies on how cluster firms can increase their resilience as a reaction to a shock. Here, we propose to relate to neo-institutional thinking.

4. External Shocks for Firms and Clusters in the Light of Neo-Institutionalism

Our study fits well to the 'new institutionalist and evolutionary paradigm in regional development' (Bristow and Healy 2014: 930), seminally developed by Storper (1995), according to which the modern economy consists of multiple worlds which are determined by reflexive collective action and collaboration within certain domains. Domains are marked by institutions in the sense of the neo-institutionalism.

New (or neo-) institutionalism is one of the leading organisational theories today. New institutionalism is characterised by a focus on how the external environment socially constructs organisations by providing templates for formal structures and policies for increasing an organisation's legitimacy in the wider world (Powell and Bromley 2013: 764). Three articles may be regarded as the cornerstones of the new institutionalism (Mohe and Höner 2010): Meyer and Rowan (1977) pioneered the idea that organisations form certain practices and routines to increase their social legitimacy and hence their chance to survive. DiMaggio and Powell (1983) explained how organisational structures arise from institutional constraints as efforts to achieve rationality with uncertainty and how constraints lead to homogeneity of structures in an organisational field, which the authors call 'institutional isomorphism'. Zucker (1977) described organisations as central institutions in society and emphasised the cultural-cognitive elements as essential within organisations.

After these seminal pieces of work a broad further discussion on definitions, roles and functions of institutions emerged. Therefore, in neo-institutionalist thinking institutions are generally rather broadly defined in that they are socially constructed and implemented by humans as opposed to nature, may range from casual habits to formal arrangements and their collective binding from traditions to sanctioned laws (Immergut 2011). Schmidt states that 'if "sentient" (thinking and speaking) agents are the drivers of change, and their ideas (what they think about what to do) and discourse (what they say about what to do) are the vehicles of change, then the institutional context is the setting within which these ideas have meaning, their discourse has communicative force and their collective actions make a difference' (2011: 119).

The institutional context is characterised by institutional logics which are 'socially constructed, historical patterns of material practices, assumptions, values, beliefs, and rules by which individuals produce and reproduce their material subsistence, organize time and space, and provide meaning to their social reality' (Thornton and Ocasio 1999: 804). In this sense institutional logics provide a link between individual agency and socially constructed institutional practices (Thornton and Ocasio 2008: 101). Examples of institutional logics are shared views on what an organisation is good at and how to achieve this (i.e. a common understanding of core competences) or on how dynamic the business environment is perceived and how fast organisations need to change, respectively. Within clusters, cluster firms often share similar institutional logics and hence demonstrate institutional isomorphism.

Recent research on neoinstitutional theory 'has been at the forefront' of efforts to analyse how organisations deal with multiple, sometimes divergent, external pressures and especially how to deal with turbulences (Ramus, Vaccaro, and Brusoni 2017: 1253-6) such as uncertainty over opportunities and constraints for an organisation (Davis, Eisenhardt, and Bingham 2009) or the instability in expectations and relative influence of stakeholders (Reay and Hinings 2009). In particular, the role of institutional logics has been highlighted in this context, most notably that the relative importance of institutional logics within an organisation may change in the course of turbulences (Reay/Hinings 2009). Also, in the face of turbulences collaboration among organisational members who advance different institutional logics, is important (Ramus, Vaccaro, and Brusoni 2017) even if it becomes more difficult (Almandoz 2012). Quite naturally, this divergence of institutional logics in the course of transition is prone to provoke turmoil among an organisation's members. This may even turn into an obstacle to the process of adaption and is called 'institutional complexity' (Ramus, Vaccaro, and Brusoni 2017). Well-planned moderation processes can mitigate it.

There is limited research on the role of institutional logics in the development of clusters. Tilleman (2009) found a positive role of congruous institutional logics in a cluster on cluster emergence in wind and solar energy industries. In a study on agricultural clusters in Ghana, Osei-Amponsah et al. (2018) find processes of bricolage and blending of institutional logics of potential partners in development initiatives, and conclude that a deep understanding of such processes may serve development practitioners in the future. Yet, there is still a considerable gap in literature at the interface of specific research on the resilience of cluster firms and clusters in the face of an external shock and on how institutional logics develop for increasing an organisation's legitimacy, its resilience and finally chance to survive. It is here where we aim to make a contribution with our study. We strive to analyse how cluster firms change institutional logics in their pursuit to prosper further and to survive – in a word to be resilient.

5. Sample and Methodological Approach

Our exploratory study with a qualitative research design is based upon a set of interviews in which representatives of regional businesses were motivated to reveal institutional logics. Although not all interview partners were personally identified from the very beginning, the basic sample structure was defined a priori. The sampling process was theory-based in its intention to find manifestations of our theoretical construct of interest (i.e. the change of institutional logics in cluster firms following an external shock) as to elaborate and examine the construct and its variations (Patton 2002: 238). The interviewees were approached via the firm network of the Innovationsregion Lausitz GmbH, which is a well-connected regional think tank that sees its purpose in the moderation of the structural change in the region.

Data was collected in ten interview sessions from summer 2017 to the early months of 2018. In each session, five to ten entrepreneurs or representatives of public or research institutions participated. The mode of interviewing is phrased ‚Erzählsalon', which describes a forum where a group of people meet in order to talk about past and current experiences. The same interviewer moderated all ten sessions. This form of qualitative interviewing is a combination of group discussion and narrative interview which is to be seen in the tradition of focus group interviews (Richter and Rohnstock 2016: 94, Patton 2002: 385). The group situation helped to disclose collectively relevant processes and had the advantage that extreme and distorting views were socially controlled. Patton stresses that a series of different focus groups helps to get a variety of perspectives and increases confidence in whatever patterns emerge. The resulting interview material met the reliability criteria of data with respect to our research question for those interviewees representing energy businesses (Mayer 2009: 38-41). Moreover, all interviewees are experts in the tradition of Meuser and Nagel (1991: 443): An expert is someone who is responsible

for developing, realising and supervising problem solving processes and/or who enjoys privileged access to information concerning group and decision processes. This holds for all interviewees since they hold responsible positions within the represented company or institution. Although the interview situation promoted exchange of representatives of companies and institutions from within and outside the energy sector, only the collected interview material of the cluster firms was of relevance. In our cluster definition we broadly follow the official approach of counting all those sectors to the cluster which either directly or indirectly (e.g. by services to direct participants) operate in the field of energy-tech (Zukunftsagentur Brandenburg 2012) and which employ at least 50 people.

Table 1 gives an overview of the number of relevant firms and their sector distribution. The numbers in brackets represent the companies in our sample. That is, the interviewees who participated in the group interviews represent 13 out of 91 companies with more than 50 employees (14,3 %) in the Lusatian energy cluster.

Number of Employees

Sector	***50-249***	***> 249***	***SUM***
Mining	0	2	2 **(1)**
Services to mining sector	0	0	0
Production	38	10	48 **(10)**
Energy Supply	18	4	22 **(2)**
Building	11	0	11
Trade	3	0	3
Research & Development	5	0	5
SUM	75	16	91

Table 2. Number of companies in 2018 with more than 50 employees within the Lusatian energy cluster (Data: Office of Statistics Brandenburg and Saxony, own table). The compilation of relevant sub-sectors follows the official definition of the regional energy-tech cluster (Zukunftsagentur Brandenburg 2012: 13). The numbers in brackets denote the companies within our sample.

Tables 3 and 4 give an overview of all focus group participants and the companies and further organisations they represent. From the mentioned 13 companies, in seven, the interview material was rich enough for deeper analysis; these are at the core of the Lusatian energy cluster and heavily exposed to the external shock since they can also be related to the lignite sub-cluster. In the focus groups the interviewees provided deep-enough insight in their companies' past and present organisational habits so that it was possible to identify the shock-related transition of institutional logics.

Company	**Short Description**	**Interviewees - Position**
A	Electrical Engineering and Automation	A1 – department manager A2 – department manager A3 – senior technical team leader
B	Boiler cleaning	B1 – owner
C	Mining and electricity production	C1 – area director C2 – management
D	Engineering	D1 – product manager D2 – department manager D3 – project manager
E	Engineering	E1 – former manager
F	Engineering	F1 – engineering expert F2 – head of R&D F3 – department head R&D F4 – product manager F5 – head of engineering F6 – head of assembly F7 – corporate finance

G	Engineering	G1 – unit manager G2 – management G3 – management

Table 3. Classification of interviewees

Among 70 interviewees, 80 percent represented companies whereas 20 percent represented further political or societal institutions. Thirty-seven percent of all interviewees represented 13 cluster companies with more than 50 employees. As already mentioned, for seven out of these 13 companies the interview material was rich enough to identify a shock-induced transition of institutional logics. These seven companies can be attributed to Lusatian lignite exploitation and related energy generation.

	Interviewees	***Companies and further organisations***
ALL	70*	53 (incl. 13 further organisations)
Companies in the energy cluster	30	16
Companies in the energy cluster with more than 50 employees	26	13
Energy & lignite cluster companies (>50 MA) with rich-enough interview-data	20	7

Table 4. Sample overview

All interviews were audiotaped and transcribed. The qualitative analysis was conducted on the base of these interview transcripts. They were analysed by structured content analysis following Mayring (2014, 2010). In the centre of each content analysis, there is the development of a system of categories, which corresponds to the research hypothesis or research question (Mayring 1985: 192). It is extracted by the help of a methodologically controlled process guided by the theorical perspective of institutional logics. We follow an exploratory research strategy, based on a heuristic model with structuring dimensions for the qualitative content analysis. These dimensions, derived from the research question were ‚old institutional logic', ‚new institutional logic', ‚external shock' as well as ‚moderation of institutional logics' and ‚institutional complexity', the latter two derived from findings of Ramus, Vaccaro, and Brusoni (2017). These were then split up in finer-grained dimensions. Subsequently, the dimensions were brought together to form a consistent system of categories. This process is deductive because the category system was established before coding. The process of structuring the material is of the categorisation-type (Mayring 1985: 198) which strives to identify single but with regard to the research question important phrases and to explain these in greater detail. Finally, the transcripts were coded by two researchers to guarantee intercoder reliability. The result is a case-based identification of all text passages, which correspond to the coding scheme and a subsequent aggregation of those codes to higher-level categories (see Tables 5 and 6).

6. Results

Two main tenets emerged from analysing the empirical data: First, we found that cluster firms which are exposed to the external shock increase their openness towards innovation and try to develop new business ideas by adapting their core competences. Second, our data reveals that for developing new business models and eventually coping with the external shock, cluster firms increase their openness towards cooperation with other cluster firms. We will hypothesize that these changes in institutional logics are antecedents of cluster resilience without being able however to determine whether they are generally necessary or sufficient. In the following paragraphs we provide evidence for these themes of ‚strengthening core competences' and ‚increasing openness towards cooperation' by highlighting major descriptions of institutional logics by the interviewees. Afterwards we briefly present further results which centre around the topics of ‚moderation of institutional logics' and ‚institutional complexity'.

Tenet 1: Strengthening core competences

Company A – Company A's employees share a clear understanding of their own core competence. Interviewee A3 explicitely called the company a ‚technology leader' and ‚number one' in the field of automation and electrical engineering. A1 expressed very similar thoughts and added that the company's creativity/know-how in its core business is so highly developed that in the end the concrete field of business is basically interchangeable. Following A2, applying the core competences in automation and electrical engineering to another field than coal mining in the future should not cause any problems. That means that the company's core competence will be used to develop new fields of business. The interview material gathered from company A employees provides a strong case for the shift of institutional logics linked to Tenet 1.

Company B – Already before the external shock company B's employees shared a self-perception of being solution-oriented and open towards development (as long as this yields benefits for customers). As interviewee B1 broadly elaborated, the development of new fields of business is not new to company B. However, there were dramatic failures in the past. Now, since the company's business model is challenged by the external shock, it becomes more and more evident that the known strategy of developing new fields of business by transforming core competences – on which B1 elaborates extensively – has high value for surviving the current hardship. Institutional logics, expressed by interviewee B1 indicate that an existing institutional logic gets reinforced by the external shock. This yields some support for Tenet 1.

Company C – Interviewee C1 explained in detail how the external shock induced a change of institutional logics towards the development of new fields of business. Again, this process is based upon transforming existing core competences. In addition, company C implemented new organisational structures (an actual department) to identify new business opportunities other then the existing ones. Like company A, also firm C provides concrete evidence for a transition of institutional logics supporting Tenet 1.

Company D – Interviewees D1-D3 highlighted their company's intention to build upon its core competence in developing areas of future business. D's core competence lies in power plant services. Especially interviewee D2 expressed pride regarding the company's capabilities. Those are intended to build the base for future ideas. This becomes evident in the interview material collected from interviewee D3 who points out that the future business model will be very much related to the current one but may be much more data driven. Transitioning from pure engineering to data-based services within the field of power generation depicts a process of adaption of a core competence to a new business environment.

Company E – The interview material of company E provides some evidence that traditional approaches applied in the past loose importance. The external shock demands experimation for developing new ideas. Following interviewee E1, mistakes are allowed and part of the process. The collected interview material indicates that company E's core competence (construction of large resource extraction machinery) will be the base of future experiments. The new focus on experimentation must be seen as a shock-induced institutional logic.

Company F – Core competence is not in the centre of company F's self-perception. Interviewee F6 pointed out that in the past the company did not actively address and promote its outstanding technological know-how in building turbines. Interviewee F3's arguments indicate the same: ‚We need

to strengthen our awareness of what we can. That is: we are very good in building turbines.'. F1, F3, and F6 expressed that in the wake of the external shock the company's core competence needs to be transformed in order to develop new fields of business. The majority of interviewees representing company F stressed the necessity of finding new ideas to survive the current change.

Company G – Interviewee G1 pointed to the challenge of experimenting on the base of existing core competences in order to identify new options. Even completely new ideas shall get their chance. Company G created physical rooms for experimentation. In face of the external shock the company integrates the institutional logic that transformation of core competences into new business is a crucial part of any coping strategy.

Table 5 provides before and after aggregated institutional logics related to Tenet 1. In companies A, B, D, E, and F there is indication for a strong perception of the company's core competence in their respective field of business. The interviewees of all sample companies provided sufficient information in order to show that in consequence to the external shock the core competence is broadly seen as base for future innovation that will pave the way to new fields of business.

Company	Tenet 1: Cluster firms exposed to the external shock increase their openness towards innovation and try to develop new business ideas by adapting their core competences.		
	Aggregation – old institutional logics	External Shock	Aggregation – new/strengthened institutional logics
A	We know about our core competence (in the field of automation and electrical engineering) and use it sucessfully in our traditional field of business	Perceived	Now we extend our core competence in order to develop new fields of business.
B	We know about our core competence (creative application and transformation of existing knowledge in the field of power plant cleaning services). We use this core competence to develop new fields of business.	Perceived	We continue with using our core competence for developing new solutions for our customers. In the wake of the current external shock we develop new business areas.
C	-	Perceived	We transform our existing core competence in order to develop new fields of business. We do so by establishing new innovation processes.
D	We know about our core competence (power plant services) but there is no necessity to use it for developing new fields of business.	Perceived	We use our core competence to innovate and get access to new fields of business. We have trust in our core competence and use it to survive the current crisis.
E	Our traditional approaches are a solid base for our business. There is no need to change anything.	Perceived	We want to develop new fields of business and are open for experiments. For this, we use our core competence.
F	We know about our core competence (building turbines) but don't make a big deal about it.	Perceived	We continue using our core competence to cope with current challenges (external shock, strengthened instituional logic). We use our core competence to develop new fields of business.
G	-	Perceived	Our core competence shall be the basis for innovation and new business. We create rooms for experiments and allow mistakes.

Table 5. Aggregate findings with respect to Tenet 1.

Tenet 2: Increasing openness towards cooperation

Company B – Already before the external shock company B was used to adapt to changing economic environments (very much related to the system changes before and after the fall of the Berlin wall) and to react creatively to given constraints/challenges in order to find manageable solutions for customers. This indicates an existing motivation to constant development. Crucial for understanding the transition of institutional logics in company B is, that past external cooperation was limited to customers only and literally never happened with non-customer regional firms (let alone competitors). This changed with the onset of the external shock. The old institutional logic of non-cooperation was replaced by an emergent

institutional logic that allows for communication and cooperation with other regional non-customer companies in order to cope with the shock.

Company C – Transition patterns of institutional logics in company C indicate detachment of an old institutional logic governing the self-perception of being a group-member that was determined by the corporate parent. Previous to the external shock, this logic concentrated external communication to other group members only. Related to the fundamental changes in the business environment, now company C opens towards cooperation with other regional but also extra-regional companies. Interviewee C1 exemplifies this development by a detailed description of actual network and cooperation activities.

Company D – For company D, interviewee D2 describes the company's very limited interest in other regional companies prior to the shock. Today, this has changed: The firm now realizes that the external shock is a common challenge to all regional energy-tech firms. The new institutional logic indicates high motivation to cooperate with other regional competitors.

Company F – Company F is part of a world-leading industrial group. It's embeddedness in this environment limited external communication to other in-group organisations. Interviewee F2 stresses that this form of communication will keep an important role in the future. Interviewee F3, however, indicates that nowadays – since the institutional changes entered the business environment in form of the described external shock – cooperation with regional independent research units (regional university) shall be renewed. F5 and F6 highlight the strengthened role of future cooperation with other regional companies.

Company G – Since its first days, company G was depending on its network which mainly consisted of customer companies to which G provided industrial services. Interviewee G1 stresses that beyond this customer-focused perspective intensified communication with other regional companies which are exposed to the shock is now seen as being of value for learning how to survive. Once again, this indicates that an old institutional logic related to customer-focused communication got at least amended (if not replaced) by a new institutional logic of intensified cluster cooperation. Interviewee G3 distinctly mentions the company's interest in the survival of the big industrial players in the region.

Table 6 provides before and after aggregated institutional logics related to Tenet 2. Whereas neither single institutional logics nor any hints of transitioning were identified in companies A and E, the remaining companies B, C, D, F, and G, provide ample support for the idea that in face of the external shock cluster companies replace old institutional logics of reticence by new ones related to a more open and network-oriented communication as coping strategy for the external shock.

Company	Tenet 2: For developing new business models and eventually coping with the external shock, cluster firms increase their openness towards cooperation with other cluster firms.		
	Aggregation – old institutional logics	External Shock	Aggregation – new/strengthened institutional logics
A	-	Perceived	-
B	We provide solutions and focus our development on existing customers. We never communicate with other non-customer regional companies because this will lead to competitive disadvantage.	Perceived	We communicate openly with other non-customer companies and even regional competitors. We build a network as coping strategy.
C	We limit communication with other non-customer organizations to those which are part of our corporate group.	Perceived	We communicate openly with other regional and extra-regional companies. We actively build a regional network.
D	We are not interested in other regional companies and don't actively communicate with those.	Perceived	We build a network with other regional companies as coping strategy.
E	-	Perceived	-
F	We limit communication with other non-customer organizations to those which are part of our corporate group.	Perceived	We acknowledge network-building with further regional companies (beyound ur corporate group) as important topic and communicate openly to those. We are actively interested in their solutions.
G	We do not communicate with other companies.	Perceived	We build a network with other regional companies as coping strategy; moreover we communicate openly with others.

Table 6. Aggregate findings with respect to Tenet 2.

Further results

Apart from the two tenets presented above, a stronger focus on internationalisation was in a few instances identified as a third prominent coping strategy of cluster firms in the face of an external shock. Whereas the impact of a more international business focus has a potentially indirect impact upon the resilience of the Lusatian energy-tech cluster (through stabilisation of revenue flows), the themes of the two tenets – increasing importance of open communication/network orientation and the will to adapt existing core competences for future innovation – are directly linked to cluster health.

Usually, the transition of institutional logics also triggers a phenomenon called institutional complexity, which calls for structured processes of moderation (Ramus, Vaccaro, and Brusoni 2017: 1253). Institutional complexity is a state of increased stress induced by the logic transition. The interview material of five sample companies provides evidence of institutional complexity. One example comes from company G in which – following interviewee G1 - the new institutional logic of openness towards experimentation (Table 5) created actual fear among employees. Following Ramus, Vaccaro, and Brusoni (2017), institutional complexity can be an obstacle to the effective transition of institutional logics. Therefore, active moderation is necessary. The interview material of three companies indicates the existence of those moderation processes in the form of workshops (company B) or an actively communicating management (company C).

7. Discussion

In the light of the above presented previous research, our findings provide a novel perspective. Our results do not directly indicate a technological lock-in of key cluster firms as described by Østergaard and Park (2013). Instead, we observe a transition of institutional logics which points to high motivation as well as to actual projects aiming at the adaption of core technologies in face of the shock. Although it may be still too early for a conclusion, at this point in time our findings do not support the results of past research questioning the resilience of cluster firms in times of crises (Behrens, Boualam, and Martin 2018). We observe that institutional logics, which were valuable in the past (pre-shock), are difficult to be maintained in the new post-shock situation. This becomes particularly evident in those cluster- and network-related institutional logics that limited cooperation in the Lusatian cluster environment. In line with Ramus, Vaccaro, and Brusoni (2017) we observe that due to the external shock collaboration actually gains in importance, which is a prerequisite for increasing resilience.

Understanding both the increased collaboration with other regional firms and the rising motivation to adapt core technologies as two integral cluster parts of successful cluster participation, we propose the hypothesis here that in the Lusatian case the external shock rather strengthened the resilience of the cluster; the latter understood as capacity to reconfigure its structure in order to maintain growth (Martin 2010). Considering Tenet 1, there is first evidence for re-orientation (following Martin a central property of cluster resilience). Taking Behrens, Boualam, and Martin's (2018) distinction between strong and weak resilience, we observe mainly the latter: the attempt to survive the external shock by switching to another industry or at least develop new, related fields of business. As explained in section 3, Storper and Christopherson (1986) see 'adaptive capacity' of clusters reinforced by 'flexible' firms with regard to their product/service offerings as well as 'appropriate institutional forms of coordination'. Both parts find support in our results: We not only provide evidence for shock-induced flexibility, also intra-cluster coordination was lifted to higher levels.

The two tenets, which we found in our empirical study generally, relate to the two classical dimensions of organisation – differentiation and integration (Lawrence/Lorsch 1967). Differentiation means that members within an organisation specialise in their activities. Complex organisations witness a high degree of differentiation and from a strategic point of view (only) those members with their activities are valuable to an organisation and eventually survive which constitute a core competence. Integration means that highly differentiated activities are coordinated by organisational mechanisms, formal as well as informal ones, and from a strategic point of view these mechanisms serve as an important competence which not only relates to the interior but also the external environment of the organisation. Building on the dichotomy of differentiation and integration and transferring it to the competences of a manager, Hansen and Oetinger (2001) introduced the idea of a T-shaped manager. This person simultaneously commits time to his own specific core competence (vertical part of the T) as well as to

the organisation as a whole (horizontal part of the T), supporting the exchange of knowledge and collaborative knowledge generation. Subsequent research transferred the idea of a T-shaped competence model to organisations in clusters. Here, internally oriented core competences, combined with internally and externally oriented communication, networking and transformation competences are integrated into a competence model for firms to successfully operate in clusters (Tomenendal et al. 2018). Our above-mentioned findings resonate well with this T-shaped model of cluster competence, as each part of the T is represented by one of our two tenets. In other words we find that the external shock to the Lusatian lignite cluster strengthened the vertical and horizontal T-model elements and by doing this improved the firms' general cluster competence. Subsequently, we hypothesize that finding a good balance between the two areas of T-shaped cluster competences increases the company's chances to survive the shock and is therefore linked to the whole cluster's resilience.

8. Conclusion

Our study provides first indicative evidence that in the face of external shock firms in clusters change institutional logics in their pursuit of higher resilience. Our research is guided by the argument that institutional logics are essentially influencing the priorities, strategies and practices of an organisation (Ramus, Vaccaro, and Brusoni 2017: 1253), therefore also their competences. Drawing on the concept of a cluster competence of organisations, which drives the organizational innovation and growth (Tomenendal et al. 2018) we argue that institutional logics are influencing cluster competences and by the same token the resilience of firms and whole clusters. In other words: When a high degree of cluster competence is supporting continued innovation and growth of firms in a cluster then institutional logics have to prevail which in turn support the development of adequate cluster competence. While the cluster competence of individual firms consists of a specific blend of the different sub-competences of core, transformation, communication and networking competences, and while different blends may be beneficial in different cluster situations and firm positions within a cluster, a certain degree of vertical elements of the T-shaped cluster competence (i.e. differentiating core competences) as well as horizontal elements (i.e. integrating communication and networking competences) is always necessary. Therefore, we performed an analysis of institutional logics and how they relate as antecedents to the vertical and horizontal elements of cluster competence.

We found that cluster firms under shock change institutional logics in the pursuit of staying in business. We propose that these changes in institutional logics strengthen cluster firms' cluster competences in a way that these firms may stay strong in a cluster, which changes, such as the loss of importance of major, focal firms and their orders. We propose to regard these developments as means to high cluster resilience (see Figure 1).

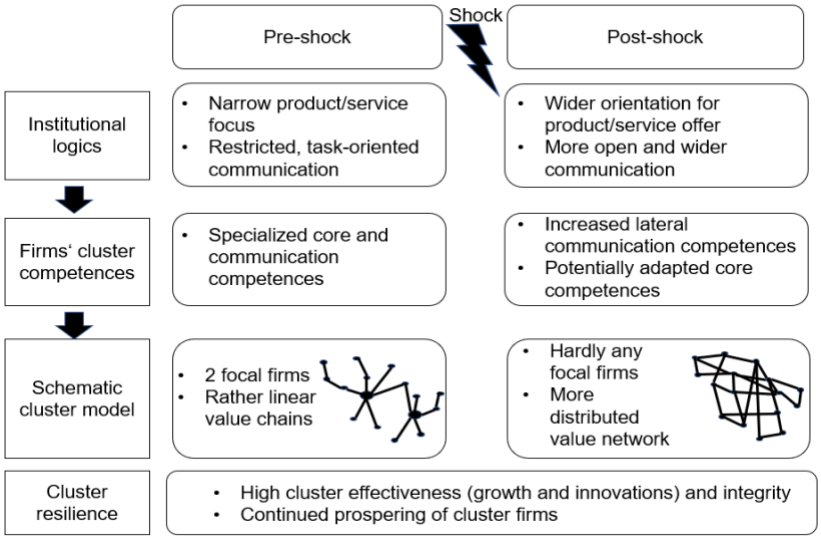

Figure 1. Development of institutional logics as antecedents to cluster resilience in the Lusatian energy cluster

Institutional logics are the linking pin between structure and agency in organisations. They restrict and enable changes in behaviours and therefore also competences. We argue that changes in institutional logics are antecedents for cluster resilience, via strengthened cluster competences. When institutional logics change towards activities that support the harvesting of core competences and towards increased communication and strengthened communication competences – as we found in our empirical study of firms in the Lusatian energy cluster – we conclude that cluster competences are strengthened accordingly. These may then contribute to higher resilience of cluster firms.

To support the respective changes in institutional logics moderation processes within organisations are recommended. In addition, reflections and discussions about current, and potentially restricting institutional logics with regard to more innovation may serve organisations well. In the sense of Ramus, Vaccaro, and Brusoni (2017), more communication within organisations may be effective for bringing forward formerly neglected ideas and components of institutional logics. Also, agency in the sense of Hirschman's possibilism (Lepenies 2008) should be strengthened over structure so that cluster firms may make use of a variety of possible elements of institutional logics in the situation of a shock, when the most beneficial way forward is less clear than in stable times.

We strive to trespass individual streams of cluster research and simultaneously contribute to the fields of evolutionary economic geography, innovation and firm analysis as well as inter-firm networks, social capital and flows of knowledge with regard to Hervas-Oliver et al.'s (2015) classification of cluster literature. We also reply to Hervas-Oliver, Sempere-Ripoll, and Boronat-Moll's (2014) call for linking the macro/relational view of cluster research (which has the cluster as a complete system in focus) with the micro/resource-based view (with individual cluster participants in focus) by building on the T-shaped model of cluster competence by Tomenendal et al. (2018). This may be applied to the whole cluster as well as individual participants, thus serving as the linking pin between the relational and resource-based view of cluster analysis. With this argumentation, we are also in line with Tengblad and Oudhuis (2018) who assume that resilience of organisations and business clusters can be modelled with the same variables.

Our study is limited to a first, exploratory phase of research on how cluster firms and whole clusters may increase resilience. Here we hint to the importance of institutional logics and their change in the face of a shock. We do not get engaged in a comprehensive analysis of other external and internal factors which potentially also might have effects on cluster resilience. The results of our exploratory study should be interpreted as a starting point for further research to build theory rather than confirming theory on the link between institutional logics and cluster resilience. In this sense, the generalisability of our results is yet to be proven. However, they may serve as a call to conduct further studies at the interface of neoinstitutionalism and cluster research on cluster resilience, an area of study with high practical relevance for regions which face severe structural change, not only for Lusatia.

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