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**ECONOMIC RESILIENCE AS
THE EVOLUTIONARY CONCEPT
FOR POST-INDUSTRIAL REGIONS:
THE CASE OF LEIPZIG AND HALLE**

Introduction

Due to the repeated occurrence of international crises and the recognition of increased inter-connectedness of regional and national economies worldwide, the question how to cope with exogenous shocks became one of the most urgent challenges for regional economists in the last years (Simmie, Martin, 2010). The term “resilience” – with a long scientific tradition in physics, ecology, psychology and many other disciplines – shall describe the capabilities to minimise negative effects from shocks beyond the influence of (regional, national or organisational) actors (Lukesch et al., 2011; Wink, 2010). Post-industrial regions face a specific challenge in building up resilience capacities, as the structural change from industrial sectors towards service and knowledge economies and an increasing relevance of creative industries already caused major stress on adjusting capabilities within the region and required a long-term change of qualification and collaboration patterns (Bathelt et al., 2011; Hassink, 2009). Central and East European post-industrial regions are even more experienced in being exposed to external threats due to their needs to go through political transformation and find ways into the distribution channels and value chains of Western industrialised countries (Suchacek et al., 2012). The following paper shall try to explain these specificities in terms of economic resilience and illustrate these explanations against the background of experiences in the two East German urban areas of Halle and Leipzig, which had to follow different pathways towards more resilient economic structures.

The paper is organised as follows: after reflecting the discussion on regional economic resilience concepts and the need for an evolutionary perspective to understand economic resilience indicators for vulnerability and adjusting capabilities are introduced to look at general preconditions for economic resilience and the specific challenges of Central European post-industrial regions to develop these preconditions. This argumentation is then illustrated by the two cases of Leipzig and Halle and finally summarised.

1. Concepts of economic resilience

In general, regional economic resilience describes the development in a region after an exogenous shock. Concepts, however, differ when defining which kind of development can be identified as “resilient” and reflect different disciplinary references. Ron Martin (Martin, 2010) distinguishes three directions by referring to approaches of “engineered (equilibrium-focused) resilience”, “eco-

logical (panarchy-focused) resilience” and “adaptive (complexity-focused) resilience”. Engineered resilience is the concept with closest relations to physics and describes resilience as a capability to bounce back to equilibrium. A common approach in this context would be to look at deviations of GDP or unemployment ratios from original trend (equilibrium) development and the time necessary to return to the original pathway (see e.g. Swanstrom et al., 2009; Hill et al., 2010). Macroeconomic hysteresis was often closely connected with these observations of deviations from original equilibrium towards a new one (see critically on this perspective Martin, 2010).

Ecological resilience leaves the perspective of the equilibrium as a reference for development. Instead, an adaptive cycle describes the process of a region to change its adaptability, connectedness and accumulation along a given path (Martin, Sunley, 2011 referring to Gunderson, Holling, 2002). This perspective of a given pattern for the adjusting path is completely left by “adaptive resilience” concepts, as these approaches understand regions as areas being permanently within evolutionary processes of change and exogenous shocks as additional stress factors on these evolutionary processes (Martin, Sunley, 2011). Resilience then describes the capacities to find adjustment processes preventing a permanent reduction of welfare or other indicators of regional economic performance. These concepts refer to regions as complex systems in multi-level governance structures and in permanently overlapping endogenous and exogenous forces to structural changes (Lukesch et al., 2011 on the regional perspective; Dopfer, Potts, 2008; Foster, 2005 on complex systems). As regions consist of actors on different levels (micro, meso and macro) and complex linkages between single system elements (Schröder, 2011), the “adaptive resilience” concepts are the most suitable approaches to mirror the reality of regional economic resilience challenges. Consequently, arguments and criteria from complex system theory have to be investigated as candidates for a theory of regional economic resilience.

What does that mean for the identification and explanation of regional economic resilience? Identification becomes more complex than solely looking at single indicators in an equilibrium state. Instead, the fundamentals of regional development have to be understood and analysed reflecting the specific regional conditions. Single criteria like regional GDP per capita or employment might offer hints on regional economic development but have to be completed by investigations of regional productivity, demographic and migration structures or economic inequalities to understand how regional evolutionary processes actually have been affected by shocks (Wink, 2010). These statistical data might then be even contrasted by subjective assessments in the region, as subjective cognitive processes might include additional factors, such as identity, pride or fears,

into the assessment. Additionally, it is necessary to agree on the time frame for adjustment, i.e. how long an adjustment process can last to call the region “resilient”. Due to the overlapping structure of shocks causality problems have to be considered, as it will be difficult to isolate the effects of single shocks. Furthermore, “slow burning” shocks cause specific identification problems, as the long time between the origin of the shock and the actual observation of an impact increases the probability of missing links. Even if there is an agreement on these elements, regional economic resilience can still be understood in different ways:

- “untouchable regions” with a relatively low vulnerability to shocks due to strong regional fundamentals and a high level of adjusting capacities – examples for this group include global metropolitan areas as London, Paris, New York or Tokyo;
- “isolated island regions” with a relatively low vulnerability to shocks due to few linkages to the rest of the world but also limited adjusting capacities, as they never have to be used – examples for this group include remote rural areas and peripheral islands without a high share of tourism;
- “rollercoaster regions” with a relatively high vulnerability to shocks but also strong adjusting capabilities to bounce back to original pathways – Silicon Valley is a prominent example for this type of region, as short-term job losses after exogenous shocks (e.g. the “dotcom-bubble”) were later compensated by growth in other technological segments;
- “avant-garde regions” with a reduced vulnerability due to the anticipation of exogenous shocks and successful emergence of adjusting capacities due to early investments before the shock – examples for this group include creative and knowledge regions as Singapore, Los Angeles or Midi Pyrenées.

From a strategic perspective becoming an “avant-garde region” seems to be the most challenging but also promising approach, as it offers opportunity to avoid negative effects from shocks by intentional precautionary measures. However, the successful implementation requires an understanding of determinants for resilience (vulnerability and adjusting capacities) and early-warning systems to improve the preconditions for resilience.

This requirement leads us to explanations of regional economic resilience within the evolutionary framework of “adaptive resilience”. These explanations are closely related to vulnerability and adjusting capabilities, as they decide how probable it is that an exogenous shock will hit the region and how well the region can adjust to this additional stress. Vulnerability is based on exposure to exogenous shocks (Briguglio et al., 2008). Consequently, the level of concentration in the openness ratio of the region, the intensity of integration into single external value chains and the level of uncertainties within the contracts with

external actors are important indicators to understand the vulnerability. Additionally, slow burning shocks cause additional risks of vulnerability, as the visibility of the stress is reduced, which might limit the acceptance of necessary precautionary measures to introduce early adjustment.

Adjusting capabilities reflect how well a complex system can evolve endogenous capacities to cope with external stress. These capacities depend on (a) diversity and redundancy, (b) creativity, learning and openness and (c) connectivity and modularity.

Diversity and redundancy are preconditions for the availability of alternatives in cases of shocks particularly affecting single regions or industries (Essletzbichler, 2007). Within evolutionary economic geography, related variety is recognised as an important amendment to diversity, as the relatedness between single industries allows easier transition within labour or technology markets, while variety reduces the dependence on single incumbent industries and technologies (Boschma, Frenken, 2011; Frenken et al., 2007; Boschma et al., 2010; Neffke et al., 2011; Brachert et al., 2011). Therefore, technological platforms serving as a technological basis for different industries form a suitable approach to strengthen the related variety in the region (Cooke, 2011; Asheim et al., 2011). Spin-offs or firm pivots are often observed as the agents within these platforms supplying technological products and services to customers from different industries or looking for varieties in their sales markets (Klepper, 2010). Redundancy is often interpreted as a limiting factor to efficiency, as various contacts and directions have to be kept up causing additional costs to a concentration on one or two central linkages. In terms of resilience, however, the long-term efficiency can only be achieved, if there are redundant options as potential alternatives in case of a destruction of single linkages by a shock. Redundancy also calls for regional inclusion to avoid segregation processes, as an increasing number of qualified residents and workers increase the availability of sources in case of crisis (Grabher, 1994, distinguishing between redundancy of elements within the system, redundancy of functions covered by the system elements and redundancy of relations between the system elements).

Creativity, openness and learning are capabilities to extend the range of options and to identify alternatives to existing organisational or production pathways. Openness and learning deal with the processing of own or foreign experiences to increase the existing knowledge stock (see Agrarwal et al., 2006; Saxenian, 2002, on experiences in transnational communities), while creativity opens up new directions to build up new experiences. The extension of existing knowledge and capabilities helps to overcome path-dependencies within development. The way new paths are created, however, is still only weakly explored,

as complex feedback mechanisms of unforeseen interactions and cause-effect relationships as well as deliberate interventions are observed in several case studies (Garud et al., 2010; Sydow et al., 2007). Openness and learning depend on the absorptive capacities in an economy, which are influenced by the level of qualifications, international contacts and routines (Taheri, van Geenhuizen, 2011; Cohen, Levinthal, 1989; Enkel, Gassmann, 2010). Creativity is more related to the level of incentives and freedom for experimenting new and unknown ideas and security to reduce fears of making mistakes (Andreasen, 2006).

Connectivity and modularity describe the internal linkages within a region. Modularity shall increase the flexibility of the regional structures, as the value chains can quickly be segmented into single units, which might be replaced, if an exogenous shock particularly hit single units (Langlois, 2002; Longo, Ören, 2008). Modularity and the objective to increase flexibility, however, increase the level of uncertainty for the regional actors, which could cause a trade-off with measures to reduce vulnerability (fixation of contracts) or increase creativity (security to allow failure of new ideas). Connectivity refers to the structure and character of linkages expressing the expectation that redundancy of linkages and characters of linkages (social, professional or contractual) and decentralisation of linkages (reducing the dependence on single central actors and gatekeepers) should support the emergence of adjusting capabilities (Broekel, Hartog, 2011).

Summing up, an evolutionary concept of regional economic resilience refers to the capabilities to avoid (mid- to long-term) negative effects of exogenous shocks on development pathways. Resilient regions should be able to show either factors reducing the vulnerability to shocks or (and) adjusting capabilities. In the following section, we look at the specific challenges for Central European post-industrial regions to reveal these factors and capabilities.

2. Challenges to the regional economic resilience in post-industrial regions

Central European regions went through remarkable transition processes after the exogenous shocks by the “fall of the iron curtain”. Existing trade linkages were cut and simultaneously the dominating industrial sectors lost their competitiveness causing a huge amount of job losses and emigration (Grabher, Stark, 1997). From an evolutionary perspective on regional economic resilience, it can be expected that these regions showed a higher level of vulnerability, as the industrial structure was typically dominated by a single sector and concentration on few products and distribution channels and the relative strength of this

sector and the long-lasting feeling of job security in this sector reduced the awareness for necessary precautionary measures to anticipate adjusting processes to exogenous shocks (Hassink, 2009).

The adjusting capacities within these regions were also limited by their characteristics as former industrialised regions. The dominating industries and single state-owned firms were not necessarily interested in redundancies and related variety, as they would fear to strengthen a competition by collaborating with organisations requiring the same technologies and firms pivots or spin-offs were missing as typical agents of change within a related variety platform. Furthermore, hierarchical structures due to political orders limited the emergence of a decentralised system of related variety, as this would become too complex to manage within a hierarchical system (Günther et al., 2010).

Openness, learning and creativity were also hindered by the hierarchical and centralised structure of the production and decision-making system. New ideas could be tested in public research institutes, but faced problems to be implemented, as the coordination between research and production systems was often relatively weak (Günther et al., 2010). The barriers to entrepreneurship during socialist times are still seen as a barrier for later cohorts of start-ups (Brenner, Fornahl, 2008; Wyrwich, Krause, 2011). Openness was hindered by the ideological borders between East and West Europe, which require at least formally a high level of secrecy. The lack of systematic contacts (although reduced by personal and informal contacts) also restricted the potential for learning, as several experiences were only poorly communicated across the borders (Matuschewski, 2005).

Modularity was limited by the relatively high level of integration within state-owned firms. Consequently, the single units only had limited options to choose potential partners, as most parts of the value chains were integrated into the same organisation. Connectivity was only given in general. The high level of centrality, however, increased the dependence on single actors and restricted the adjusting options in the regions.

Summing up, Central European post-industrial regions faced specific challenges to build up resilience capacities, and in the next section we will compare the two cases of Leipzig and Halle to show differences and similarities within the strategies to overcome the barriers.

3. Experiences in Leipzig and Halle

Leipzig and Halle are both located centrally in Germany and belonged to an industrial heartland in World War II (Sleifer, 2006). During the time of the

GDR, the whole region of Leipzig, Halle and Bitterfeld was particularly focused on chemical and energy production causing major environmental pollution problems and a high level of industrial concentration. The change of the political system and German unification hit the region drastically, as almost all industrial sites were immediately closed due to the environmental problems and the low competitiveness with West German producers (Günther et al., 2010). Leipzig and Halle are neighbouring urban areas with a distance of 40 kilometres and a joint international airport at a location between the two cities. Both cities belong to different regions (Leipzig to Saxony and Halle to Saxony-Anhalt), and both cities are not the regional capitals despite the fact that they are bigger than the two capital cities (Dresden and Magdeburg).

Leipzig had better opportunities to build up resilience capacities, as the city has a long tradition of international fairs, which served as important events for temporary geographical proximity for business contacts between East and West even during the GDR time (Suchacek et al., 2012). Furthermore, the urban centre of Leipzig was one of the only big cities in Germany without major destructions in World War II and a high attractiveness of architecture and facilities from late 19th century. Consequently, major investments went into shopping facilities as well as renovations of old galleries and malls. The image of Leipzig as trade location and intermediary between East and West was also used to attract major logistics investors. This positive development encouraged investors from the automotive sector to build new sites and form new industrial clusters. The image as an East German “boom town” reached finally its peak when Leipzig became the German candidate city for the Olympic Games 2012 followed by huge public infrastructure projects. Today, Leipzig is one of the few East German urban areas with increased population and has a relatively high degree of diversity with a high share of cultural and business-related services. Despite this positive development, Leipzig still has the highest unemployment rate of urban areas in Saxony.

Halle faced more difficulties to find its pathway after the German unification (Franz, Hornych, 2009; Suchacek et al., 2012). The political strategy was also directed towards strengthening of the service sector and the urban core. The weaker image and experiences of Halle, however, still caused major population loss and only a slower economic catching-up process compared to Leipzig. Today, Halle tries to establish itself as the knowledge centre for the solar industry with several university programs and public research institutes and received a major foreign direct investment by Dell.

The differences within the development can be illustrated by employment and population data*. Figure 1 shows the population development in both cities.

* All data are sourced from Statistical Offices in Saxony and Saxony-Anhalt.

The comparison is slightly distorted by an administrative reorganisation in Saxony declaring areas formerly not part of Leipzig as new urban districts of this city and increasing the number of inhabitants in 1999. Nevertheless the chart reveals the constant growth of population in Leipzig since 1999, while Halle continuously lost inhabitants until 2009. Figure 2 refers to the development of employment quotas in both cities, which are still below the level of 1995. Since 2005, employment quotas have been growing in both cities with a stronger growth in Leipzig, which is even more remarkable, as the population also grew in this period. Consequently, there is evidence that resilience capacities in Leipzig are stronger than in Halle. In the next section, some further hints on that are provided by looking at vulnerability and adjusting capacities in the two cities.

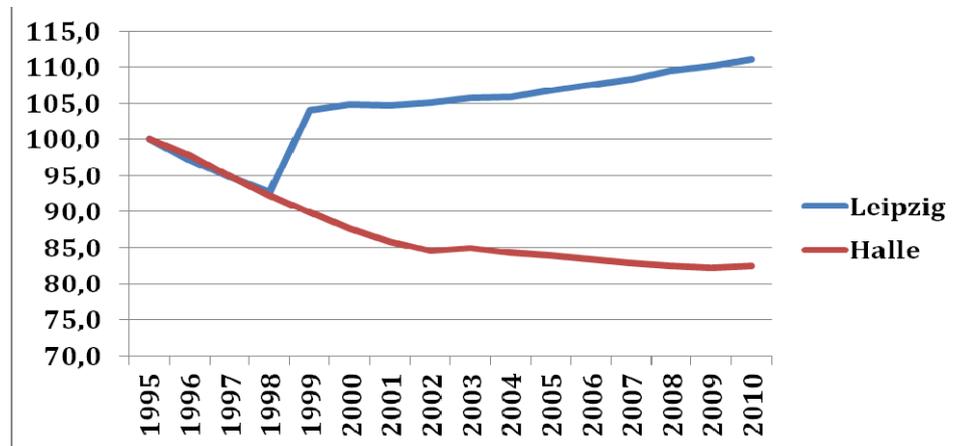


Figure 1. Population Development in Leipzig and Halle (1995 = 100)

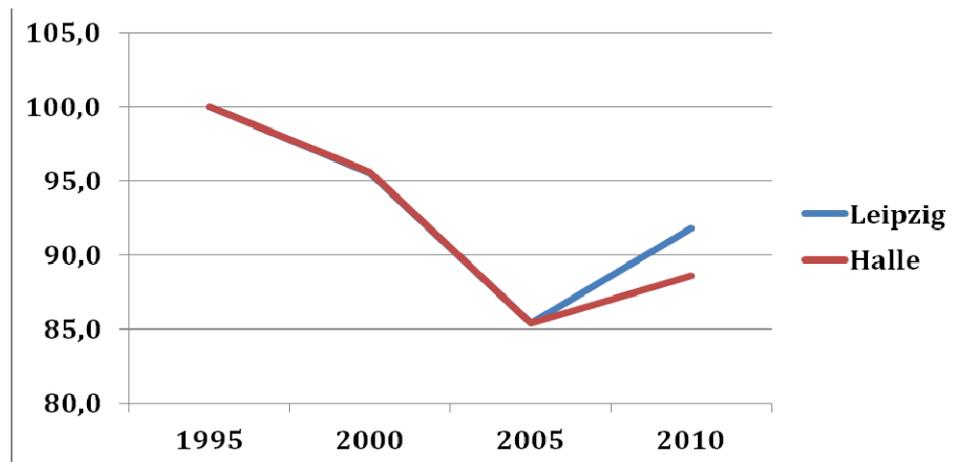


Figure 2. Employment quota in Leipzig and Halle (1995 = 100)

4. Resilience factors in Leipzig and Halle

In the second section, general factors to explain the regional economic resilience were introduced. This section provides first arguments, why Leipzig might show faster progress towards resilience than Halle, by looking at some suitable indicators for these factors. Vulnerability was connected to openness ratios and the level of concentration in external relations and sourcing. Business in both cities increased external linkages via trade, in particular as a result of foreign direct investors. Leipzig was especially successful in attracting big investors from logistics (Amazon, DHL) and automotive sector (Porsche, BMW; see Günther et al., 2008). These investments could have increased the dependence on business cycles in other regions or parts of the world, but so far no ending to growth processes can be observed. Another important external linkage is the attraction of Federal and EU funding based on the European Regional Development Funds. Leipzig and Halle are two of three East German regions being already phasing-out regions since 2007 (all other East German regions are still fully eligible to ERDF subsidies until the end of 2013). The imminent reduction of subsidies – intensified by cuts in German Federal feed-in tariff programs for photovoltaic energy – is recognised as a major threat to the further development with so far unforeseeable consequences.

Adjusting capabilities are based on modularity and connectivity, openness, learning and creativity and diversity and redundancy. Modularity has been strengthened in both city regions as a consequence of value chain management of foreign investors. As a result, several small and medium-sized enterprises were integrated into the value chains and developed strategies of diversifying their products and services to be able to switch between different industrial value chains. The connectivity originally based on contacts already in GDR times was adjusted to collaboration structures, which became closer to the structures in West Germany (Günther et al., 2010, on the existing differences in the innovation systems). Weaknesses are still recognised in the service industries, in particular cultural and media services, where several public initiatives did not reach their objectives so far (Rosenfeld, Hornych, 2010; Bathelt, 2005), while private activities, for example in the computer and video game industry caused remarkable growth results in Leipzig.

Openness, learning and creativity are closely related to the already mentioned topics of increased integration into international value chains, increased export ratios and collaboration structures within the innovation systems. Creative industries profited in both cities from the rich cultural heritage and the location of a regional public television and broadcasting organisation. Leipzig,

however, had to accept that nearly all big West German printing houses originally setting up locations at Leipzig already left despite the strong reputation of the international book fair. Leipzig as well as Halle attracted public research institutes and raised their number of students. So far, however, the research capacities are not as efficiently focused on key technologies as in Dresden and Jena, which are still the most important research locations in East Germany.

Diversity and redundancy were once again supported by the foreign direct investments. Leipzig succeeded in almost completely readjusting its industrial structure during the last two decades and Halle reduced its dependence on the Chemical industry remarkably. The most important sources for related variety were the regional SME, which were able to focus on technologies applicable to different sectors. The critical question for the future, however, will still be whether these relatively small firms will be able to overcome critical periods of change, as for example after the cuts in feed-in tariffs in the photovoltaic sectors.

Conclusions

This paper served to provide first ideas on understanding the specific challenges of regional economic resilience for Central European post-industrial regions. The concept of regional economic resilience requires an evolutionary perspective focusing on vulnerability and adjusting capabilities. The two cases of Leipzig and Halle illustrate the difficulties in building up these capabilities. Leipzig seems to be more successful within the transition process, which is particularly influenced by foreign direct investment projects and the already existing reputation as urban trade centre before German unification. The employment data, however, underline the limits to resilience even in this urban area with several supportive preconditions. Halle's adjustment was mainly influenced by a continuous loss of population, and it will be an important challenge for this urban area to keep its existing level of employment and population in particular facing drastic reductions in public subsidies.

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