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The Deep Historical Roots of Industrial Culture and Regional Entrepreneurship—A case study of two regions

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The Deep Historical Roots of Industrial Culture and Regional Entrepreneurship — A case study of two regions

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Abstract

We describe and compare the development trajectories of two German regions, South Saxony and Mecklenburg, with a special focus on entrepreneurship and innovation. South Saxony has a long history of self-employment and knowledge generation that results in a persistent culture of innovative entrepreneurship. In Mecklenburg, such a culture did never emerge. Differences between the entrepreneurial ecosystems in the two regions especially pertain to the level of knowledge production and its link to new business formation in innovative and knowledge-intensive industries.

JEL classification: L26, M13, O1, O3, R11

Keywords: Entrepreneurship, entrepreneurial ecosystems, economic history, culture, regional development

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1. Two regional histories

The development of regions can be strongly shaped by their history. Due to such historical roots, the evolution of regions follows specific trajectories. A fascinating example of recent research on historical roots is the long-term persistence of regional levels of entrepreneurial activity despite disruptive shocks such as devastating wars, changes in political regimes, and even the exchange of the largest part of the regional population (for a review see Fritsch and Wyrwich, 2023). However, our knowledge about the factors behind such persistence phenomena is still not well developed. We know little about how the historical context shapes the present and the future of regions.

This paper wants to contribute to the understanding of the historical roots of regional development by contrasting the past and presence of two East German regions with strikingly different histories, *South Saxony* and *Mecklenburg*. The focus of the comparison is on knowledge and entrepreneurship, two factors that can be regarded as of key importance for economic development. We show how the different histories of the two regions resulted in rather different regional ecosystems of innovation and entrepreneurship with divergent economic performance. While the two regions have comparable levels of overall self-employment and new business formation, they differ considerably with regard to their knowledge base and the type of entrepreneurship. Our analyses suggest that the regional knowledge base plays an important role in the quality of entrepreneurship and the emergence of a long-lasting entrepreneurial culture.

The following section briefly describes what we know about regional trajectories of entrepreneurship, knowledge, and growth. Section 3 gives an overview of the general macroeconomic framework conditions of the two case study regions that are briefly introduced in Section 4. The following sections then give more detailed descriptions of the history of these regions, mainly through the lenses of knowledge and entrepreneurship (Sections 5 and 6). We then compare the development trajectories of these regions (Section 7). The final section summarizes the main results and derives implications for theory, policy, and further research.

2. Regional trajectories of entrepreneurship, knowledge, and growth

The development of regions may be characterized by all kinds of changes due to business cycles, devastating wars, natural disasters, or changes in the political regime. There are, however, factors that were found to remain rather constant and persistent over long periods of time despite such changes. One of these factors is the relative level of regional entrepreneurship, self-employment, and new business formation which is an important determinant of economic prosperity (Fritsch and Wyrwich, 2017; 2019; 2022). Research has identified a number of factors that affect the level and the type of regional entrepreneurship. The concept of entrepreneurial ecosystems accounts for the fact that it is not only the presence of these factors but their interrelations and co-evolution that affect entrepreneurial activities (Spigel, 2020; Stam and van de Ven, 2021)¹. One of the key elements of an entrepreneurial ecosystem that plays an important role in a prosperous economy with successfully innovating start-ups is the knowledge that is present in universities, non-university research institutions, private sector firms, and in the regional workforce (Acs et al., 2009; Qian, Acs and Stough, 2013; Fritsch and Wyrwich, 2019). Knowledge and entrepreneurship often co-evolve and can be regarded as key drivers of regional development, particularly in a turbulent environment (Fritsch and Wyrwich, 2022). Hence, the entrepreneurial ecosystem constitutes an important component of the more broadly defined regional innovation system, that section of the economy that generates knowledge, innovation, and newness (Asheim, Isaksen and Trippl, 2019).

Our understanding of entrepreneurial ecosystems and the long-term persistence of regional entrepreneurship is still rather incomplete. One key explanation of such long-term persistence is the prevalence of a regional culture of entrepreneurship that is often the result of a long tradition of pronounced levels of self-employment and new business formation. Generally, a regional culture is

¹ A common definition of an entrepreneurial ecosystem does not exist. Acs et al. (2014, 479) describe the system of entrepreneurship as “the dynamic, institutionally embedded interaction between entrepreneurial attitudes, ability, and aspirations, by individuals, which drives the allocation of resources through the creation and operation of new ventures.” Spigel, Kitagawa and Mason (2020, 484) define entrepreneurial ecosystems “as the regional collection of actors (such as entrepreneurs, advisors, workers, mentors, and workers) and factors (cultural outlooks, policies, R&D systems, and networks) that all contribute to the creation and survival of high-growth ventures.”

typically defined as a “collective programming of the mind” (Beugelsdijk, 2007, 190) or as an “aggregate psychological trait” (Freytag and Thurik, 2007, 123). It can be also described as an informal institution that changes only rather slowly as compared to the development of the regulatory framework of formal rules that may change rather quickly and frequently. Research has shown that informal institutions tend to maintain a high degree of independence from changes in the social, economic, and political context, particularly changes in formal rules (North, 1994; Williamson, 2000). Differences in the regional culture could explain why people do not react similarly to certain challenges that apply nationwide (Huggins and Thompson, 2021).

One can distinguish between a normative-cognitive and a policy layer of an entrepreneurial culture (for details see Fritsch and Wyrwich, 2019). The *normative-cognitive layer* reflects the social acceptance or legitimacy of entrepreneurship in a region (Kibler et al., 2014) and alludes to high shares of entrepreneurial role models, of people with entrepreneurial values and with an entrepreneurship-prone personality profile (Huggins and Thompson, 2021; Obschonka and Stuetzer, 2017). Further elements of this normative-cognitive layer of an entrepreneurial culture are a high level of entrepreneurship-promoting social capital (Westlund and Bolton, 2003; Westlund et al., 2014), a realistic public image of entrepreneurs (Cardon et al., 2011), and a collective memory of historically successful entrepreneurship (Fritsch et al., 2019; Fritsch, Pylak and Wyrwich, 2022).

The *policy layer* of a regional culture of entrepreneurship comprises entrepreneurship-friendly laws and regulations that lead to a supportive infrastructure for start-ups. Such infrastructure includes, for example, entrepreneurial networks (e.g. mentorship, shared facilities) and the availability of venture capital (e.g. Kenney and Patton, 2005; Samila and Sorenson, 2011; Spigel, 2020). It may also comprise key public actors in the local innovation system such as ‘entrepreneurial’ universities that actively promote academic entrepreneurship (e.g. Etzkowitz, 2000; Shane, 2004). The two layers are, of course, interdependent. Policy can and does influence the beliefs and experiences of the regional population, and can particularly affect the regional knowledge base by providing an infrastructure of public education and research. The preexisting

culture can and does affect the design and the implementation of policy. This persistence of an entrepreneurial culture can be an important stabilizing factor for the entrepreneurial ecosystem that may be particularly important in the face of unfavorable conditions of the regional environment (Huggins and Thompson, 2021).

3. The general framework

Both our case study regions are located in East Germany. The eastern part of Germany is particularly interesting for the analysis of long-term developments because it experienced a number of disruptive shocks. After the devastating Second World War (WWII) East Germany came under the control of Russia that installed a socialist state, the German Democratic Republic (GDR), that introduced a Soviet-style planned economy where most production was organized in large state-owned companies and where private ownership of the means of production was a foreign concept. The government strongly favored collectivist values and implemented a number of policies intended to eradicate entrepreneurship. These policies included massive socialization of private enterprises and the suppression of any remaining private sector activity (for details, see Pickel, 1992, and Arp, 2005).

The socialist state collapsed late in 1989, and the two German states were reunified in 1990. The GDR regime left behind an economy that, as a result of inappropriate organization, mismanagement, worn-out production facilities, and inadequate infrastructure, only achieved barely a third of the West German productivity level. At the end of September 1989, i.e. a few weeks before the beginning of the peaceful revolution that led to the breakdown of the old regime, the share of entrepreneurially self-employed persons in the labor force of the GDR as a whole was 1.8% (Statistik der Deutschen Demokratischen Republik, 1990). Hence, some of the private companies and thus the entrepreneurial tradition survived until the end of the GDR period despite massive repressions. The much higher share of the self-employed population in West Germany (about 9% compared to 1.8% in the East) clearly documents that the anti-entrepreneurial policy of the socialist regime had a rather considerable effect (Fritsch and Wyrwich, 2019).

The subsequent transformation process of the East German economy to a market economic system was a “shock treatment” where the ready-made formal institutional framework of West Germany was adopted practically overnight (e.g., Brezinski and Fritsch, 1995; Hall and Ludwig, 1995; Sinn and Sinn, 1992). This development induced a massive and swift structural change, accompanied by an almost complete replacement of the incumbent firms. Between 1989 and 1991, the share of manufacturing employment in East Germany dropped from 48.7% percent to 16.0% (Hall and Ludwig, 1995), and unemployment rose from virtually zero in 1989 to more than 15% in 1992 (Burda and Hunt, 2001). The liberalization of entrepreneurship in the new market system led to a veritable start-up boom in the first years after reunification, with the vast majority of these start-ups being in the service sector (Fritsch, Greve and Wyrwich, 2022a). While the privatization of formerly state-owned enterprises mainly attracted investors from West Germany and abroad, the founders of new companies were predominantly former GDR citizens.²

Due to the high level of business start-ups, the East German self-employment rate rose steadily, reached the West German level around 2005, and has since been slightly above the corresponding value for the West of the country (Fritsch, Greve and Wyrwich, 2022b). However, during the first three decades after the collapse of the GDR, the employment created by the newly founded businesses could not compensate for the job losses associated with the transformation. Although the average level of unemployment in the old and new Federal States has largely converged in 2019, there are considerable regional differences here. One factor that contributed to the equalization of the level of unemployment in East and West was the massive outflow of young and well-educated people (Hunt, 2006), which was largely driven by the relatively poor economic situation in East Germany after the re-unification. This ‘brain drain’ has now an increasingly negative impact on economic development in eastern Germany.

² A major problem of East German founders was a lack of knowledge and experience with the requirements of a market economy. Above all, a lack of business knowledge and low skills in management were obstacles to growth and increased the risk of failure. Another problem was the low equity capital of the founders, because in the context of the GDR economy there were hardly any incentives or opportunities to build up private assets.

Today, more than 30 years after this transformation process began, Eastern Germany still lags far behind the economy of Western Germany (IWH, 2019). Despite positive developments, the consequences of the socialist era and the subsequent transformation to a market economy are still clearly noticeable. One of the obvious legacies of the recent turbulences is that there are hardly any larger firms in the East German economy. Larger economic units are more or less exclusively branch operations of large West German and international companies, for example in the automotive industry. The fact that only an extremely small share of the more than 1,000 medium-sized German world market leaders—often family businesses with a long entrepreneurial tradition—are located in East Germany (Vonnahme, 2021) is obviously a consequence of the extensive destruction of the entrepreneurial base during the GDR era that is still effective today.

4. Overview of case study regions

Our two case study regions, South Saxony and Mecklenburg, have rather different natural conditions that strongly shaped their economic histories. South Saxony³ is located south of Berlin at the border of the Czech Republic (next to Bohemia) and comprises the mostly rural Ore Mountains (*Erzgebirge*) as well as the cities of Dresden, Chemnitz and Zwickau (Figure 1) that are, however, of rather modest size.⁴ Dresden is the capital city of the Federal State of Saxony with a large university and a high thickness of other research facilities. The geographic distance between Dresden and the city of Prague is slightly smaller than between Dresden and Berlin. The region has a long tradition of mining and manufacturing. High levels of research, innovation and entrepreneurial initiative made South Saxony one of the wealthiest regions in Europe before WWII. The region has also managed the challenge of the shock-transformation after the collapse of the socialist regime considerably better than other parts of East Germany (Fritsch and Wyrwich, 2022).

³ South Saxony encompasses the counties Dresden city (14612), the Saxon Switzerland East Ore Mountains (14628), Central Saxony (14522), Chemnitz city (14511), Ore Mountains (14521), and Zwickau city (14524).

⁴ Dresden has about 550 thousand population while Chemnitz (about 250 thousand population) and Zwickau (slightly more than 90 thousand population) are much smaller.

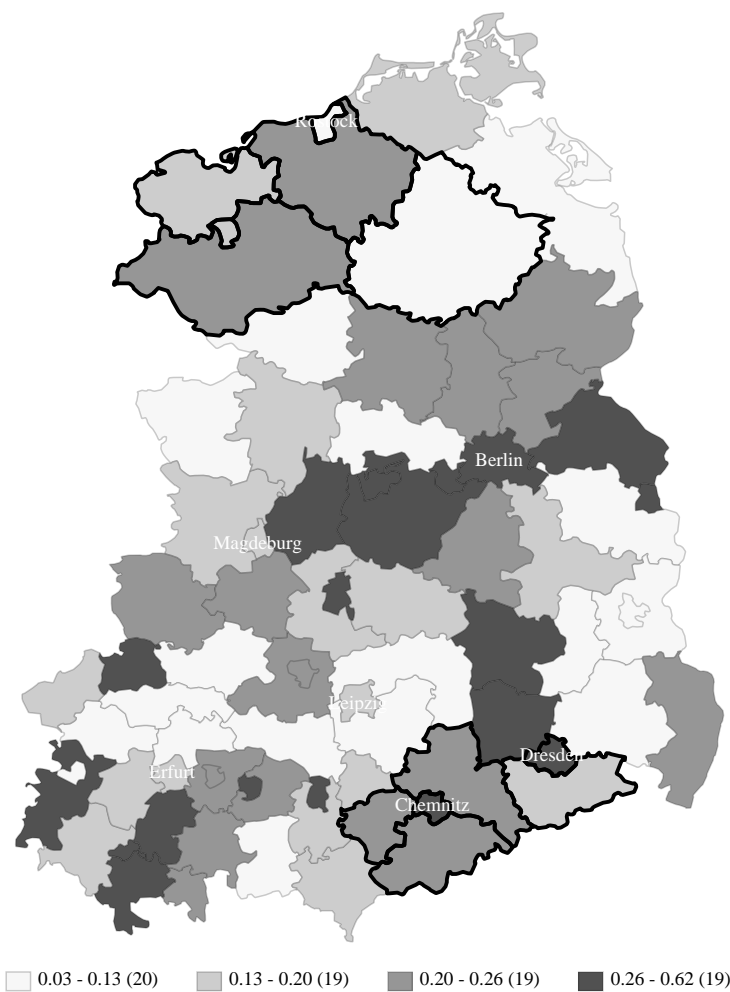


Figure 1: Startup rate in innovative manufacturing, 2015-2019

Our second case study region is Mecklenburg⁵ located north-west of Berlin at the Baltic Sea with Rostock as its largest city (with slightly more than 200 thousand population) and the main harbor. The administrative center is Schwerin with about 96 thousand population. The area was for centuries dominated by feudal structures of large-scale agriculture with low population density. Mecklenburg was always among the poorest and economically less developed German regions with an image of a notorious technological laggard. Research and innovation always played a rather minor role there. Today the region is still

⁵ Mecklenburg encompasses the counties Rostock city (13003), Schwerin city (13004), Mecklenburg Lake District (13071), Rostock (13072), Northwest Mecklenburg (13074) and Ludwigslust-Parchim (13076).

dominated by often large-scale agricultural production. Significant manufacturing activity can only be found in and around Rostock.

Table 1: Historical indicators 1925 and 1989

	South Saxony	Mecklenburg
Income per employee (<i>Reichsmark</i>), 1925 ^a	4 038.83	2 730.83
Tax revenue from business operations per taxpayer (<i>Reichsmark</i>), 1925 ^a	4 154.68	2 765.48
Self-employment (excluding agriculture), 1925 ^b	9.67	10.24
Self-employment rate in manufacturing, 1925 ^b	4.60	4.37
Self-employment rate in science-based industries, 1925 ^b	0.31	0.27
Self-employment (excluding agriculture), 1989 ^c	2.84	1.40
Population, 1925 ^b	2 767 979	828 225
Population density, 1925 ^b	390	52
Patents per 10 thsd, population, 1925 ^d	2.64	0.53
Number of universities	3	1
Share of manufacturing employment, 1925 ^b	54.10	16.91
Share of manufacturing employment, 1989 ^c	54.52	32.04
Share of agricultural employment, 1925 ^b	12.52	46.75
Share of agricultural employment, 1989 ^c	5.82	19.25
Employment share in knowledge-intensive industries, 1925 ^b	9.73	2.76
Share of persons with university degree over total workforce (%), 1989 ^c	7.64	7.49

Sources: (a) Statistisches Reichsamt (1929); (b) Statistik des Deutschen Reichs (1927). Knowledge-intensive industries in 1925 are defined as “machinery, apparatus, and vehicle construction,” “electrical engineering, precision mechanics, optics,” “chemicals,” and “rubber and asbestos”; (c) Rudolph (1990). Share of manufacturing employment in 1989 excludes construction; (d) Reichspatentamt (1926).

Table 1 shows a number of indicators for the two regions in the year 1925 (before WWII) and at the end of the socialist period in September 1989. Indicators for the current structure and performance of these regions are summarized in Table 2. There are systematic differences for many of these indicators that reflect the differences in the entrepreneurial ecosystems and that are likely to be rooted in the history of both regions, which we focus on in the following.

Table 2: Overview of present-day indicators

	South Saxony	Mecklenburg
GDP per capita, 2015-2019, in thousand	30.62	27.93
Change in GDP per capita, 1990-2016	2.29	1.99
Self-employment (excluding agriculture), 2010-2015 ^d	10.86	9.50
Startup rate, overall, 2015-2019 ^a	22.45	24.30
Startup rate, innovative manufacturing, 2015-2019 ^a	0.26	0.17
Startup rate, high-tech services, 2015-2019 ^a	1.51	1.09
Patents per 10 thsd. employees, 2010-2014 ^c	5.38	1.80
R&D employment share, 2010-2014 ^b	5.07	1.40
Number of universities	3	1
Number of technical colleges	3	3
Number of non-university research institutes of national scientific organizations / no. of employed persons ^g	20 / 6,181	6 / 1,143
Number of university professors per population, 2010-2017 ^e	4.65	3.29
Number of professors at technical colleges per population, 2010-2017 ^e	2.93	3.47
Third-party funding per university professor, 2010-2017 ^e	456.70	195.45
Third-party funding of universities in relation to basic funding, 2010-2017 ^e	67.15	31.89
Third-party funding per professor at technical colleges, 2010-2017 ^e	22.18	36.46
Third-party funding of technical colleges in relation to basic funding, 2010-2017 ^e	12.98	16.38
Share of students (%) in total population, in Winter Term 2017/18 ^e	3.05	3.46
Population	2 024 531	1 149 184
Population density, 2015	285	71
Share of manufacturing employment, average 2010-2016 ^b	0.29	0.20
Share of employees in establishments with fewer than 200 employees, 2010-2014 ^b	0.72	0.78
Entrepreneurial personality fit, average 2003-2015 ^f	-19.67	-19.87

Sources: (a) Mannheim Firm Panel (ZEW); (b) Employment Statistics (*Betriebs-Historik Panel*) of the Institute for Labor Market Research (IAB, Nuremberg); (c) Rassenfosse et al. (2019); (d) German Federal Statistical Office (*Arbeitskreis Erwerbstätigenrechnung*); (e) German University Statistics; private universities are excluded. (g) Federal Report on Research and Innovation; (f) Fritsch, Obschonka and Wyrwich (2019).

5. South-Saxony: early silver mining and innovation

Entrepreneurship and innovation have a long tradition in the southern part of Saxony. Systematic colonization of the region started in the early 12th century.⁶

⁶ Before the colonization the region was only rather sparsely populated with very few and small settlements.

The inflow of population was soon boosted by the first discoveries of silver near the village of Christiansdorf (today Freiberg) in 1168 and the resulting development of mining. The silver discoveries created a 'silver rush' (*Berggeschrey*) that attracted people from other regions to the area. Quite soon rich deposits of other minerable ores such as tin, copper, and bismuth were discovered. A special feature of this initial period was the "freedom of mining" (*Bergfreiheit*).⁷ This means that everyone was allowed to extract mineral resources on his own account but had to deliver a certain share of the proceeds to the sovereign. This type of regulation was clearly conducive to entrepreneurship and one can well assume that it particularly attracted people with an entrepreneurial and adventurous mindset.

While the ores were initially extracted in easily accessible open pits it was soon necessary to dig deeper and go underground. This was associated with steadily increasing technical requirements. The development of ore mining, but also the smelting and further processing of the extracted ores, stimulated the development of local crafts and were a strong impetus for numerous inventions and innovations. In this process an extensive, valuable and rapidly growing knowledge base emerged. This also presented the task of creating institutional structures to collect the knowledge, secure it, develop it further and make it available for economic use. An important milestone in solving this task was the founding of the Freiberg Scholarship Fund (*Stipendienkasse*) in 1702 to promote the systematic education of mining officials. The Scholarship Fund developed into the founding of the Freiberg Mining Academy (*Bergakademie Freiberg*) in 1765 as one of the first technical universities in the German-speaking world (Albrecht, 2016). At the beginning of the 20th century the region's outstanding scientific and technical knowledge base manifested itself in three technical universities located in relative close distance (in Chemnitz, Dresden and Freiberg), that all had a special focus on natural sciences and engineering.

Beginning in the 18th century the South Saxony was one of the first German regions to develop industrial production (Albrecht, 2018a, b). The region was prominent in mechanical engineering, electrical engineering and wood

⁷ This is where the name of the city Freiberg comes from.

processing delivering goods like machinery, technical instruments, and textiles to other German regions and to other countries (Gutberlet, 2014). Before World War II, South Saxony was among the most highly industrialized regions in Europe and one of the wealthiest ones in Germany (Tipton, 1976). The industry was characterized by a well-skilled workforce, a high employment share in knowledge-intensive industries and a high level of patenting (Table 1). The many small and medium-sized firms, among them many family businesses, established a tradition of entrepreneurial talent and innovativeness (Tipton, 1976; Mieck, 2009).

The catastrophic consequences of the lost Second World War were strongly felt in Saxony. Immediately after the end of the war, industrial plants were dismantled by the Russian occupation forces. The new socialist state collectivized the means of production by expropriations and the systematic suppression of private entrepreneurial initiative (Pickel, 1992; Arp, 2005). As a result of this development, entrepreneurs in particular left the GDR until the construction of the Wall in 1961, many of whom then established new companies in the West (Falck et al., 2013; Hefe, 1998). At the end of the socialist period in 1989 the share of remaining self-employed persons in the workforce was relatively high in most parts of South Saxony; in some regions this share made significantly more than 3% compared to an East German average of 1.8% (Fritsch and Wyrwich, 2019). That significantly more private firms in South Saxony had ‘survived’ the collapse after the Second World War and 40 years suppression of entrepreneurship by the socialist state clearly indicates the strong entrepreneurial tradition that existed before the GDR period.

During the socialist period the region also preserved much of its institutions of higher education and research, particularly its three technical universities located in Chemnitz, Dresden and Freiberg. In addition to these three universities South Saxony today also hosts three universities of applied sciences (*Fachhochschulen*), a type of higher education institution that is comparable to what is a ‘technical college’ in other countries.⁸ It is most remarkable that after

⁸ The universities of applied sciences (*Fachhochschulen*) are mainly intended to provide undergraduate education with a focus on transferring theoretical concepts and scientific methods into practical application. They differ from regular universities in many respects, including purpose, scope and size, teaching, and research (Warning 2007); they do not grant Ph.Ds. Professors have much higher teaching loads than those at the regular universities and little or no

unification the government of the Federal State of Saxony was successful in attracting twenty institutes of the major German research organizations (Max Planck Society, Fraunhofer Society, Helmholtz Society and Leibniz Association), nearly all of them located in the city of Dresden.⁹ Since the location of such institutes requires substantial financial contributions of the Federal State, their rather large number indicates a rather pronounced political will of the regional government to build a strong regional knowledge base and a well-functioning entrepreneurial ecosystem (BMBF, 2020). Altogether, for a region of that size in terms of population (i.e. slightly more than two million inhabitants), the knowledge infrastructure of South Saxony is very well-developed. It is rather remarkable that the Federal State of Saxony had also a leading role among the East German regions in implementing comprehensive policies aiming at the promotion of innovative start-ups. The historical strength of the knowledge base in South Saxony as well as the political support of innovation and entrepreneurship after unification manifest in high shares of R&D employment, large numbers of patents per employee as well as high shares of start-ups in innovative and knowledge-intensive industries (Table 2).

Summarizing, one can say that South Saxony was characterized by a pronounced long-term co-evolution of knowledge and entrepreneurship. Both factors represent strongly related key elements of the region's ecosystem that are deeply rooted in its history. Knowledge and entrepreneurship can be regarded as important elements of the regional culture that was able to persist four decades of socialism and a radical transition to a market economy. Particularly the rather pronounced policy efforts of building a dense infrastructure of public research in the region as well as intensive support of innovative start-ups after the demise of the socialist regime are entrenched in this culture and may have been stimulated by a memory of innovation and prosperity in times before WWII and the socialist regime.

support in terms of finance or personnel for conducting research. On average, universities of applied sciences are much smaller in terms of personnel and students than regular universities.

⁹ Two of these institutes are located in the city of Chemnitz and one is in Waldheim. The geographic distance of these locations to the city of Dresden is less than 80 kms.

6. Mecklenburg: large-scale agriculture and resistance towards industrialization

The region of Mecklenburg is the western part of the Federal State of Mecklenburg-Western Pomerania. It comprises the former historical Dukedoms of Mecklenburg-Schwerin and Mecklenburg-Strelitz.¹⁰ In contrast to the highly industrialized region of South Saxony, the economy of Mecklenburg was dominated by agriculture and there was hardly any industrial development prior to WWII. By 1925, almost half of the population (46.75%) was employed in agriculture compared to only 12.52% in South Saxony. Until WWII the agricultural sector in Mecklenburg was characterized by large-scale farms owned by squires (*Landjunker*) who ferociously tried to preserve their dominant positions in the social, political and economic landscape.¹¹ As a consequence, they also strongly opposed any attempts of the central government to foster industrialization because they feared the emergence of new powerful actors (e.g. industrialists) in their region as well as the formation of an industrial proletariat that calls for social reforms (Tipton, 1974). Entrepreneurship played no meaningful role in the historical development of the region.

Economic and social backwardness of the region on the verge of the 20th century as well as rather limited employment opportunities led to massive outmigration to newly emerging centers of industrial production as well as to overseas. For instance, between 1846 and 1914 around 16,000 overseas emigrants left Mecklenburg-Strelitz and 80,000 overseas emigrants left Mecklenburg-Schwerin between 1853 and 1877 (Mieck, 2009).

Industrialization in Mecklenburg began much later than in other parts of the country, particularly when compared to South Saxony (for details see Mieck, 2009). In the year 1925, the employment share in the manufacturing and crafts sector in Mecklenburg was 16.9%, far below the national average of 26.2% and 54.1% in South Saxony (Table 1). In 1922, the first aircraft factory (*Heinkel Flugzeugwerke*) was founded in Warnemünde close to the city of Rostock and it

¹⁰ Western Pommerania was part of the Prussian province of Pommerania. As part of Prussia, this area had a different institutional and cultural development before World War II.

¹¹ This pattern is illustrated by the fact that until 1822 most of the population working on these farms were serfs with rather low level of education. Social mobility was virtually non-existent (Benthien et al., 1984).

did rapidly grow into one of the largest German aircraft companies before WWII. The armament policies of the Nazi regime in the 1930s fueled the development of an aircraft cluster in the region with Rostock as its center (Berentsen 1981; North 2015). Due to the large-scale character of this industry, it was not particularly conducive to spur entrepreneurship. The high-tech and knowledge-intensive aircraft industry in Mecklenburg was, however, completely dismantled after the occupation by the Soviet Army at the end of WWII. After the complete destruction of all production facilities and buildings a fish-processing combine was set up on the site (Mieck, 2009; Karlsch and Laufer, 2002). The *Heinkel* firm relocated to the West German region of Stuttgart and continued operations there. In Mecklenburg, the industry never managed to recover again.

The new socialist East German state reorganized the agricultural sector in line with the Marxist-Leninist concepts. In a Land Reform of the years 1945-1952 the squires were expropriated, and farming lands were transferred to former peasants and to refugees from former German territories¹². In a second phase of the socialist agricultural policy, nearly all of the farmland was collectivized. The socialist government introduced an extensive industrialization policy in Mecklenburg so that the share of the workforce employed in agriculture decreased from 44.8% to 21.2% between 1955 and 1990 while the share of manufacturing employment rose from 13.2% to 23% (Mieck, 2009). One of the political priorities in the industrialization was the formation of a shipbuilding industry because the previously major German centers of shipbuilding at the Baltic Sea were located in the West German Federal Republic or fell to Poland after WWII (e.g., Stettin, Danzig). The government also heavily enforced an expansion of ports and the harbor of Rostock was supposed to become a "gateway to world trade" (Mieck, 2009).

Despite increasing the industrial share of several cities in Mecklenburg (Rostock, Neubrandenburg and Schwerin), capital shortages and investment bottlenecks impeded a more comprehensive industrialization of the region. Many

¹² To realize the land reform, the property of the disempowered squires was transferred to a state land fund and was then distributed among households. For instance, in the three northern districts about 114,000 families received land. However, by 1949 about the quarter of them gave up their farms. Therefore, the GDR leadership announced a new Soviet-type agricultural policy aiming at collectivization of the farms (North 2015).

of the production facilities in the North belonged to combines that had their headquarters outside the region and the production tended to be not very knowledge-intensive. Agriculture, shipbuilding, and fishing – all being not really knowledge-intensive industries – were the most important economic sectors during the GDR period (Mieck, 2009).

After the reunification, many industries established during the GDR era in Mecklenburg collapsed or operated only inefficiently despite immense subsidies. Particularly the shipyards and shipping companies in Rostock were in permanent crisis with a dramatic drop of employment (Mieck, 2009). Although agriculture still played an important role by the time the GDR fell apart, rural employment dropped rapidly already during the first years after reunification. An industry that is related to agriculture and remained important after the reunification is food-processing (Mieck, 2009). Poor economic development induced further outmigration adding to the historically scarce population density of the region. Nowadays, this part of the country is one of the most sparsely populated regions of Germany and its inhabitants' as well as population density levels that lie far below the levels of South Saxony (Table 2).

Thanks to its natural conditions, the region of Mecklenburg represents an attractive vacation spot. Tourism in the region has been flourishing since the late 19th century¹³ and remains a promising sector for the future economic development (Mayer and Stoll-Kleemann 2020). Another promising sector that is highly promoted by policy in the region is biotechnology (BMBF 2020). Although the overall level of startup activity in Mecklenburg is marginally higher than in South Saxony (22.45 vs. 24.30 per 10 thousand employed persons respectively – see Table 2), a high share of the start-ups is in the hospitality sector, whereas the share of start-ups in innovative and knowledge-intensive industries is far behind the level of South Saxony. Innovation activity and the regional knowledge base remains highly underdeveloped.

The only university in Mecklenburg that is located in Rostock was founded already in 1419. Being once a center of knowledge that attracted greater

¹³ The first German resort was founded in 1793 near the summer residence of the Dukes of Mecklenburg. After the construction of a railroad in 1870, the numbers of tourists rapidly increased (Benthien et al., 1984).

numbers of students from other countries, it has today lost much of its leading role beyond the local context. It is also much less focused on natural sciences and technology than the three technical universities in South Saxony. Today, the region also hosts three Universities of Applied Sciences. Compared to South Saxony the government of the region made much less efforts of developing the regional knowledge base. This is reflected in the rather small shares of R&D employment, the low number of patents per population and low start-up rates in innovative and knowledge-intensive industries (Table 2).

7. Comparative analysis of innovation and entrepreneurship in the two regions

It is quite remarkable that both of our case study regions appear to be not very different when looking at the overall levels of self-employment, new business formation and education. Obviously, it is not the overall level of entrepreneurship that makes the difference between the two regions but its quality. Both regions had comparable self-employment rates before WWII but the economic success of entrepreneurship as indicated by tax revenue from business operations per taxpayer (Table 1) was much higher in South Saxony. The considerably better economic performance of businesses in South Saxony before WWII corresponds to a much more developed knowledge base as indicated by a higher level of patenting and greater employment shares in science-based and knowledge-intensive industries. Also today, the levels of overall self-employment and new business formation in the two regions are quite similar. South Saxony has a slightly higher overall self-employment rate, but the start-up rate is higher in Mecklenburg. Also, the shares of population with a university degree at the end of the socialist period in 1989 or the share of students today do not differ systematically between the two regions (see Table 2).

The main differences pertain to the share of resources devoted to innovation and knowledge production. Today, South Saxony has a more than 3.5 times higher share of R&D employment (5.07% vs. 1.40% of all employees) and nearly three times more patents per employee than Mecklenburg (5.38 patents vs.

1.80 patents per 10 thousand employees).¹⁴ South Saxony also has considerably higher start-up rates in innovative manufacturing and high-tech service industries. This much higher level of innovativeness goes together with a much better developed infrastructure of universities and non-university research institutes that can be regarded the backbone of the regional knowledge base that also constitutes an important infrastructure for knowledge transfer into the private sector. These findings clearly indicate a key role of the regional knowledge base for innovative entrepreneurship and its persistence. The figures suggest that the pronounced entrepreneurial heritage of South Saxony is mainly evident in the levels of new business formation in innovative and knowledge-intensive industries. It is the quality of entrepreneurship that counts!

A quite significant difference between the two regions under study pertains to the size and the density of the population. While large parts of both regions are rather rural, South Saxony has more and larger cities resulting in a much higher average population density there. —285 population per square km in South Saxony vs. 71 population per square km in Mecklenburg. The lower “thickness” of the entrepreneurial ecosystem in Mecklenburg could imply a lower potential for desirable interaction, lower market potential, and fewer knowledge spillovers.

Quite obviously, the development of both our case study regions is deeply rooted in their history. The discovery of silver and other ores in the region of South Saxony initiated a growth trajectory that was characterized by intensive co-development of entrepreneurship, knowledge and innovation resulting in long-term economic prosperity. At the end of the socialist period in the year 1989, the rate of remaining self-employment was twice as large in South Saxony (2.84%) as compared to Mecklenburg (1.40) (see Table 1). The relatively high share of self-employed people at the end of the socialist regime in 1989 in the region suggests that this long history created a deeply rooted entrepreneurial attitude in the regional population that contributed to relatively quick recovery. It is also quite remarkable that after the regime switch that occurred with German reunification in 1990 the government of the newly created Federal State of Saxony strongly

¹⁴ Our results are in line with Rammer et al. (2020). The authors show that compared to Berlin, the Ore Mountains area in South Saxony is the only East German region with above-average product or process innovations as well as continuous R&D activity, whereas some areas of Mecklenburg are the most lagging behind.

invested into a rich research infrastructure and promoted entrepreneurship, particularly innovative start-ups, much earlier and with considerably more vigor than other local governments in the former socialist part of Germany. This indicates the role of the policy layer of an entrepreneurial culture for persistence of entrepreneurship and knowledge production.

In contrast, the region of Mecklenburg never experienced such lasting impulses that could have promoted a deeply rooted culture of knowledge creation, innovation, and entrepreneurship. A glimpse at the regional entrepreneurial personality fit suggests that the population in Mecklenburg has a weaker entrepreneurial profile as compared to South Saxony (see Table 2).¹⁵ In fact, the region was and still is largely dominated by its agricultural sector and a relatively weak knowledge base associated with a long history of technological backwardness and non-sustainable attempts of industrialization in the socialist period. Some impulses for innovative manufacturing such as the aircraft and aerospace production cluster in Rostock existed for just some years but was demolished immediately after WWII. That Mecklenburg had considerably less of a lasting entrepreneurial tradition may have at least four reasons.

- First, the technological backwardness of the region and its weakly developed knowledge base before WWII provided only relatively small numbers of entrepreneurial opportunities and may have also resulted in low levels of absorptive capacity of potential entrepreneurs.
- Second, as a consequence of the weakly developed knowledge base, the quality of historical entrepreneurship in terms of knowledge intensity, innovation and economic success was much lower in Mecklenburg. Based on a study of persistence of entrepreneurship in Poland, Fritsch, Pylak and Wyrwich (2022) argue that self-employment in knowledge-intensive industries represents entrepreneurship of a relatively high quality.¹⁶ A reason for assuming a

¹⁵ A value closer to 0 indicates a more pronounced entrepreneurial profile. In fact, the value in Mecklenburg lies slightly below the East German average (-19.70), whereas the value of South Saxony exceeds the East German average. For details on the index composition see Fritsch, Obschonka and Wyrwich (2019).

¹⁶ The authors found that in Poland, only historical self-employment in knowledge-intensive industries is significantly related to new business formation today while historical self-employment in other industries or historical self-employment in general plays no meaningful role in the explanation of current entrepreneurship levels.

relatively high quality of knowledge-intensive self-employment is that setting up and running such a firm requires certain entrepreneurial attitudes and qualifications. Moreover, knowledge-intensive firms may be technologically and economically more successful thereby creating considerable numbers of promising entrepreneurial opportunities.¹⁷ For these reasons one can expect that positive role model effects of self-employment in knowledge-intensive industries are generally more pronounced than is the case for self-employment in other parts of the economy. Based on these arguments regions with relatively high levels of self-employment in knowledge-intensive industries should have inherited a greater number of high-quality entrepreneurs that can serve as attractive role models and facilitate the prevalence of a place-based collective memory that stimulates higher levels of new business formation many years later.

- Third, the strong focus on agriculture. There is considerable empirical evidence, that agriculture is not a particularly fruitful breeding ground for entrepreneurship (Fritsch and Wyrwich, 2019; 2023).
- Fourth, the feudal social structures that dominated the region until WWII, massive attempts of the landowners (squires) to preserve their privileged positions as well as their hostility to new developments created a strong people climate of suppression, economic dependence, and backwardness that was not at all favorable for entrepreneurship (e.g., Tipton 1974). Such a social atmosphere is in stark contrast to what is assumed to be an ‘entrepreneurial’ climate characterized by individualism, creativity, and openness to new developments (e.g., Fritsch and Wyrwich, 2019).

8. Discussion and Conclusions

Entrepreneurship and knowledge are key sources of regional development. Comparing two regions in post-socialist East Germany, we demonstrate that differences of the ability to cope with challenges of the radical transition to a market economy and economic development can be to a considerable degree

¹⁷ Although there is no solid empirical evidence available that would allow us to assess the performance of firms in different industries in the time before WWII, most of those firms that are remembered today were innovative and knowledge intensive.

attributed to entrepreneurship and knowledge. Our findings clearly underline the importance of the regional knowledge base for the performance of an entrepreneurial ecosystem. Particularly in South Saxony entrepreneurship and knowledge are closely related. These results suggest that analyses of entrepreneurial ecosystems should account for this close relationship. The case of South Saxony also demonstrates how the co-evolution of entrepreneurship and knowledge over a long period of time can create a regional culture that generates long-term economic benefits. This clearly indicates that a region's history, traditions, and cultures can play an important role in our understanding of its development.

More research is warranted to understand how the historical roots of entrepreneurship and knowledge determine trajectories of regional development in a fast-changing world. This may also help policy to find adequate region-specific development strategies that enable new and sustainable growth paths.

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