Michael Fritsch · Michael Wyrwich

# Regional Trajectories of Entrepreneurship, Knowledge, and Growth

## The Role of History and Culture

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# Regional Trajectories of Entrepreneurship, Knowledge, and Growth

The Role of History and Culture

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# Preface

This book summarizes and extends research conducted by the authors during the past decade. Although much of the material included in this book has already been published in the form of academic articles, we offer much more than a simple compilation of our earlier publications. First, we updated nearly all of the empirical analyses based on new data or longer time series of data that are only now available. Second, publishing the material in the form of a book allows us to present the arguments and the empirical material in a more extended way than it is possible in most academic journals, which often have restrictions placed on the length of articles. Third, we believe that having the complete arguments and empirical analyses collected in one place provides a much more comprehensive presentation and allows for considerably deeper insights.

Although bringing this research together in a book has considerable advantages, readers who are primarily interested in a certain topic or chapter may feel it a disadvantage if they have to switch between different parts of the book for data descriptions or historical backgrounds. In order to make the different chapters more readable on their own, we briefly reiterate the most relevant historical facts in each chapter. Therefore, a reader who studies the entire book may find some repetitions and redundancies.

We are indebted to innumerable individuals, groups, and institutions who supported our work in many ways. Discussions at conferences and workshops where we had the opportunity to present our work, as well as many of the referee reports that we received from scholarly journals, proved to be very helpful and were quite frequently sources of new ideas. Particular thanks go to those colleagues who participated in our discovery process as co-authors or collaborators in related work. Most direct support came from our colleagues Udo Brixy, Elisabeth Bublitz, Sandra Kublina, Martin Obschonka, Alina Sorgner, and Michael Stuetzer. The Institute for Employment Research (IAB) at the German Federal Employment Agency (BA) as well as the Center for European Economic Research (ZEW) graciously provided us with important data. Rosemarie Mendler prepared all the maps with great accuracy, and Anja Ladig, Thomas Robert Holy, and Marco Mai provided valuable technical

assistance in updating references and supporting the editing of the final text. Special thanks go to Mark Pegors for polishing the final manuscript. Last but not least, we are deeply indebted to the German Research Foundation (DFG). It was with their backing that the first part of this research journey began under the auspices of the Collaborative Research Center "Social Developments in Post-Socialist Societies—Discontinuity, Tradition, Structural Formation" at the universities of Halle and Jena, Germany.

We very much hope that this book will find an interested audience. Our aim is to present an inspiring illumination of the multifaceted role played by history and culture in regional trajectories of entrepreneurship, knowledge, and growth.

Jena, Germany                                                                      Michael Fritsch
May 2018                                                                          Michael Wyrwich

# Contents

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# List of Figures

# List of Tables

# Chapter 1
# Introduction

Economic growth and prosperity are key topics on the political agenda. Despite intensive research, we still have only incomplete answers to questions such as: "Why do some countries and regions prosper, while others fall behind?", or "Why are certain countries and regions more seriously hit by exogenous shocks and suffer for long periods of time while others show quick recovery?"

This book focuses on regional sources of growth and the responsiveness of regions to global and national developments. Although there are many growth-relevant factors at the national and international level, zooming in on the regional level shows considerable differences in the effect of such factors across regions. Not only is there considerable diversity across regions with regard to their resources for growth, such as knowledge, talent, and behavior, regions may also considerably differ in their response to global and national challenges. We go, however, beyond the recognition that 'regions matter' for economic growth, by analyzing long-term trajectories of regional development in the sense of regional economic and social histories. The main claim that we make in this book is that there are deep historical roots that determine the relative economic performance of regions today. In short, not only do 'regions matter', but perhaps even more importantly, 'history matters'.

In the tradition of Joseph A. Schumpeter (1934), we emphasize entrepreneurship and innovation as important sources of economic growth. Our analysis shows that there are substantial differences in the levels of available knowledge, entrepreneurship, and innovation activity across regions, in earlier times as well as today. Investigating these differences, we find significant correspondence between the historical and the current levels of these factors. We show that historical traditions of entrepreneurship and innovation activity have an effect on regional growth and prosperity today.

The empirical analyses in this book are confined to Germany, and cover a time period of a nearly 120 years, from the year 1900 until today. Germany provides us with a particularly interesting case study for the analysis of long-term developments because the country was the focal point of a number of disruptive shocks to the

framework conditions of the social, political, and economic environment beginning in the early twentieth century. Main disruptions include the disastrous events of World War I, followed by a shift from an imperial regime to democracy in 1918, national turmoil in the post-war years causing hyperinflation in 1923, the world economic crisis of the late 1920s and early 1930s with the subsequent rise of the Nazi regime, the destructive results of World War II followed by massive in-migration of expellees from former German territories, and occupation by Allied Powers. After World War II, the country was divided into a Soviet controlled communist East Germany, while West Germany adopted a western-type market economy. Some forty years later, East and West Germany were reunified, bringing about a shock transformation of socialist East Germany to a market economy with severe and long-lasting economic problems. These disruptive shocks allow us to analyze the role of formal and informal institutions for regional development.

A key starting point for our research is the observation that regional differences in the level of entrepreneurship (measured by self-employment and new business formation) tend to be rather persistent over the long period of our analysis. Given the disruptive changes to the socio-economic framework conditions in Germany, we argue that finding a persistent level of regional self-employment and new business formation reflects a regional culture of entrepreneurship. Such a regional entrepreneurial culture can be understood as an informal institution that 'survives' drastic changes to the formal institutional framework. Chapter 2 introduces the notion of formal and informal institutions, and provides a detailed characterization a regional culture of entrepreneurship. Based on this characterization we discuss the role of a regional entrepreneurial culture for regional development, and provide an overview of possible reasons for the persistence of regional entrepreneurship.

Chapter 3 provides important basic information for the analyses that follow. We first give a brief overview of German history since the early twentieth century (Sect. 3.1). We then introduce the primary data sources that are used in the analyses. Finally, we describe the regional structures of self-employment and new business formation in both the early twentieth century and today (Sect. 3.2).

Chapter 4 investigates the persistence of regional levels of entrepreneurship in three different scenarios. Scenario I highlights West Germany during the years 1976–2014, a time that was characterized by rather stable economic and institutional framework conditions. Scenario II looks at the development of self-employment and new business formation in West Germany beginning in 1907 and carrying through until 2014, a much longer period that includes a number of drastic disruptive changes. The third scenario focuses on East Germany during the period 1907–2014. This scenario is particularly interesting because of the 40 years of Soviet imposed socialist ideology in East Germany, and the shock transformation to a market economy system after the dissolution of the socialist East German state. The empirical evidence suggests that East German regions with high levels of historical self-employment were able to cope with the challenges of the transformation process relatively well. This can be regarded a clear indication of the important role played by entrepreneurship and an entrepreneurial culture in regional development.

In Chap. 5, we analyze the particularly interesting case of East Germany in more detail. The historical realities of East Germany provide us with a "natural laboratory" in which to investigate the interplay between formal and informal institutions. After enduring 40 years of socialist institutions and anti-entrepreneurial policies, reunification of East Germany with West Germany in 1990 brought about the almost immediate installation of a western-type market economy. During the 40 years of communism in post WWII East Germany, West Germany was developing a capitalist market economy. Looking more closely at the East German example allows us several levels of analysis. First, we can examine the impact of the socialist institutions and policies on regional self-employment and entrepreneurial activity. Second, we are able to make a comparative analysis of the regional dynamics of entrepreneurship between the socialist era and after. Finally, we can accomplish a comparative, multilevel, side-by-side analysis of entrepreneurial activity and self-employment between East and West Germany—so to say 'an international comparison within one country'—, and observe the relative impacts of formal and informal institutions on regional growth.

Chapter 6 analyzes the effect of entrepreneurship on regional development. We find indeed that those regions with high levels of historical self-employment (a measure of entrepreneurship) experience higher growth rates today. According to our analysis, the mechanism behind this empirical regularity is that high historical self-employment rates apparently imply high current start-up rates that, in turn, have a positive effect on growth.

In Chap. 7 we investigate the link between historical levels of self-employment, historical knowledge sources and regional innovation activity today. A special focus of the analysis is on current levels of new business formation in technology intensive industries that can be regarded as particularly important for regional growth. We find that historical knowledge sources and an entrepreneurial tradition play a significant role in the number of start-ups in innovative industries. The results show that a considerable part of the knowledge that constitutes an important source of entrepreneurial opportunities is deeply rooted in history.

We test our conjecture that a regional tradition of entrepreneurship indicates a regional entrepreneurship culture in Chap. 8 by analyzing data about the personality traits of the local population. We find a significant positive relationship between the historical level of self-employment in a region and the presence of people with an entrepreneurial personality profile today. An aggregate entrepreneurial personality profile of the local population is not only associated with higher current levels of new business formation, but also with higher levels of innovation activity today. In the final chapter, Chap. 9, we summarize the results of our research, draw conclusions for theory, discuss policy implications and outline avenues for further research.

All in all, our empirical analyses of the growth trajectories of German regions demonstrate that history plays a critical role in economic development. Specifically, a culture of entrepreneurship can be extremely resilient and persistent over long periods of time, and has the ability to survive extraordinarily disruptive shocks to the political, social and economic framework conditions. This clearly demonstrates that critical sources of regional development are deeply rooted in the past, and that

previous activities and experiences do significantly shape current developments. Our analyses open up diverse avenues for future research. Our book is a "call to arms" for integrating history, institutions, and culture into any reasonable analysis that aims at understanding regional development. We demonstrate that accounting for historical factors is particularly relevant for an understanding of why certain regions experience a concentration of entrepreneurship and other regions do not. It goes without saying that the design and development of political programs that intend to foster regional entrepreneurship and growth must consider the historical, institutional and cultural environment of specific regions in order to be effective.

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# Chapter 2
# Entrepreneurship Culture and Regional Development

## 2.1 The Persistence of Regional Entrepreneurship

Studies of established market economies, such as West Germany (Fritsch and Mueller 2007), the Netherlands (van Stel and Suddle 2008), Sweden (Andersson and Koster 2011), the United Kingdom (Mueller et al. 2008; Fotopoulos 2013), and the United States (Acs and Mueller 2008), show that regional start-up rates tend to be relatively persistent over periods of one or two decades. Even if the overall level of new business formation in a country changes, the rank order of regions tends to remain rather constant (Fotopoulos and Storey 2017). Hence, regions that have a relatively high level of self-employment and new business formation today can be expected to also experience high levels of entrepreneurship in the future.

One of the main reasons for this strong persistence could be that region-specific determinants of entrepreneurship also remain relatively constant over time, or, as stated by Alfred Marshall (1920), *natura non facit saltum* (nature does not make jumps). Indeed, variables that have been shown to be conducive to the emergence of new firms, such as qualification of the regional workforce or employment share in small firms (Fritsch and Falck 2007), do tend to remain fairly constant over successive years (Fotopoulos 2013; Fritsch and Kublina 2016).

A second explanation for the persistence of regional levels of new business formation could be the presence of an entrepreneurial culture (Andersson and Koster 2011; Fritsch and Wyrwich 2014). An entrepreneurial culture can be thought of as an informal institution that is 'in the air', i.e., reflected in norms, values, and codes of conduct in a society (North 1994) that are in favor of entrepreneurship. An entrepreneurial culture should, at least to some degree, be independent of socio-economic conditions and may, therefore, even survive considerable shocks to the socio-economic environment, such as serious economic crises, devastating wars, and drastic changes of political regimes (North 1994; Williamson 2000). Research has shown that these types of informal institutions tend to change much more slowly

than formal institutions, and only over rather long periods of time (North 1994; Nunn 2009; Williamson 2000).

Analyzing cases that are characterized by disruptive shocks of framework conditions, such as Germany during the course of the twentieth century, may help to identify the relevance of regional cultures. The main idea here is that if there is a persistence of regional entrepreneurship despite radical changes in the framework conditions, this may be viewed as an indication that the stability of structural characteristics is not the primary cause of this persistence. Because of the historical realities of the last more than 100 years (see Sect. 3.1 for details), Germany offers us a "natural laboratory" to study the role entrepreneurial culture plays in the persistence of entrepreneurship.

## 2.2   Entrepreneurial Culture: A Multifaceted Phenomenon

An entrepreneurial culture is typically understood "as a positive collective programming of the mind" (Beugelsdijk 2007, p. 190). Etzioni (1987) argues that one important aspect of entrepreneurial culture is spatial variation in the social legitimacy of entrepreneurs and their activities. Applying this argument to the regional level, the degree of societal legitimacy for entrepreneurship may be higher in some regions than in others (Kibler et al. 2014). As a consequence, the more society views entrepreneurship as a legitimate activity, the higher its demand and the more resources are dedicated to such activity. A society's acceptance of entrepreneurship can be regarded as part of the informal institutions of a community. North (1994) defines these informal institutions as codes of conduct, as well as social norms and values, the very building blocks of 'culture'. According to Williamson (2000), culture belongs to the level of social structure that is deeply embedded in a population and that tends to change very slowly over long periods of time.

Another conceptualization of entrepreneurial culture is to characterize it as an "aggregate psychological trait" (Freytag and Thurik 2007, p. 123) in the regional population that favors entrepreneurial values such as individualism, independence, and motivation for achievement. One way of capturing such a conceptualization of entrepreneurship culture is computing the population share of people with an entrepreneurship-prone personality profile at the regional level. Applying the Big Five concept of personality measurement, entrepreneurial people score high on extraversion, conscientiousness, and openness, but have low scores in agreeableness and neuroticism (Obschonka and Stuetzer 2017). According to Rentfrow et al. (2008), regional differences in the share of people with an entrepreneurial mindset today may be explained by social influences within the region as people respond, adapt to, or get socialized according to regional norms, attitudes, and beliefs. Furthermore, people with an entrepreneurial mindset may tend to migrate to places where the local population has similar personality characteristics (see also Obschonka et al. 2013, 2015).

There is considerable overlap between an entrepreneurship culture and the concept of social capital, as has been put forward by Coleman (1988), Putnam (2000) and others (Fritsch and Wyrwich 2016). In essence, social capital refers to the social acceptance of certain values and of respective behaviors, trust and particularly the networks of social relationships between actors both public and private (for an overview, see Westlund and Bolton 2003). It includes information channels such as role models that can have a considerable effect on individual behavior. The existence of social capital may not only have a stimulating effect on the decision to start an own business, but it may also be conducive to the quality of the new businesses and their performance.[1]

## 2.3    The Self-Perpetuation of Regional Entrepreneurship Culture

Social acceptance of self-employment constitutes an important building bloc of a regional entrepreneurship culture. According to a widespread belief, the level of acceptance or legitimacy of entrepreneurship in a region is determined by the number of entrepreneurial role models. The main idea behind this hypothesis is that an individual's perception of entrepreneurship, the cognitive representation, is shaped by observing entrepreneurial role models in the social environment. This is supposed to increase the social acceptance of entrepreneurial lifestyles, and to raise the likelihood of adopting entrepreneurial behavior. Furthermore, entrepreneurs in the local environment provide opportunities to observe and learn about entrepreneurial tasks (e.g., Minniti 2005; Nanda and Sørenson 2010; Bosma et al. 2012). Observing successful entrepreneurs provides potential entrepreneurs with examples of how to organize resources and activities, and increase self-confidence in the sense of 'if they can do it, I can, too' (Sorenson and Audia 2000, p. 443). In this way, factual entrepreneurship creates a sort of perceptual non-pecuniary externality that spurs additional start-up activity and makes entrepreneurship self-reinforcing. Furthermore, individuals who observe that one of their peers is a successful entrepreneur may perceive entrepreneurship as a favorable career option (for a detailed exposition of this argument, see Fornahl 2003). Generally, in regions that are characterized by a

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[1]As far as social capital is related to entrepreneurship, the idea goes beyond the concept of an entrepreneurial culture. Entrepreneurship culture captures only that part of social capital that affects the level and the perception of entrepreneurship. It comprises the values, trust and social acceptance of entrepreneurship and the relevant role models and peer mechanisms related to social interaction of entrepreneurs and non-entrepreneurs. It does not include the system of relationships as such. The concept of an entrepreneurship culture goes beyond the notion of social capital as it includes the supportive institutional and physical infrastructure, or policy layer such as entrepreneurship-friendly laws and regulations, supply of supporting services (for example, in training and consulting), access to financial resources, and entrepreneurship education at schools and universities.

widespread positive attitude toward entrepreneurial activities more people might perceive entrepreneurship as a viable career option and start an own business.

Andersson and Koster (2011) argue that the demonstration and peer effects of past start-up activities can affect current entrepreneurship rates. They test their proposition with data for Swedish regions that covers, however, a relatively short time-period of 10 years. Andersson and Koster (2011) find a positive relationship between the levels of new business formation at the beginning and at the end of their observation period. This relationship is more pronounced in regions with high start-up rates. This can be regarded as an indication that entrepreneurial role models accelerate future entrepreneurship, particularly in areas with high levels of entrepreneurship due to the just described mechanisms of self-perpetuation.

Minniti (2005) provides a theoretical model that, based on the above-mentioned regional role model effects, can explain why regions with initially similar characteristics may end up with different levels of entrepreneurial activity. In this model, chance events at the outset of such a process may induce entrepreneurial choice among individuals that leads to different levels of regional entrepreneurship. In historical terms, one could also think of certain natural conditions and institutional shocks that influence the emergence of certain types of economic activity in a region, and ultimately entrepreneurship. The presence of entrepreneurial role models in the social environment reduces ambiguity for potential entrepreneurs and may help them acquire necessary information and entrepreneurial skills. In Minniti's model, this self-reinforcing effect of entrepreneurship depends critically on the ability of individuals "to observe someone else's behavior and the consequences of it" (Minniti 2005, p. 5). The self-perpetuating effect of entrepreneurship through demonstration and peer effects and the role of social acceptance of entrepreneurship are illustrated in Fig. 2.1.
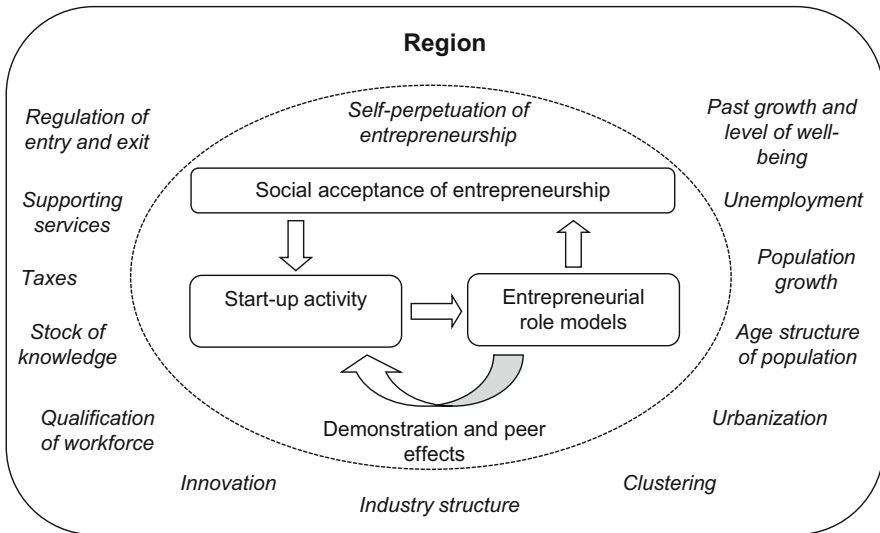


**Fig. 2.1** Determinants of regional new business formation and self-perpetuation of entrepreneurship through demonstration and peer effects (own illustration)

A regional culture of entrepreneurship, however, may need more than societal legitimacy of entrepreneurial behavior, individuals able and willing to become entrepreneurs, entrepreneurial role models, networks, and peer effects. An infrastructure of supporting services may also be necessary, particularly the availability of competent consulting as well as appropriate financial institutions. It is not farfetched to expect that regions characterized by high levels of new business formation and a pronounced entrepreneurship culture may develop such a supporting infrastructure over time. However, creating a supporting infrastructure in a region that lacks social acceptance of entrepreneurship and entrepreneurial role models might not be very effective.

Another way of describing the ingredients of a culture of entrepreneurship is by assessing how much entrepreneurship-facilitating social capital exists represented, for instance, by networks aimed at stimulating the emergence of new firms, and by determining if a vital local culture of venture capital financing is in place (Westlund and Adams 2010). Furthermore, the acceptance of not only start-up activity but also of failure may be an important element of an entrepreneurship culture. If there is a low stigma of failure in a region, this may encourage people to give entrepreneurship a try because the psychological costs of failure are lower than elsewhere (e.g., Wyrwich et al. 2016). In short, there are many aspects of the regional environment that may be, to different degrees, conducive to new business formation (Dubini 1989).

## 2.4   The Two Layers of Entrepreneurship Culture

In earlier work, we developed a framework that is helpful in understanding the interplay of different elements of an entrepreneurship culture (Fritsch and Wyrwich 2016). In a nutshell, one can distinguish between a political and a normative-cognitive layer of a regional entrepreneurship culture (Fig. 2.2). The *normative-cognitive* layer of an entrepreneurship culture pertains to the social acceptance of self-employment. In regions with a pronounced entrepreneurial culture, there is a widespread positive attitude toward entrepreneurial activity among the population. Specifically, this includes:

- *Entrepreneurial values of the regional population*: entrepreneurial norms and values such as individualism, autonomy, and achievement or mastery are widespread.
- *Abundance of entrepreneurial personalities*: the population contains a high share of persons with an entrepreneurial personality, which is characterized by traits such as extraversion, openness to experience, conscientiousness, and the ability to bear risk.
- *Large numbers of entrepreneurial role models who generate demonstration and peer effects*: high levels of self-employment in the region.
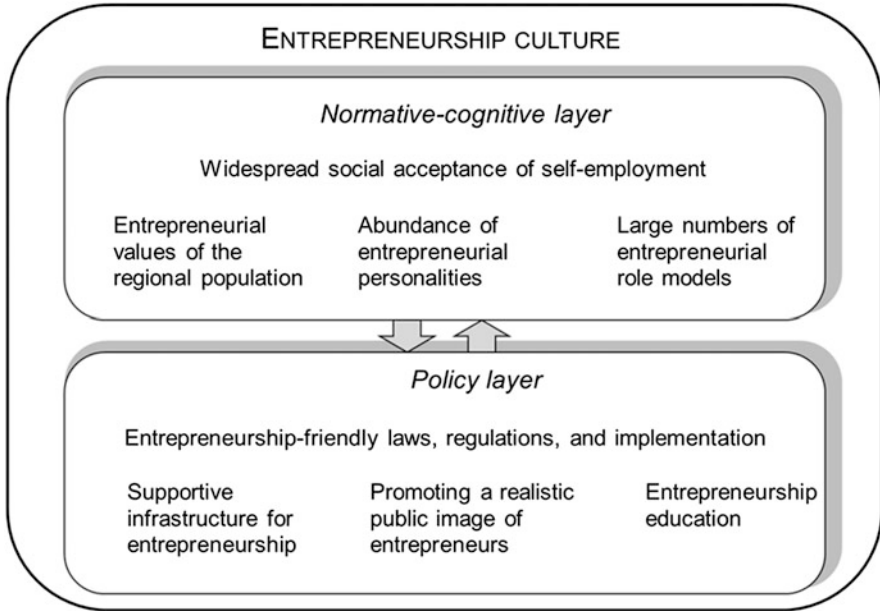
**Fig. 2.2**  Elements of an entrepreneurship culture

The *political layer* consists of formal institutions and mechanisms to create and support a regional culture of entrepreneurship. It includes, for example:

- *Entrepreneurship-friendly laws and regulations*: for example, conditions for entry and exit, freedom of establishment and trade, competition policy, the tax system, the social security system, and, last but not least, a low level of corruption.
- *A supportive infrastructure for entrepreneurship*: the existence of supporting services for business founders, as well as for established firms, including good access to financial resources for start-ups and small businesses and training and consulting services.
- *Promoting a realistic public image of entrepreneurs*: awareness campaigns, programs for encouraging contact with entrepreneurial role models.
- *Entrepreneurship education*: particularly at universities but also beginning with some very basic skills at a lower level in the education system.

As previously mentioned, it is debatable as to how far policy can 'create' a culture of entrepreneurship. Perhaps it is more realistic to delegate policy to the role of strengthening and reinforcing the existing elements of a culture of entrepreneurship by supporting the preconditions for self-employment and promoting an awareness of successful entrepreneurial role models.

The *normative-cognitive layer* is a largely informal institution. An analysis of this layer provides an indication of how embedded the entrepreneurial culture is among the local population. The two layers are, of course, interdependent. Policy can and

does influence the beliefs and experiences of the regional population, and the preexisting culture can and does influence the design and implementation of policy. Empirical evidence, however, clearly suggests that the normative-cognitive layer of a regional entrepreneurship culture plays the dominate role. The survival of regional pockets of entrepreneurial activity that endured the anti-entrepreneurial policies of the socialist regime of East Germany (see Chap. 5), demonstrates that these entrepreneurial norms and values are able to withstand even severe policies aimed at their elimination. This also reinforces the notion that informal institutions tend to persevere.

## 2.5   Entrepreneurship Culture: An Informal Institution

The persistence of a positive perception of entrepreneurship is not something that is specific to an entrepreneurial culture. There is considerable empirical evidence that points towards a long-term persistence of informal institutions in general. Becker et al. (2016), for instance, compare Eastern European regions that were affiliated with the Habsburg Empire to regions that were not. Their study shows that people in regions that were part of the Habsburg Empire have a higher level of trust in political institutions, and face lower levels of judicial and police corruption compared to regions with the same formal institutions but no past association with the Habsburg Empire. A long persistence of regional informal institutions is also vividly illustrated by Voigtlaender and Voth (2012). The authors show that German regions that experienced anti-Semitic violence in the fourteenth century had higher levels of violence against Jews in the 1920s and 1930s. If these kinds of attitudes can survive for centuries, it seems possible that other attitudes, such as those regarding entrepreneurship, might also be long-term characteristics of a region.

The reasons for such a long-term persistence of values in a region are largely unclear. Several empirical studies have found that the intergenerational transmission of entrepreneurial values and attitudes may explain this regional persistence (e.g., Chlosta et al. 2012; Dohmen et al. 2012; Laspita et al. 2012). The transmission could also take place in the course of everyday social interactions (e.g., Giannetti and Simonov 2009; Andersson and Larsson 2016) and through peer effects at the workplace (e.g., Nanda and Sørenson 2010). Such transmission mechanisms may, however, be significantly thwarted by drastic changes of the socio-economic environment such as devastating wars or heavy in-migration of people from other countries and regions. Hence, persistence of entrepreneurship under turbulent environmental condition, such as the developments in Germany during the twentieth century, pose the question of what further mechanisms might be relevant in this respect.

Altogether, there are good reasons that entrepreneurship culture is deeply embedded in regions. Therefore, the presence of an entrepreneurial culture is likely an important driver of the persistence of entrepreneurship. An empirical problem is that it is difficult to disentangle the cultural effect on start-up activity from other

determinants. In the following chapter, we introduce an empirical setting that allows us to disentangle these other determinants from the specific influence of entrepreneurial culture on start-up activity.

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# Chapter 3
# Setting the Stage: Self-Employment and New Business Formation in Germany 1907, 1925 and Today

## 3.1 A Brief Overview of German Economic History Since the Early Twentieth Century

Between 1900 and 1950, Germany, and all of its respective historical regions, was the focal point of several catastrophic events. These events presented a series of serious shocks to the socio-economic framework. The First World War brought not only destruction and disruption to the framework, but resulted in the replacement of the imperial regime by a Republican constitution in 1918. Hyperinflation in the early post-war years caused severe economic problems, and the country was not spared from the effects of the world economic crisis of the late 1920s and early 1930s, one result of which was the rise of the Nazi regime. This regime initiated and was defeated in World War II. Post-World War II Germany was a shadow of its former self. Especially in the larger cities, the infrastructure was left in shambles.[1]

After World War II the western part of the country experienced heavy in-migration of expellees from former German territories, and was required to accept occupation by Allied Powers. While the Western Allies began the process of building a modern market economic system in Western Germany, the Eastern part of the country was occupied by the Soviet army and took a rather different developmental path. The Soviets dismantled existing machinery and transferred it for productive use in the USSR. Moreover, they quickly installed a socialist regime with a centrally-planned economic system. In 1949, an East German state—the German Democratic Republic (GDR)—was founded and absorbed into the Soviet bloc. As a consequence of political pressure and severe economic problems, there was massive out-migration of East Germans to the West until the East German border was closed and the Berlin Wall was constructed in 1961. Throughout the GDR period, a

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[1]There is well-documented evidence that the degree of war time destruction varied across space (e.g. Burchardi and Hassan 2013).

reshaping of regional structures in East Germany was enforced by a variety of industrialization policy campaigns initiated by the socialist regime (Berentsen 1992).

The socialist East German state collapsed in late 1989 and East and West Germany were reunified in 1990. The following 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). 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% 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). In the course of the transformation process, East German regions again experienced massive out-migration, especially that of young and qualified workers (Hunt 2006). Even today, more than 25 years after this transformation process began, nearly all East German regions lag well behind their West German counterparts.

The 40 years of socialist administration in East Germany after World War II are of particular interest for our analysis, because during this period the region was host to a significant number of policies intended to eradicate entrepreneurship. During the years of the socialist regime, collectivist values were strongly favored and entrepreneurship was perceived as a bourgeois anachronism (e.g., Pickel 1992; Thomas 1996). The implementation of a rigorous anti-entrepreneurship policy strategy included massive socialization of private enterprises and the suppression of any remaining private-sector activity (for details, see Brezinski 1987; Pickel 1992). This policy was operated with a particular focus on those regions that could be regarded as strongholds of entrepreneurship characterized by high levels of self-employment (Ebbinghaus 2003, pp. 75–89).

The massive in-migration of German nationals from former German territories at the end of World War II, as well as the out-migration of East German residents (especially before 1961 when the Berlin Wall was built) to West Germany during and after the socialist regime, might have impacted and shaped regional cultures. This is possibly augmented by the fact that migration tends to be selective with regards to age, qualification (e.g., Hunt 2006), and certain personality characteristics that could be regarded as pro-entrepreneurial (e.g., Boneva and Frieze 2001; Jokela 2009). Unfortunately, we have no available information on the socio-demographic or personality characteristics of expellees from the former German territories, nor about the East Germans arriving in West Germany during the first post-War decades, that would allow us to control for such effects. It can, however, be said that immigration from former German territories at the end of World War II could hardly be considered selective since almost the entire German population was forced to leave. Moreover, these expellees had limited choice in where they were settled by authorities. It has been shown that East Germans migrating to the West after 1990 do not have a different entrepreneurial profile than those people that remained in the East (Fritsch et al. 2018).

Empirical evidence suggests that placement of expellees was mainly determined by the availability of food and housing, i.e. they were settled in more rural locations with less wartime destruction (Burchardi and Hassan 2013). Given the limited locational choice of expellees after World War II, it appears rather unlikely that those with a more entrepreneurial personality shaped regional cultures by selecting themselves into regions with high levels of entrepreneurship. It is clear, however, that the massive inflow of expellees did not affect all German regions to the same degree, but was marked by huge regional variations. In some regions, expellees comprised more than 30% of the indigenous population, while in other regions their share was well below 10% (Braun and Kvasnicka 2014).

Braun and Kvasnicka (2014) find that the arrival of expellees did shape economic structures, and accordingly the scope for entrepreneurship. They find that the presence of expellees was conducive to the transformation of regional industry structures from low-productivity agriculture to higher productivity manufacturing industries. Furthermore, Semrad (2015) shows that a higher population share of Sudeten Germans (Germans expelled from Czechoslovakia after WWII) is positively related to higher educational development some two decades later. A case in point of the structural transformation brought about by the mass influx of expellees, is the city of Kaufbeuren in Bavaria. Kaufbeuren became host to the bulk share of expelled glass makers from the former Sudeten German town of Gablonz. In 1950, more than 50% of all of the self-employed living in Kaufbeuren were expellees (Census 1950), most of them had their business in the glass industry.

The Soviet occupation of East Germany after WWII caused an exodus to West Germany of several firms (somewhere between 9 and 13% of all East German firms) and a number of entrepreneurs. Falck et al. (2013) document the impact of the arrival of East German machine tool companies in West Germany after the war, illustrating how regional industry structures were impacted by this exodus (for a comprehensive overview, see Hefele 1998). There are many examples of more well-known German firms that relocated out of the Soviet zone. For example, *Siemens* moved from Berlin to Munich and became the most important driver leading the transformation of that region from a rural backwater to a high tech cluster (e.g. Sternberg and Tamasy 1999; Buenstorf et al. 2015). Other examples of famous firms that reshaped regional industry structures in their target regions after relocation, are the insurance company *Allianz*, the *Deutsche Bank*, car makers *Audi* and *BMW* having their roots in Saxony, and the optics company *Carl Zeiss*, which after World War II split up into completely separate firms in East and West Germany (Kogut and Zander 2000).

The division of Germany into two separate states also impacted regional development. In this respect, Redding and Sturm (2008) find that after separation, West German cities near the East German border experienced a dramatic decline in population growth relative to other West German cities. They explain this phenomenon by suggesting that there was a concomitant decline in the market potential of these cities. Ritter and Hajdu (1989) document that the division of Germany also impacted business and transportation networks within specific regions, as well as trade flows between regions. These impacts led to a drastic spatial reorganization of economic activities.

A recent study by von Ehrlich and Seidel (2018) shows that special location-specific policies designed to support German regions and cities along the former border between East and West Germany (*Zonenrandgebietsfoerderung*) had a persistent positive effect on regional income levels and economic density. Another example that vividly illustrates regionally different and persistent effects of German division is the re-location of the main German airport hub from Berlin to Frankfurt after WWII (Redding et al. 2011). Frankfurt retains its position as Germany's most important airport, even after re-unification.

Altogether, the severity of the impacts on the regional structure of West Germany caused by the shocks related to events surrounding WWII clearly contradict the idea that an enduring regional industry structure is an important source of entrepreneurial persistence. This reality is even more pronounced in East Germany where out-migration of entrepreneurial people who were escaping the anti-entrepreneurial pressure of the socialist GDR regime should have weakened the residual regional culture of entrepreneurship. Apart from that, it should be noted that most of the industrial capacities were, more or less, in despair in 1945, directly after WWII. Thus, both the launching of new firms and rebuilding established firms that existed before the war, required enormous entrepreneurial engagement.

## 3.2  Regional Self-Employment and New Business Formation 1907, 1925 and Today

### 3.2.1  *Self-Employment 1907 and 1925*

The oldest available data for regional self-employment in Germany stems from a 1907 establishment census (Statistik des Deutschen Reichs 1909). Information about the historical levels of entrepreneurship in 1925 is gleaned from an extensive occupations census taken in 1925 (Statistik des Deutschen Reichs 1927). Although the definition of administrative districts in 1907 and 1925 was considerably different from what is defined as an administrative district today, it is still possible to assign the historical districts to current districts and planning regions. If a historical district falls within two or more current planning regions, we assign employment to the respective planning regions based on each region's share of the geographical area. The same can be done on the somewhat smaller county level, but here some additional steps need to be considered.[2]

We use planning regions to create the spatial framework of our empirical analyses. There are 96 German planning regions that represent functionally integrated spatial units comparable to labor-market areas in the United States. For administrative reasons, the cities of Berlin, Hamburg and Bremen are defined as planning

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[2]The procedure requires merging certain so-called 'district free cities' (*kreisfreie Staedte*) with the surrounding counties in order to get functional regions.

regions even though they are not functional economic units. To avoid distortions, we merged these cities with adjacent planning regions.[3] By doing this, we are left with a total of 93 planning regions in Germany, 71 in the area formerly known as West Germany, and 22 in the former East. Since there is no data for the Saarland in the 1925 census,[4] some of the analyses for West Germany are restricted to 70 planning regions.

The information we have for 1925 provides details about the "social status" of individuals as either self-employed, working in paid employment or non-participation in the workforce.[5] For the year 1907, we are forced to rely on the number of establishments in private sector industries to construct our historical entrepreneurship measure. In order to make the levels of self-employment comparable between regions, we establish self-employment rates based on the labor market approach (Audretsch and Fritsch 1994). For 1907 we make the assumption that one private sector establishment represents one self-employed individual. Hence, the self-employment rate is defined as the number of establishments in manufacturing and services (non-agricultural private sector) divided by all employees. Self-employment in the non-agricultural private sector in 1925 is defined as the number of self-employed in manufacturing and services divided by all employees.

We generally exclude self-employment in agriculture from the analyses because it constitutes a rather special case that is hardly comparable to other industries. In particular, it requires qualifications and abilities that differ considerably from entrepreneurship in other sectors. One special feature of self-employment in agriculture in early nineteenth century Germany was that farms in most German regions consisted almost entirely of family businesses that were passed on by customs of inheritance. Hence, hardly any farm owner had to experience the risky process of founding and establishing his or her business. Moreover, since growth of farms was limited by available acreage, the business strategies of farmers were dominated by attempts to preserve their farms; expansion played a rather minor role, if any. In contrast, self-employment in non-agricultural sectors of the economy is much more critically related to industrialization and economic development. Therefore, it should more positively reflect perceived role models and should be more closely associated with the generation of additional entrepreneurial opportunities than self-employment in agriculture. We also exclude homeworkers (*Heimgewerbetreibende*) in the analyses. Homeworkers represent a marginal form of self-employment. They often produced goods or performed few and often simple manufacturing steps for one single final producer or retailer. Although homeworkers may be regarded as 'freelancers', the vast majority of them were closely integrated into the production processes of their

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[3]Berlin is merged with Potsdam-Mittelmark, Hamburg is merged with the region of Schleswig-Holstein South and Hamburg-Umland South and Bremen is merged with Bremen-Umland.

[4]At that time Saarland was under French administration.

[5]The data for 1925 include detailed county level information not only about employment status, but also about gender, type of industry (divided into 26 industries), and social status (*kleinere Verwaltungsbezirke*). The variable 'social status' distinguishes between blue-collar workers, white-collar employees, self-employed people, homeworkers, and helping family members.

principal firm and had low levels of economic self-determination. Due to the reasons mentioned above, we consider it unlikely that homeworkers and those people self-employed in agriculture represent the "nucleus" of a regional entrepreneurial culture that drives the self-perpetuation of entrepreneurship over time.

Figure 3.1 shows the spatial distribution of self-employment rates in all private sectors (excluding agriculture and homeworkers) for the years 1907 and 1925.[6] A first observation is that there are rather pronounced regional differences in the level of self-employment. In the year 1907 the share of the workforce that was self-employed ranges from 8% to a little more than 21%, and in the year 1925 between 6% and about 14%. Self-employment rates are especially high in larger cities such as Berlin, Frankfurt, Hamburg, Leipzig, and Munich. Regions with relatively low self-employment rates in West Germany include the Ruhr area north of Cologne and the area of Saarbruecken. Both of these regions were characterized by a high concentration of large-scale industries, such as mining and steel processing.[7] The obvious differences of self-employment rates between the 2 years may be caused by differences of definitions and classification used by the two censuses from which our data are gathered.

### 3.2.2  New Business Formation in Recent Decades

We use two different data sources for assessing the levels of new business formation in recent decades. The first of these data sources is the Enterprise Panel of the Center for European Economic Research (*ZEW-Mannheim*). These data are based on information from the largest German credit-rating agency (*Creditreform*). As with many other data sources on start-ups, these data may not completely cover the case of all solo entrepreneurs. However, once a firm is registered, hires employees, requests a bank loan, or conducts reasonable economic activities, even solo entrepreneurs are included, and information about their activities is gathered beginning with the 'true' date the firm was established. Hence, many solo entrepreneurs are captured along with the correct business founding date. This information is limited to the set-up of a firm's headquarters and does not include the establishment of branches (for details, see Bersch et al. 2014). These data are currently available for the years 1995–2016.[8]

The second data source is the German Social Insurance Statistics. This dataset contains every German establishment that employs at least one person and is obliged to pay social insurance contributions (Spengler 2008). This means that single-owner businesses with no paid employee are excluded. A considerable advantage of this

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[6]For descriptive statistics see Table 4.6.

[7]There is no information on self-employment in the region of Saarbruecken in the year 1925 because this region did not belong to Germany at that time.

[8]Although this dataset includes information on new businesses for the years 1990–1994, this information is, however, not consistent with the data for the years 1995–2016.
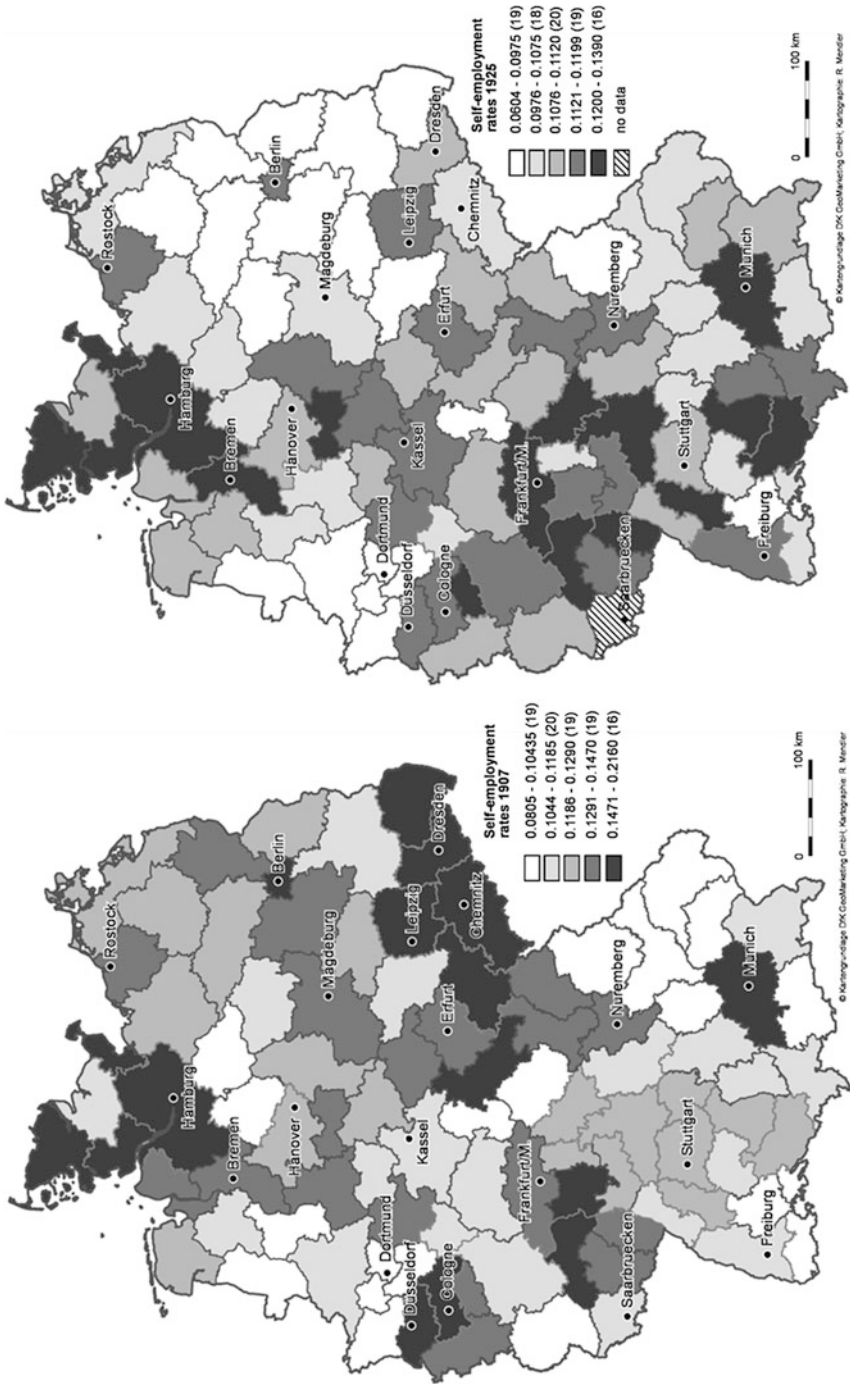
**Fig. 3.1** Spatial distribution of the self-employment rate in the years 1907 (left) and 1925 (right)

dataset, however, is that data on start-ups begins in 1976 and continues uninterrupted until 2014, offering us a longer time series. It is because of this longer time series that we use this source in some of our analyses. A disadvantage of this data source is the imprecise timing of entry. A start-up is recorded in the data at the time it hires its first employee, irrespective of whether the establishment existed before this moment. Currently, the Social Insurance Statistics does not distinguish between headquarters and branch plants. This means that every new branch plant is recorded as an entry. In contrast to previous studies, we employ a novel and more reliable method of identifying start-ups based on workflow analyses (Hethey and Schmieder 2010).

Figure 3.2 shows the regional start-up rates in Germany based on the ZEW firm panel. Again, there are significant differences in the number of yearly start-ups per
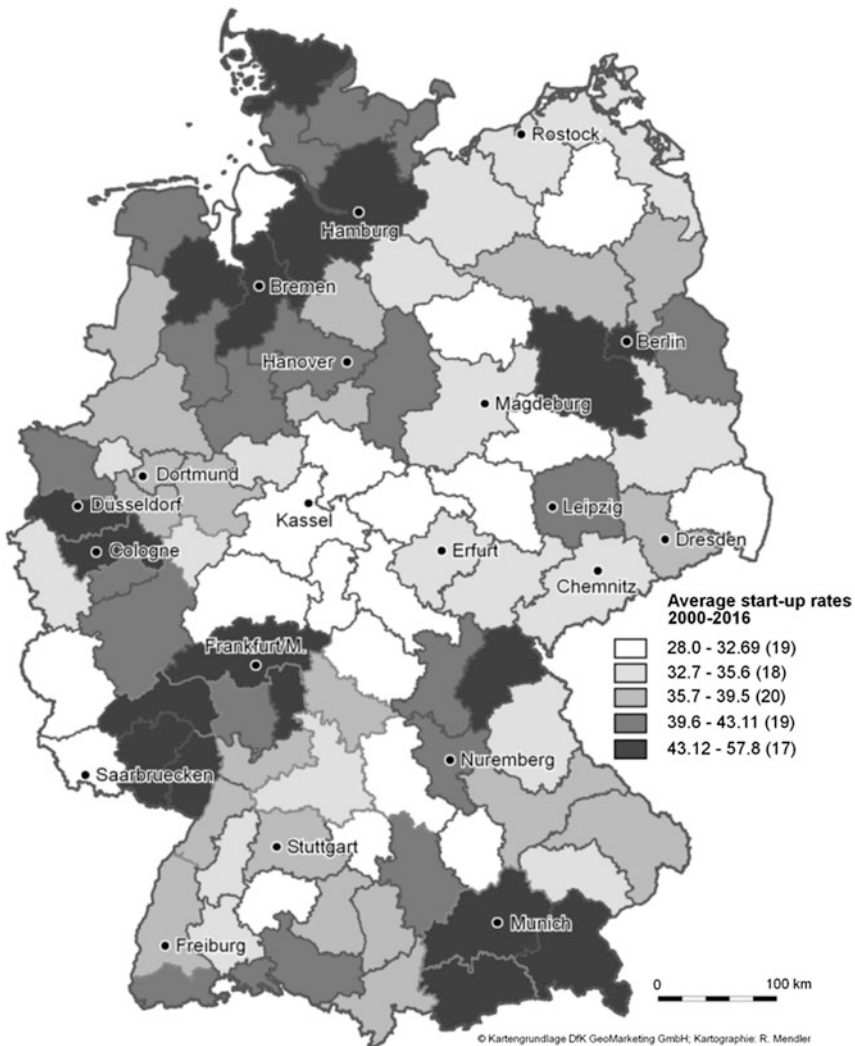


**Fig. 3.2** Average regional start-up rates in the 2010–2016 period based on ZEW data

10,000 people in working age ranging from 28.0 to 57.8 We find relatively high levels of new business formation in regions that host larger cities such as Berlin, Cologne, Frankfurt, Hamburg, Leipzig, Munich, and Stuttgart—a pattern that corresponds to the spatial structures of the years 1907 and 1925 (Fig. 3.1). Generally, start-up rates in the 2010–2016 period tend to be relatively low in East Germany, as well as in Northern Hesse around and south of Kassel. Of course, the spatial patterns of self-employment and new business formation are significantly shaped, not only by the respective political, social, and economic circumstances in the respective years, but also by varying definitions of entrepreneurship.

Our multivariate analyses in Chap. 4 control for a variety of regional and historical characteristics that may influence spatial patterns, such as agglomeration economies, industry structure, and the regional knowledge base. These analyses also show that despite the different concepts of defining and measuring entrepreneurship, there is still a highly statistically significant correspondence for the regional patterns of entrepreneurial activity.

## 3.3  Summary

Our brief overview of early twentieth century German history illustrates the severity and variety of shocks that impacted the political, social, and economic framework conditions of the country (Sect. 3.1). After describing our data sources, we offer more detailed information about how we use the data and deal with issues presented by the data, such as differing definitions of self-employment and new business formation and of spatial realities. Finally, we present our findings using figures that show the regional differences in entrepreneurial activity at the advent of these shocks and today (Sect. 3.2). The figures shown in this chapter clearly demonstrate that there are pronounced regional differences in the prevalence of entrepreneurial activity, both in the past and today. Comparing the regional structures of historical self-employment rates with the regional distribution of current start-up activity shows some correspondence that indicates a certain degree of persistence of regional levels of entrepreneurship.

In the subsequent chapters, we build on this reality by analyzing the persistence of regional entrepreneurship in a multivariate framework. Our primary focus is on this question: How did the massive changes to the framework conditions that occurred over the course of the twentieth century affect the level of regional entrepreneurship? We will argue that the persistence of high levels of regional entrepreneurial activities can be regarded as a relatively strong indication for the long-term effect of a regional entrepreneurial culture. This conjecture will be tested in a variety of ways. For example, in Chap. 8 we delineate an entrepreneurial personality profile and use data about the personality traits of the regional population as a way of confirming the existence of an entrepreneurial culture. We extend our analyses in Chaps. 5 and 6 by investigating the interaction between high levels of regional historical entrepreneurship and the economic performance of regions.

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# Chapter 4
# The Persistence of Regional Entrepreneurship

## 4.1 Empirical Strategy

We analyze the persistence of regional entrepreneurship in three scenarios that relate to different time periods and regions. Particularly the three scenarios are distinguished by rather different degrees of stability in the political and economic environment. The idea behind this approach is to identify how long entrepreneurship can persist depending on the length of the time period and the turbulence of the framework conditions.

The *first scenario* presents regional entrepreneurship in West Germany from 1976 to 2014, a period characterized by relatively stable conditions without any major shocks to the socio-economic environment (Sect. 4.3). For the *second scenario* (Sect. 4.4) we extend our period of analysis to cover more than 100 years and compare regional entrepreneurship in West German regions in 1907 and 1925 with the level of entrepreneurial activity in the 1976–2014 period. As described in Sect. 2.1, a number of considerable disruptions occurred during this period, including World War I, the world economic crisis of the late 1920s, World War II, occupation by the Allied Powers, massive in-migration of expellees, the introduction of a new constitutional base and political system, as well as reconstruction of the economy. If we find a persistence of regional entrepreneurship in the second scenario, this can be viewed as an indication that there exist factors other than persisting structural characteristics that are effective even in the face of severe ruptures in the past. Moreover, since the entire population is replaced over a long period of more than 100 years, persistence of relatively high or low levels of entrepreneurship would indicate an intergenerational transfer of the attitude towards entrepreneurial behavior.

In the *final scenario* (Sect. 4.5), we investigate the persistence of regional entrepreneurship in East Germany from 1925 to 2014. After the end of World War II, East

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This chapter is partly based on Fritsch and Wyrwich (2014). As compared to this earlier publication, the empirical analyses have been updated using data with considerably longer time series.

Germany experienced considerably more severe shocks than West Germany. By the end of the war, this part of the country was occupied by the Soviet army and was integrated into the Soviet bloc. In contrast to West Germany where the Western Allies soon began to assist in the reconstruction of the economy, the Soviets installed a socialist regime—the German Democratic Republic (GDR)—with a centrally-planned economic system. There was also a massive out-migration of East Germans to the West continued until the closing of the East German border in 1961.

The collapse of the socialist East German state in late 1989 was quickly followed by unification of East and West Germany in 1990. The following shock transformation of the East German economy to a market economic system induced massive structural change accompanied by high levels of unemployment and massive out-migration. During East Germany's 40 years of socialist regime, the region was host to a rigorous anti-entrepreneurship policy strategy that attempted to eradicate entrepreneurship (see Sect. 3.1 for a more detailed exposition).

In our analyses we use the self-employment rate and the regional start-up rate as indicators for regional entrepreneurship. These two measures are well accepted in entrepreneurship research and are the only reasonable indicators that are available at a regional basis for relatively long time-periods.[1]

## 4.2    Persistence of Start-Up Activity in Germany: Descriptive Evidence

Figure 4.1 shows the regional start-up rates in Germany today. The data on start-up activity are obtained from the German Social Insurance Statistics. This dataset contains every German establishment that employs at least one person obliged to pay social insurance contributions (Spengler 2008). The start-up rate is measured in accordance with the labor market approach (Audretsch and Fritsch 1994), whereby the number of annual start-ups in the private sector is divided by the sum (in thousands) of all employees. The analysis is at the level of Planning Regions, which represent functional spatial units.

There are considerable regional differences in the levels of new business formation in Germany between 2000 and 2014. Figure 4.1 reveals that start-up rates tend to be higher in West Germany compared to East Germany. The on average lower level start-ups with at least one employee in East Germany probably has to do with problems of transitioning to a market economy after having been under a socialist regime for 40 years. Due to this legacy, East Germany can be regarded a distinct regional growth regime (Fritsch 2004).

Regional start-up rates are highly correlated over time in both parts of the country (Table 4.1; see Table 4.6 and 4.7 in the Appendix for descriptive statistics). Even

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[1]If available, alternative indicators for new business formation and self-employment from other sources tend to be highly correlated with the data used here.
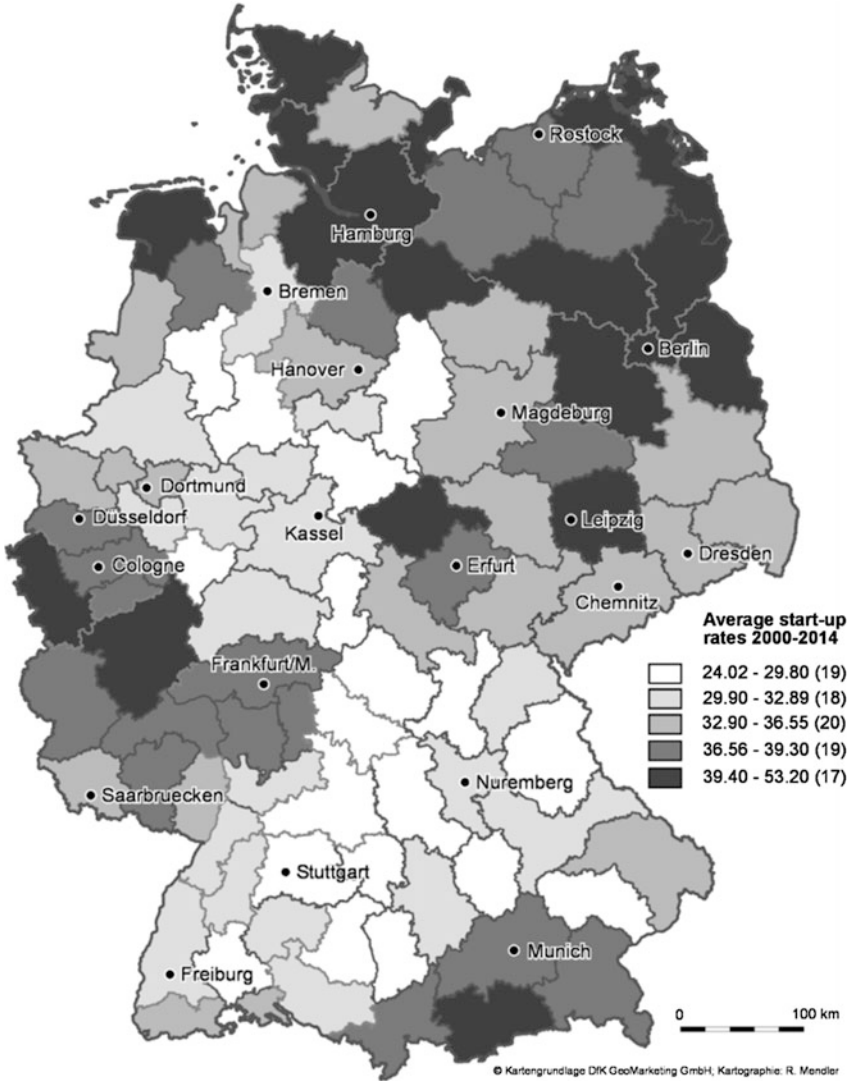
**Fig. 4.1** Regional start-up rates across German regions 2010–2014 according to the Employment Statistics

over a 20 year period, the value of the correlation coefficient is above 0.66 in East and West Germany. Figures 4.2 and 4.3 illustrate the high degrees of variation across regions, as well as the high persistence of regional levels of new business formation over time. Altogether, there is clear evidence for persistence of entrepreneurship across German regions. In the next step, we analyze whether this persistence pattern can be found in different scenarios, namely in a stable institutional environment (Scenario I) and in the face of massive historical ruptures (Scenarios II and III).

**Table 4.1** Correlation of start-up rates over time—West and East Germany (1976–2014/ 1993–2014)

|  | t − 1 | t − 5 | t − 10 | t − 20 | t − 37 |
|---|---|---|---|---|---|
| Start-up rate t = 0 West Germany | 0.939*** | 0.879*** | 0.815*** | 0.763*** | 0.684*** |
| Start-up rate t = 0 East Germany | 0.877*** | 0.912*** | 0.643*** | 0.667*** | – |

Note: ***Statistically significant at the 1% level
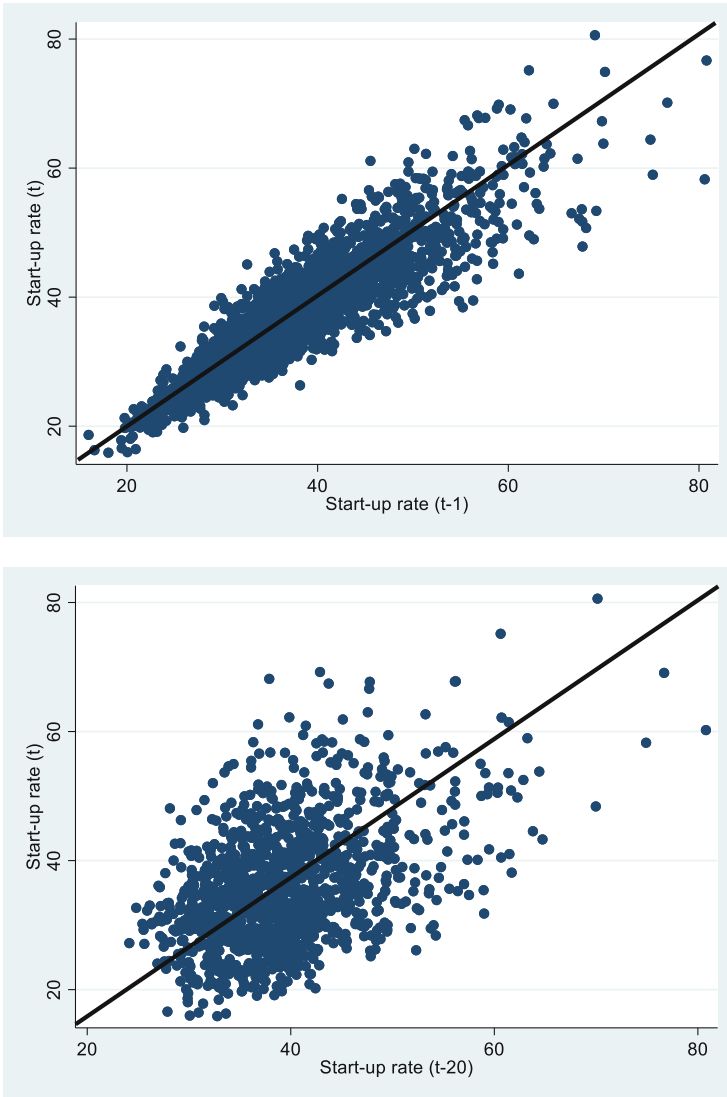


**Fig. 4.2** The relationship between start-up rate (per 10,000 individuals) in t and t − 1 (upper plot) and t and t − 20 (lower plot) in West Germany
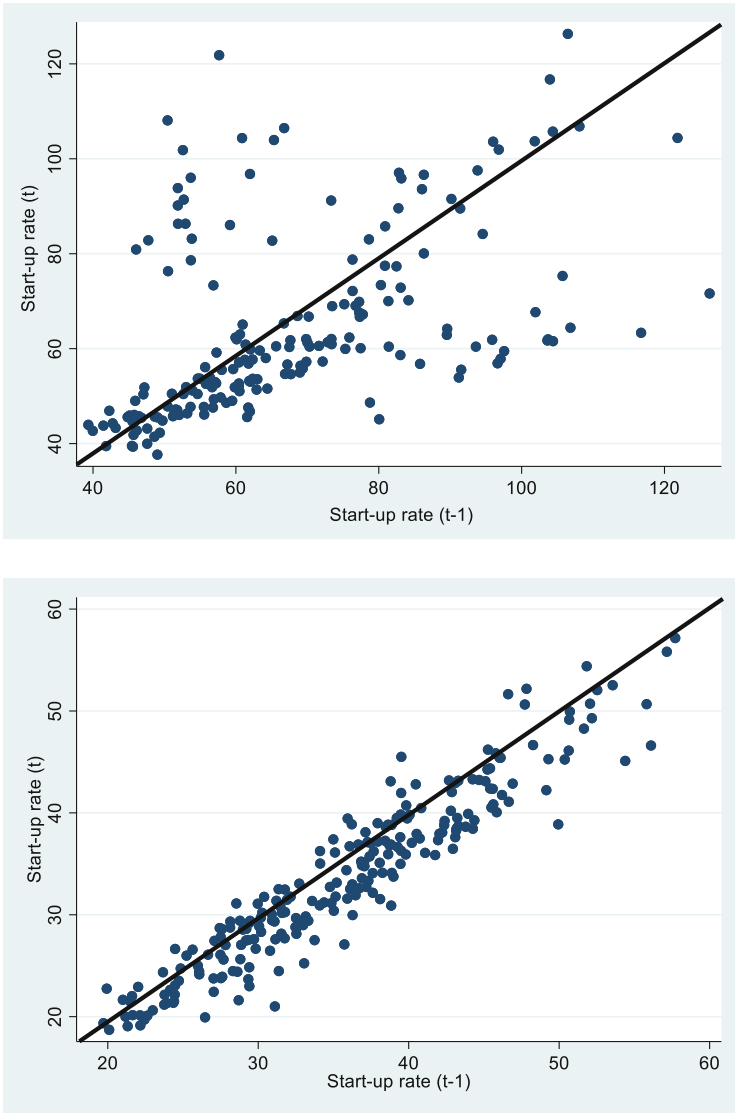
**Fig. 4.3** The relationship between start-up rate (per 10,000 individuals) in East German regions in t and t − 1 in the period 1993–2003 (upper plot) and in the period 2004–2014 (lower plot)

## 4.3   Scenario I: Persistence of Regional Entrepreneurship in a Stable Environment—West Germany 1976–2014

We begin our multivariate analysis of the persistence of regional entrepreneurship by looking at the rather stable environment of West Germany for the period 1976–2014. We regress the current regional start-up rate on its lagged values and on some other variables in order to control for the relevant characteristics of the regional environment (Table 4.2). The control variables include regional population density that represents a "catch-all" variable of regional characteristics, the employment share of R&D personnel, which may indicate the level of innovative entrepreneurial opportunities available in a region (for a discussion of these variables, see Fritsch and Mueller 2007), and the local employment rate. The employment rate is defined as the number of employees over the population in working age. We use this variable instead of the unemployment rate because official unemployment data are not available for the 1970s and early 1980s. Federal State dummies are included to capture effects of different political conditions. Additionally, the standard errors are clustered at the level of Federal States and years to account for spatial autocorrelation. Robust standard errors also account for heteroskedasticity (White 1980). We run the models for the 1976–2014 period.

The results indicate a highly significant positive effect of new business formation in previous periods on current start-up rates (Table 4.2, Column I and II). The effect in Model I is strongest for the start-up rate in $t - 1$, which is in line with previous research. Using more than one lagged start-up rate implies problems of multicollinearity. In order to rule out this issue and to demonstrate that the previous level of new business formation is not just a short-term effect, we include the start-up rate of period $t - 3$ in Model II. This lagged start-up rate is highly significant as well. Altogether, the results show the same persistency pattern of start-up activity as found by Fritsch and Mueller (2007) for a much shorter period of analysis.

We also perform the regressions for lagged self-employment rates (Table 4.2, Column III and IV). As could have been expected, we find that the past regional self-employment rate has a strongly significant effect on the current level of start-ups. This effect is dominated by the self-employment rate lagged by 1 year, while self-employment rates lagged by 2 or 3 years are insignificant. This pattern might be explained by multicollinearity. When we introduce into the model only the 3 year lagged self-employment rate, we obtain a coefficient estimate that is very close in size to the coefficient for the 1 year lag used in specification with multiple lags (Model III).

In the models presented in Table 4.2, population density is significantly positively related to start-up activity, while the share of R&D employment is not statistically significant in the models that consider lagged start-up rates. This share is significantly positively related to start-up activity in the models considering lagged self-employment rates. The employment rate is significantly negatively related to start-up activity.[2]

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[2]The results on control variables partly differ from previous analyses (Fritsch and Mueller 2007; Fritsch and Wyrwich 2014), probably because these previous approaches did not include year fixed effects.

**Table 4.2** The role of past start-up rates and self-employment rates on the current start-up rate in West Germany, 1976–2014

| Dependent variable: Start-up rate | I | II | III | IV |
|---|---|---|---|---|
| Start-up rate (t − 1) | 0.480*** | | | |
| | (0.0240) | | | |
| Start-up rate (t − 2) | 0.278*** | | | |
| | (0.0248) | | | |
| Start-up rate (t − 3) | 0.172*** | 0.827*** | | |
| | (0.0240) | (0.0133) | | |
| Self-employment rate (t − 1) | | | 1.400*** | |
| | | | (0.168) | |
| Self-employment rate (t − 2) | | | −0.225 | |
| | | | (0.214) | |
| Self-employment rate (t − 3) | | | −0.062 | 1.080*** |
| | | | (0.161) | (0.022) |
| Population density (t − 1) | 0.014*** | 0.027*** | 0.119*** | 0.128*** |
| | (0.003) | (0.004) | (0.004) | (0.00436) |
| Share of R&D personnel (t − 1) | 0.001 | −0.001 | 0.054*** | 0.056*** |
| | (0.004) | (0.005) | (0.006) | (0.006) |
| Employment rate (t − 1) | −0.078*** | −0.161*** | −0.0766** | −0.145*** |
| | (0.015) | (0.020) | (0.030) | (0.020) |
| Federal State dummies | Yes*** | Yes*** | Yes*** | Yes*** |
| Year dummies | Yes*** | Yes*** | Yes*** | Yes*** |
| Constant | −0.502*** | −1.199*** | −2.611*** | −2.797*** |
| | (0.078) | (0.097) | (0.082) | (0.086) |
| Number of observations | 2485 | 2485 | 2485 | 2485 |
| F-value | 653.33*** | 355.62*** | 329.36*** | 301.7*** |
| $R^{2\ adj}$ | 0.941 | 0.907 | 0.871 | 0.865 |

Notes: Dependent variable: regional start-up rate in $t_0$. Pooled ordinary least squares (OLS) regressions. Robust standard errors in parentheses. Standard errors are clustered at Federal State X Year-level to capture spatial autocorrelation. ***Statistically significant at the 1% level; and **statistically significant at the 5% level. All continuous variables are log-transformed

In a further step, we follow Andersson and Koster (2011) and run quantile regressions. The idea behind this analysis is that the effect of a culture of entrepreneurship that leads to persistence of start-up rates should be particularly strong in regions with relatively high levels of new business formation. Due to the extremely high correlation between start-up rates in successive years, we restrict the model to the start-up rate in t − 3 and the control variables as shown in column II of Table 4.2. We do, indeed, find that the estimated marginal effect of previous levels of new business formation tends to be the stronger in areas with high start-up rates (Fig. 4.4). Whether this pattern of persistency of regional entrepreneurship is mainly caused by the relatively stable framework conditions during this period, or whether persistence can be found over a longer period that includes some drastic changes in the economic and political environment, is investigated in the following two scenarios.

**Fig. 4.4** Estimated marginal effect of the start-up rate in t − 3 on the start-up rates in t = 0 in West Germany (shaded areas indicate upper and lower confidence intervals; bootstrapped standard errors with 1000 replications) (The quantile regressions do not include year fixed effects. Including them implies a constant estimated marginal effect across quantiles. This is in line with the argument that observing a significant number of past role models implies a stronger effect than in areas with few entrepreneurial activities. Controlling for such time effects cancels out differences in effect sizes across regions with much different levels of new firm formation)

## 4.4   Scenario II: Persistence of Regional Entrepreneurship in the Face of Two World Wars Followed by Massive In-Migration—West Germany 1907–2005

The second scenario is characterized by considerable disruptions: World War I, the world economic crisis of 1929, the advent of the Nazi regime in 1933, the devastation of World War II, occupation by the Allied Powers, massive in-migration of refugees from former territories (particularly from the East), separation into East and West Germany, reconstruction of the country, and German Reunification (for details, see Sect. 3.1). The massive migration of expellees from former German territories at the end of World War II, as well as the out-migration of East Germany during and after the socialist regime, might have shaped regional cultures. Although we do not have sufficient information available that would allow us to control for such effects, it can be said that immigration from former German territories at the end of World War II was hardly selective. Moreover, these expellees had limited choice in where they were settled by authorities (see Sect. 3.1 for a more detailed exposition).

Given the limited locational choice of expellees after World War II, it appears rather unlikely that those with a more entrepreneurial personality shaped regional cultures by selecting themselves into regions with high levels of entrepreneurship. In

the case of East Germany (Scenario III), out-migration of entrepreneurial individuals caused by the anti-entrepreneurial pressure of the socialist GDR regime should have weakened the remaining regional culture of entrepreneurship. Therefore, if we still find persistence after the breakdown of the socialist regime, this can be regarded as a relatively strong indication for the long-term effect of entrepreneurial culture.

The indicators for the presence of regional entrepreneurship prior to the shock events are the self-employment rates in 1907 and 1925. The self-employment rates in 1907 and 1925 measure the share of role models within total regional employment, thereby reflecting how widespread self-employment was across regions prior to the disruptive shock events.

Our assessment focuses on the 1925 dataset because the data are more suitable and offer a wider breadth of information. For this year, the self-employment rate is determined by dividing the number of self-employed persons in non-agricultural private sectors by all employees. The historical data are based on a comprehensive survey conducted in 1925 (Statistik des Deutschen Reichs 1927). For 1907, we only have information on the number of private sector establishments (Statistik des Deutschen Reichs 1909). As mentioned already in Chap. 3, we have to make the assumption that one private sector establishment represents one self-employed individual. Accordingly, the self-employment rate for 1907 is the number of establishments (self-employed) divided by all employees.

In 1907 and 1925, the definition of an administrative district was quite different from how a district is defined today. Nevertheless, it is possible to assign the historical districts to the current planning regions (for details, see Sect. 3.2.1).

Correlation coefficients between the start-up rates for the 1976–2014 period and the self-employment rate in 1907 ($r = 0.109$***) and 1925 ($r = 0.156$***) show a highly significant positive relationship (see Tables 4.6, 4.7 and 4.8 in the Appendix for descriptive statistics). Regressing the start-up rates for the years 1976–2014 on the self-employment rate in 1925 reveals a significant positive effect (Table 4.3, Column I). Notably this effect is apparently stronger when controlling for competing explanations for regional differences in start-up activity (Column II). Controlling for the industry structure in 1925 does not change this pattern (Column III). Similarly, regressing the start-up rates on the self-employment rate in 1907 reveals a significant effect as well (Column IV). Altogether, the significant effect the regionally different historical self-employment rate has on current levels of self-employment and start-up activity suggests the presence of a historically-grown entrepreneurial culture. Our results also indicate the persistence of regional differences in start-up activity over longer time periods that include several disruptive shocks to the environmental conditions.[3]

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[3]The results on the control variables are in line with those of Table 4.2. The only difference is that the employment share of R&D personnel is statistically significant with a negative sign. This pattern is apparently an issue of high correlation between the share of R&D personnel and population density. Excluding the latter leads to an insignificant coefficient estimate of the employment share of R&D personnel.

**Table 4.3** Effect of the self-employment rate in 1925 on regional start-up rates in West Germany, 1976–2014

| Dependent variable: Start-up rate | I | II | III | IV |
|---|---|---|---|---|
| Self-employment rate, 1925 | 0.0948*** | 0.358*** | 0.419*** | |
| | (0.0196) | (0.0262) | (0.0321) | |
| Self-employment rate, 1907 | | | | 0.251*** |
| | | | | (0.0327) |
| Population density (t − 1) | | 0.109*** | 0.113*** | 0.0870*** |
| | | (0.00698) | (0.00744) | (0.00769) |
| Share of R&D personnel (t – 1) | | −0.0606*** | −0.0674*** | −0.0511*** |
| | | (0.00944) | (0.00660) | (0.00679) |
| Employment rate (t − 1) | | −0.890*** | −0.602*** | −0.533*** |
| | | (0.0549) | (0.0523) | (0.0482) |
| Industry structure 1925 | | | Yes | |
| Industry structure 1907 | | | | Yes |
| Federal State dummies | Yes*** | Yes*** | Yes*** | Yes*** |
| Year dummies | Yes*** | Yes*** | Yes*** | Yes*** |
| Constant | −5.137*** | −6.065*** | −5.415*** | −5.666*** |
| | (0.0435) | (0.0678) | (0.153) | (0.149) |
| F-value | 289.45*** | 386.99*** | 374.5*** | 368.21*** |
| Number of observations | 2450 | 2450 | 2450 | 2450 |
| $R^{2\ adj}$ | 0.605 | 0.706 | 0.734 | 0.717 |

Notes: Dependent variable: regional start-up rate in $t_0$. Pooled ordinary least squares (OLS) regressions. Robust standard errors in parentheses. Standard errors are clustered at Federal State X Year-level to capture spatial autocorrelation. ***Statistically significant at the 1% level; **statistically significant at the 5% level. All continuous variables are log-transformed. There is no data for the Saarland for the year 1925. The area is not considered in the analysis of column IV to keep comparability of results

For Scenario II, we again applied quantile regressions. We want to discover how the effect of historical self-employment rates differs across regions with low and high rates of new firm formation (Fig. 4.5). The highest estimated marginal effects can be found for the upper quartiles of the distribution. Thus, persistence is particularly pronounced in regions with high levels of new firm formation. Furthermore, there seems to be a threshold value around the median value with respect to the estimated marginal effect. This may indicate that there is a critical level of self-employment for the self-reinforcing effect of entrepreneurial culture.
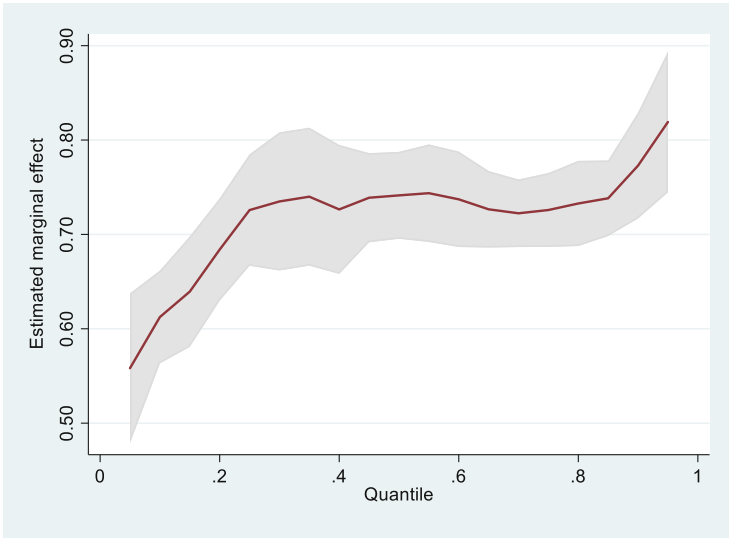
**Fig. 4.5** Estimated marginal effect of the self-employment rate in 1925 on the start-up rates in West Germany (shaded areas indicate upper and lower confidence intervals; bootstrapped standard errors with 1000 replications)

## 4.5 Scenario III: Persistence of Regional Entrepreneurship in the Face of two World Wars, 40 Years of Socialist Regime, a Shocking Transformation Process, and Massive Out-Migration—East Germany 1907–2014

As a result of the massive anti-entrepreneurship policies of the socialist period in East Germany, the self-employment rate at the end of the GDR regime in 1989 was only about 1.8% compared to 10.5% in West Germany. The few private firms in existence were primarily found in those small trades ill-served by inflexible centrally planned state firms. Remarkably, the remaining levels of self-employment were particularly high in those regions that had a pronounced entrepreneurial tradition in pre-socialist times. Further, the socialist regime was not able to crowd out self-employment with equal effectiveness across the GDR. This is, for instance, indicated by the finding that in regions with a pronounced entrepreneurial tradition a higher share of craftsmen abstained from joining socialist handicraft cooperatives (Wyrwich 2012). Thus, regional variation in private sector activity in 1989 can be regarded as mainly a result of variation in private initiative, or different levels of resistance to political attempts to abolish private firms. This persistence of regional entrepreneurial cultures during 40 years of a socialist regime is particularly remarkable because the anti-entrepreneurial policies should have created relatively high incentives for people with an entrepreneurial mindset to leave the GDR. As a result, these policies certainly caused a bloodletting of entrepreneurs and entrepreneurial resources in these regions.

With the transformation to a market economy system, new business formation in East Germany started to boom, particularly in the services and construction sectors. However, it took until 2005—15 years—before the self-employment rate in East Germany matched that of West Germany. Even though there are now similar levels of self-employment, characteristics of the new businesses in terms of industry affiliation, survival, and number of employees are quite different between the two regions. Since 1990, start-ups in East Germany have been much more concentrated in sectors characterized by a small minimum efficient size, particularly construction, tourism, and consumer services. These sectors have lower survival rates and, on average, fewer employees than new businesses set up in West Germany during the same period. In short, East Germany did not become a carbon copy of West Germany, but has instead, due to its socialist legacy, a distinct regional growth regime (Fritsch 2004).

Analyzing the persistence of East German start-up rates in successive years is limited by the relatively short time series of available data and by the turbulence of the transformation process, which was particularly pronounced during the early 1990s. Our analysis of start-up activity covers the period 1993–2014. The spatial framework consists of the 21 East German Planning Regions. The region of Berlin is excluded since the data do not allow distinguishing between the eastern and western part of the city, the latter of which was not under socialist regime. We again use information on the self-employment rate in 1907 and 1925 but also consider the self-employment rate at the end of the socialist period in 1989.

A first remarkable result is that there is a significantly positive correlation of self-employment in 1989, which marks the demise of the GDR regime, and historical self-employment in 1907 (r = 0.638*** statistically significant at the 1% level) and 1925 (r = 0.216***). This statistical relationship suggests that the policy of crowding out private firms during the socialist regime had weaker effects in areas with high levels of self-employment before World War II. This may be regarded as an indication of regional differences in the degree of resistance to anti-entrepreneurship policies. The willingness of individuals to resist these policies is reflective of strong entrepreneurial intentions and the relative strength of a regional entrepreneurship culture. High levels of continuing self-employment are found in regions that had a relatively strong tradition in the manufacturing sector prior to World War II, such as Chemnitz and Dresden (see Sect. 3.2.1; for a more detailed description, see Wyrwich 2012). One way an entrepreneurial culture may have survived is through intergenerational transmission via parental or grand parental role models in self-employment (e.g., Chlosta et al. 2012; Dohmen et al. 2012; Laspita et al. 2012). Furthermore, there might have been a favorable collective memory about the merits of entrepreneurship in areas where it played an important role for economic prosperity in the past.

During the 1993–2014 period, the correlation coefficient between the start-up rate in year t and in t − 1 in East German regions is 0.877 and highly significant, indicating a high level of persistence. The regression analysis for East Germany confirms a considerable persistence of regional start-up rates in the 1993–2014

**Table 4.4** The role of past start-up rates and self-employment rates on the current start-up rate in East Germany, 1993–2014

| Dependent variable: Start-up rate | I | II | III | IV |
|---|---|---|---|---|
| Start-up rate (t − 1) | 0.380*** | | | |
| | (0.0540) | | | |
| Start-up rate (t − 2) | 0.194*** | | | |
| | (0.0540) | | | |
| Start-up rate (t − 3) | 0.209*** | 0.538*** | | |
| | (0.0691) | (0.0659) | | |
| Self-employment rate (t − 1) | | | 0.710* | |
| | | | (0.418) | |
| Self-employment rate (t − 2) | | | 0.378 | |
| | | | (0.428) | |
| Self-employment rate (t − 3) | | | −0.395 | 0.547*** |
| | | | (0.337) | (0.116) |
| Population density (t − 1) | 0.0182 | 0.0194 | 0.0561** | 0.0486* |
| | (0.0258) | (0.0255) | (0.0263) | (0.0267) |
| Share of R&D personnel (t − 1) | 0.0239 | 0.0595* | 0.115*** | 0.128*** |
| | (0.0299) | (0.0327) | (0.0369) | (0.0363) |
| Employment rate (t − 1) | −0.240** | −0.454*** | −0.468*** | −0.627*** |
| | (0.116) | (0.125) | (0.132) | (0.112) |
| Federal State dummies | Yes*** | Yes*** | Yes*** | Yes*** |
| Year dummies | Yes*** | Yes*** | Yes*** | Yes*** |
| | −1.379*** | −2.688*** | −3.283*** | −3.650*** |
| Constant | (0.387) | (0.423) | (0.417) | (0.416) |
| F-value | 569.53*** | 459.27*** | 514.61*** | 466.28*** |
| Number of observations | 378 | 378 | 378 | 378 |
| $R^{2\ adj}$ | 0.976 | 0.969 | 0.962 | 0.961 |

Notes: Dependent variable: regional start-up rate in $t_0$. Pooled ordinary least squares (OLS) regressions. Robust standard errors in parentheses. Standard errors are clustered at Federal State X Year-level to capture spatial autocorrelation. ***Statistically significant at the 1% level; and **statistically significant at the 5% level. All continuous variables are log-transformed

period (Table 4.4). The results on the role of lagged start-up and self-employment rates on start-up activity are in line with the results for West Germany.

The correlation between the self-employment rates before German unification and the start-up rates between 1993 and 2014 is insignificant (Table 4.8). This result is most certainly driven by transition-specific effects, such as the booming new business formation particularly in the construction sector and in small-scale consumer services, a sector that was highly underdeveloped in the GDR economy. Many of these service-sector start-ups occurred out of necessity due to a lack of other available job opportunities. Indeed, a high employment rate is negatively related to entrepreneurship in East Germany. We also see a significantly positive correlation between the employment rate with the self-employment rates in 1907, 1925 and

**Table 4.5** The effect of self-employment rates in 1925 and 1989 on the current start-up rate in East Germany, 1993–2014 (Scenario III)

| Dependent variable: Start-up rate | I | II | III | IV | V |
|---|---|---|---|---|---|
| Self-employment rate, 1925 | 0.239*** | 0.444*** | 0.256** | | |
| | (0.0876) | (0.107) | (0.107) | | |
| Self-employment rate, 1989 | | | | 0.136*** | |
| | | | | (0.0438) | |
| Self-employment rate, 1907 | | | | | 0.176** |
| | | | | | (0.0783) |
| Population density (t − 1) | | −0.00618 | 0.0104 | 0.0692** | 0.150*** |
| | | (0.0284) | (0.0362) | (0.0343) | (0.0394) |
| Share of R&D personnel (t − 1) | | 0.140*** | 0.0788** | 0.0578* | 0.121*** |
| | | (0.0358) | (0.0352) | (0.0346) | (0.0363) |
| Employment rate (t − 1) | | −1.021*** | −0.819*** | −0.805*** | −1.067*** |
| | | (0.103) | (0.122) | (0.120) | (0.105) |
| Industry structure 1925 | | | Yes | Yes | |
| Industry structure 1907 | | | | | Yes |
| Federal State dummies | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** |
| Year dummies | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** |
| Constant | −4.540*** | −4.163*** | −4.174*** | −4.255*** | −5.999*** |
| | (0.208) | (0.353) | (0.619) | (0.587) | (0.381) |
| Number of observations | 378 | 378 | 378 | 378 | 378 |
| $R^{2\ adj}$ | 0.948 | 0.961 | 0.964 | 0.964 | 0.962 |

Notes: Dependent variable: regional start-up rate in $t_0$. Pooled ordinary least squares (OLS) regressions. Robust standard errors in parentheses. Standard errors are clustered at Federal State X Year-level to capture spatial autocorrelation. ***Statistically significant at the 1% level; and **statistically significant at the 5% level. All continuous variables are log-transformed

1989. This indicates that regions with high remnants of entrepreneurial culture experienced a comparatively positive labor market development after transition. In any case, the level of local unemployment that was mainly caused by the transition to a market economy might confound the positive effect of the historical self-employment rate on start-up activity.

The analysis reveals that the self-employment rate in 1907, 1925 and 1989 have a positive and significant effect on the re-emergence of start-up activity after the breakdown of communism. The results strongly indicate persistence of regional entrepreneurship. The models of Table 4.5 also show that the share of R&D personnel is positively related to start-up activity in East Germany, whereas population density has no robust effect. Similar to the result for West Germany, the employment rate has a negative impact on start-up activity.

Quantile regressions using Model II of Table 4.4 and Model III of Table 4.5 show that the effect of past start-up activity and the historical self-employment rate on current start-up activity is strongest for regions with high levels of new firm formation (Figs. 4.6 and 4.7). The increase of the marginal effect with rising start-up activity is
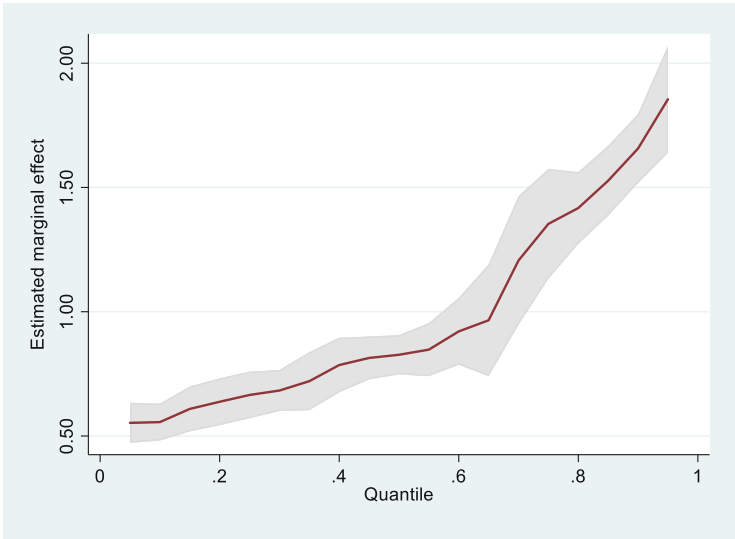
**Fig. 4.6**  Estimated marginal effect of the start-up rate in $t - 3$ on the start-up rates in East Germany (shaded areas indicate upper and lower confidence intervals; bootstrapped standard errors with 1000 replications)
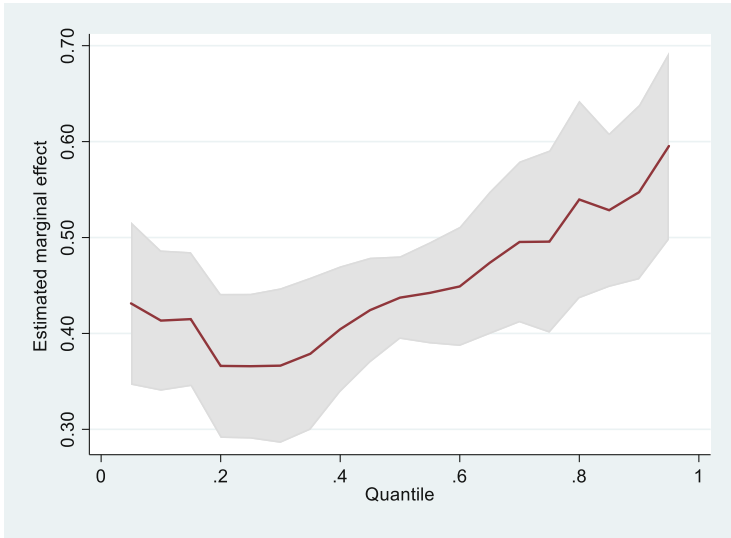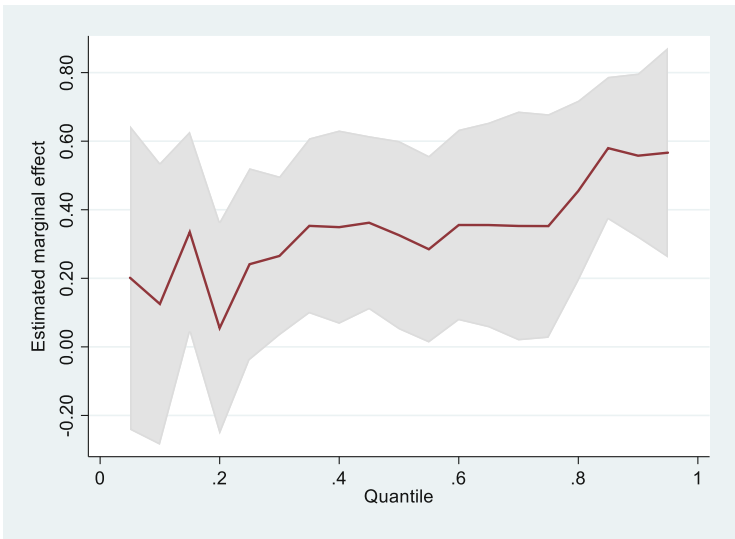


**Fig. 4.7**  Estimated marginal effect of the self-employment rate in 1925 on the start-up rates in East Germany (shaded areas indicate upper and lower confidence intervals; bootstrapped standard errors with 1000 replications)

not as straightforward as in Scenario II. Remarkably, the effect of the historical self-employment rate is apparently not significantly different from zero for regions in the three lower quantiles. This less clear relationship might be explained by the much more intensive disruptive shocks in East Germany that may have damaged the entrepreneurial culture. Altogether, the findings for Scenario III demonstrate that there is a significant persistence of regional differences in entrepreneurship over long periods of time. It is remarkable that these differences survived four decades of socialism characterized by a series of intense anti-entrepreneurship policies. The fact that regional entrepreneurship proved to be self-sustaining under these hostile circumstances suggests that a regional entrepreneurship culture, once established, may be rather robust.[4]

## 4.6   Discussion and Conclusions

Our empirical investigation reveals a pronounced persistence of self-employment and start-up rates in German regions over long periods of time, which is a strong indication for the presence of a regional entrepreneurship culture that has long-lasting effects. The fact that such a regional culture of entrepreneurship can survive even abrupt and harsh changes in environmental conditions such as, in the case of East Germany, World War II and 40 years of socialist regime (Scenario III) shows that the persistence of entrepreneurship is only partially due to stability in the regional determinants of entrepreneurship. It turns out that a regional culture of entrepreneurship can survive the destruction of a supportive infrastructure, as was the case in East Germany during 40 years of a socialist regime. The findings for East Germany are particularly strong evidence that peer effects and regional norms and values can create an entrepreneurship-friendly "mental software" in the regional population that is not forgotten in times of hostile environmental conditions. This result is even more remarkable given the massive migration into West German regions and out of East German regions after World War II. Obviously, a regional culture of entrepreneurship is a strong force that, once developed, can survive and influence regional development for long periods of time. This finding is in accordance with other research that shows a high stability of informal institutions over time (North 1994; Williamson 2000).

The noticeable persistence of regional entrepreneurship found in our analyses implies more than just the long-term effects of a developed entrepreneurial culture. The stability of regional levels of self-employment and new business formation also

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[4]As a robustness check, we ran all models of Scenario I, II to III with a different independent variable. This is the number of start-ups divided by all employees and unemployed. Since the data on unemployment is available only from 1985 onwards, we can investigate persistence only for a shorter time period. In a second battery of robustness checks we use the start-up rate as defined by the ZEW. This data is available for the period 1995–2016. These robustness checks confirm the main findings.

strongly suggests that the establishment of an entrepreneurial culture will not likely happen overnight and will come only with considerable political effort if even massive anti-entrepreneurial policies in the socialist period did not eradicate such a culture. Hence, trying to build a regional entrepreneurial culture might be viewed as an investment in a kind of capital stock that may only be realized in the long run, but will have a long lasting effect.

Our results give rise to a number of important questions. The first question concerns the sources of a regional entrepreneurship culture. How does a regional culture of entrepreneurship emerge and what can policy do to stimulate the development of such a culture? Analyses of historical examples of the emergence of an entrepreneurship culture may be particularly helpful for answering these questions.

In many regions, the sources of an entrepreneurship culture may be deeply rooted in economic history. Maybe the type of agriculture that prevailed in a region, e.g., large-scale farming with many employees (like in northeast Germany) versus small family-run farms (such as are found in the German region Baden-Wuerttemberg), plays a role. Differences in the structure of agriculture may be based in socio-political realities, but they may also have to do with the quality of the soil, or with certain social practices, such as the mode of inheritance. If, for example, it has been common practice in a region to divide the land among the beneficiaries in real terms (*Realteilung*), the resulting small lots created an incentive to shift economic activity toward some type of craft business, maybe first as a secondary occupation that later became the main source of income. This is a commonly voiced explanation for the emergence of an economic structure characterized by a relatively large number of small firms in some regions in the south of Germany. This type of economic shift would not have been so likely to occur, however, if land was cohesively transferred to one beneficiary only (*Anerberecht*), as was the case in other regions of Germany. Such examples suggest that attempts to explain the emergence of a regional entrepreneurship culture will need to reach far back into the economic history of regions.

A second important question is how a culture of entrepreneurship, once established, is transmitted across generations and can persist through severe changes of the environmental conditions. Recent research has demonstrated the importance of role models and peer effects that may partly explain the persistence of such a culture (Bosma et al. 2012; Chlosta et al. 2012; Dohmen et al. 2012; Laspita et al. 2012). There may, however, be additional factors that are important for the persistence and transmission of an entrepreneurial culture that should be the subject of further research.

A third question we have not touched on here is the effect of a regional culture of entrepreneurship on regional development. Given the compelling empirical evidence showing a positive contribution of new business formation to regional growth (see Fritsch 2013), we should expect that regions with such a culture can draw long-term benefits and are better able to cope with the challenges of their external environment. Hence, the analysis of long-term growth trajectories may reveal the full effects of an entrepreneurial culture. We investigate the effect of historical levels of self-employment on regional growth in Chap. 6.

# Appendix

**Table 4.6** Summary statistics

| | Mean | Standard deviation | Minimum | Maximum |
|---|---|---|---|---|
| *West Germany (1976–2014)* | | | | |
| Start-up rate | 37.847 | 8.564 | 15.893 | 80.601 |
| Self-employment rate | 0.069 | 0.015 | 0.04 | 0.134 |
| Self-employment rate, 1925 | 0.11 | 0.014 | 0.06 | 0.139 |
| Self-employment rate, 1907 | 0.12 | 0.02 | 0.081 | 0.167 |
| Population density | 5.419 | 0.663 | 4.213 | 7.125 |
| Share of R&D personnel | 0.017 | 0.008 | 0.003 | 0.048 |
| Employment rate | 0.525 | 0.06 | 0.375 | 1.27 |
| *East Germany (1993–2014)* | | | | |
| Start-up rate | 45.587 | 21.025 | 18.71 | 126.316 |
| Self-employment rate | 0.075 | 0.007 | 0.053 | 0.09 |
| Self-employment rate, 1989 | 0.02 | 0.005 | 0.012 | 0.029 |
| Self-employment rate, 1925 | 0.102 | 0.008 | 0.09 | 0.115 |
| Self-employment rate, 1907 | 0.138 | 0.025 | 0.105 | 0.215 |
| Population density | 4.735 | 0.506 | 3.751 | 5.71 |
| Share of R&D personnel | 0.016 | 0.005 | 0.007 | 0.034 |
| Employment rate | 0.494 | 0.048 | 0.365 | 0.627 |

Notes: The employment rate can take on values above 1 if the number of employees in the local establishments exceeds the number of people in working age registered in a region. Considering the unemployment rate, which is entirely based on the residence level, in the empirical analysis instead of the employment rate leaves the main results virtually unchanged. Official unemployment rates are available for a much shorter time period. This is why we refer to the employment rates, which are based on own calculations, in the main analysis

**Table 4.7** Correlation matrix West Germany

| | | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|---|
| 1 | Start-up rate | 1 | | | | | |
| 2 | Self-employ-ment rate | −0.059*** | 1 | | | | |
| 3 | Self-employ-ment rate, 1925 | 0.118*** | 0.106*** | 1 | | | |
| 4 | Self-employ-ment rate, 1907 | 0.095*** | −0.045** | 0.733*** | 1 | | |
| 5 | Population density | −0.03 | −0.262*** | −0.227*** | 0.229*** | 1 | |
| 6 | Share of R&D personnel | −0.261*** | 0.029 | 0.096*** | 0.279*** | 0.549*** | 1 |
| 7 | Employment rate | −0.454*** | −0.21*** | 0.214*** | 0.223*** | 0.247*** | 0.394*** |

Notes: *** significant at the 1% level; ** sig. at the 5% level

**Table 4.8** Correlation matrix East Germany

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|---|---|
| 1 | Start-up rate | 1 | | | | | | |
| 2 | Self-employment rate | −0.299*** | 1 | | | | | |
| 3 | Self-employment rate, 1989 | −0.044 | 0.105** | 1 | | | | |
| 4 | Self-employment rate, 1925 | −0.034 | −0.217*** | 0.184*** | 1 | | | |
| 5 | Self-employment rate, 1907 | −0.048 | 0.033 | 0.544*** | 0.5*** | 1 | | |
| 6 | Population density | −0.009 | −0.352*** | 0.46*** | 0.524*** | 0.715*** | 1 | |
| 7 | Share of R&D personnel | −0.155*** | −0.282*** | 0.247*** | 0.279*** | 0.349*** | 0.718*** | 1 |
| 8 | Employment rate | −0.196*** | −0.545*** | 0.16*** | 0.494*** | 0.409*** | 0.6*** | 0.593*** |

Notes: *** significant at the 1% level; ** sig. at the 5% level

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# Chapter 5
# The Case of East Germany

## 5.1 The Re-emergence of Entrepreneurship as a Key Element of the Transformation to a Market Economy

The fall of the Berlin Wall in November 1989 marked the beginning of a transformation of the former socialist regimes of Eastern Europe to a market economic system. The re-emergence of private entrepreneurship—strongly suppressed in the planned socialist economies—is a key element of this development. The transition to a market economy increased the number of entrepreneurial opportunities tremendously and entrepreneurs have been crucial agents of change throughout this process.

The surge in start-up activities after the "rules of the game" had changed, vividly illustrates what was put forward by William Baumol (1990); the allocation of talent into productive entrepreneurship is strongly determined by the institutional framework. A considerable amount of literature on entrepreneurship in a transitional context has emerged that stresses the important role of institutions and institutional change for the emergence and the performance of new firms (for an overview, see Kshetri 2009).[1] Indeed, the transition of former socialist countries of Eastern Europe is a fascinating empirical arena for studying and understanding the important interplay between institutions and entrepreneurship.

In this chapter we analyze the emergence of new business formation and entrepreneurship during East Germany's transformation from a socialist system to a western-type market economy. Our main interest lies in discovering the effect the legacy of a socialist system had on entrepreneurship in the successive periods. In contrast to other transition countries, the case of East Germany has some attractive

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This chapter builds on Fritsch et al. (2014).

[1]E.g., Brezinski and Fritsch (1995), Johnson and Loveman (1995), Smallbone and Welter (2001, 2009), McMillan and Woodruff (2002).

features that create quasi-natural lab conditions for studying the role that (exogenous) institutional change had on entrepreneurship.

East Germany is particularly well-suited for an analysis of the institutional legacy of socialism for at least two reasons. First, with the reunification of Germany in 1990, the ready-made West German framework of formal institutions was adopted practically overnight. As a result of this, entrepreneurship in East Germany could build on the approved institutions of a successful western-type market economy from its beginning. This quasi-natural experiment of a clear-cut exogenous institutional shock rules out endogeneity that may be caused by the mutually reinforcing interplay of emerging entrepreneurship and institutional change that is typical for other transition economies. Hence, our results for the case of East Germany may be regarded as particularly reliable since we are not faced with the problem of disentangling empirically whether institutional change affects entrepreneurship, or whether entrepreneurship affects institutional change (reverse-causality problem). Second, comparisons of development in East Germany and West Germany provide a suitable benchmark for identifying special features of entrepreneurship that may be regarded as an outcome of a socialist legacy or a "treatment effect" of exposure to a socialist system.

These two features of the East German case make it well suited to test Baumol's (1990) claim that the level of potential entrepreneurs is approximately the same in all societies, but the proportion of those people who make productive use of their talent by running their own business depends on the ruling institutions. Hence, considering self-employment to be a form of productive entrepreneurship in the sense of Baumol's (1990) hypothesis, we should expect a convergence of both the level and the type of self-employment between East and West Germany.

However, we go considerably beyond such a simple test of Baumol's (1990) hypothesis in a number of respects. One of these extensions is to analyze the characteristics of entrepreneurs in the two parts of the country. If individual characteristics of entrepreneurs and non-entrepreneurs reflect incentives of the institutional framework for becoming self-employed, then these characteristics in East and West Germany should not be too different. The differences that we find between East and West German entrepreneurs may be regarded as a legacy of the socialist regime. A second extension is the inclusion of informal institutions in the analysis.[2] This is possible by investigating differences across East German regions and accounting for historical levels of entrepreneurship in pre-socialist times. We regard such historical levels of entrepreneurship as indicators for a regional entrepreneurship culture and analyze how such a regional culture affects the levels of new business formation and self-employment in the post-socialist transition period. If we find correspondence between historical and current levels of regional entrepreneurship, this suggests that such a culture could not be eradicated by four decades of anti-entrepreneurial socialist formal institutions. Such a result could be regarded as a confirmation of

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[2]Baumol (1990) seems to recognize the role of informal institutions by mentioning the low social prestige of entrepreneurship in ancient Rome.

the hypothesis that informal institutions change much more slowly and are more persistent than formal rules (North 1994; Williamson 2000). The analysis shows to what extent the informal institution of a regional entrepreneurship culture leaves an imprint on entrepreneurship and is able to survive radical changes of the governing formal systems.

In the next section (Sect. 5.2), we first provide a brief sketch of the historical background by portraying the state of entrepreneurship in East Germany during the socialist regime. Section 5.3 then describes the development of the overall level of self-employment in East Germany after unification and the regime switch to a market economy. Based on the overall picture, we then offer a comparative analysis of the individual characteristics of business founders and self-employed people in East Germany and West Germany (Sect. 5.4). The main aim of this analysis is to identify to what extent four decades of socialist treatment in East Germany has left its imprint on an individual's attitude about entrepreneurship. Section 5.5 deals with regional differences and long-term trends of regional levels of self-employment. In particular, we relate current levels of entrepreneurship to the level of self-employment before and during the socialist period in order to identify persistence. We regard persistence as the manifestation of an informal institution of a regional entrepreneurship culture. Finally, we draw conclusions and suggest some promising and important avenues for further research (Sect. 5.6).

## 5.2 Historical Background

After the devastating defeat of World War II, Germany was occupied by the Allied Powers. In 1949, the eastern part of the country, which was under the control of the Soviet army, became the German Democratic Republic (GDR); a socialist state with a centrally-planned economic system. The western part of Germany became the Federal Republic of Germany (FRG) with a western-type market economy. After about 40 years, East Germany was reunified with the West after the socialist East German state collapsed in late 1989. This reunification gave the former GDR membership in the European Union and the introduction of the West German market economic system.

The socialist GDR regime strongly favored collectivist values and perceived entrepreneurship as a bourgeois anachronism (e.g., Pickel 1992; Thomas 1996). Hence, the socialist government adopted a rigorous anti-entrepreneurship strategy that made numerous attempts to eradicate entrepreneurship and private-sector firms. This included massive socialization of private enterprises and intensive control of the few remaining private-sector activities that were officially tolerated (for details, see Brezinski 1987; Pickel 1992). However, even in light of the GDR's massive anti-entrepreneurship policy, 1.8% of the population aged 18–64 years were self-employed in September 1989 (Statistik der Deutschen Demokratischen Republik 1990), just before the socialist German Democratic Republic collapsed. This number, at that time,

constituted less than 20% of the number of self-employed West Germans (Fritsch et al. 2014).

Compared to other countries of the socialist block, the transformation process in East Germany was much faster and much more radical (Brezinski and Fritsch 1995). Due to the rapid unification with West Germany, the institutional framework of a western-type market economy became effective almost overnight. This "shock" transformation induced massive structural change accompanied by an almost complete replacement of incumbent firms over a short period of time. These developments led to a massive drop of manufacturing employment in East Germany from 48.7% in 1989 to 16.0% 2 years later (Hall and Ludwig 1995). As a result, the unemployment rate increased from virtually zero to more than 15% in 1992 which makes the East German transition one of the most dramatic episodes of economic disruption and change during the relatively peaceful years of the late twentieth century (Burda and Hunt 2001, p. 1).

## 5.3  New Business Formation and Self-employment in East and West Germany During the Transformation Process

The opening of markets and the switch to a market economic system in 1990 induced a start-up boom in East Germany that clearly demonstrated the willingness of many East Germans to be self-employed. According to the German Micro-Census,[3] the self-employment rate (the share of self-employed persons over the working population aged between 18 and 65 years) rose from about 1.8% at the end of the socialist period in 1989 to more than 5% in 1991 (Fig. 5.1).[4] During the 1990s, the self-employment rate in East Germany grew rapidly and reached the West German level in 2004. This equalization of the self-employment levels in East and West Germany is in line with Baumol's (1990) claim that the character of the institutional framework is a main determinant of the level of productive entrepreneurship in a society.

A likely reason for the persistently high level of new business formation in East Germany (Fig. 5.2) could be the relatively high unemployment rate that may have resulted in many businesses being started up "out of need" (necessity entrepreneurship). One indication that unemployment was indeed having this effect, is the peak of new business formation around the year 2005 that is presumably due to the labor market reforms and the massive extension of public support for start-ups by unemployed people, as well as aggressive promotion of entrepreneurship as a career option (for details, see Caliendo and Kritikos 2010). Although there was a relatively

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[3]The German Micro-Census, conducted by the Federal Statistical Office, has a general sampling fraction of 1% of the total population living in Germany, providing information for 820,000 individuals in each wave (Statistisches Bundesamt 2009).

[4]This rise in the self-employment rate is slightly overestimated because of the decreasing employment rate, which is the denominator of the self-employment rate.
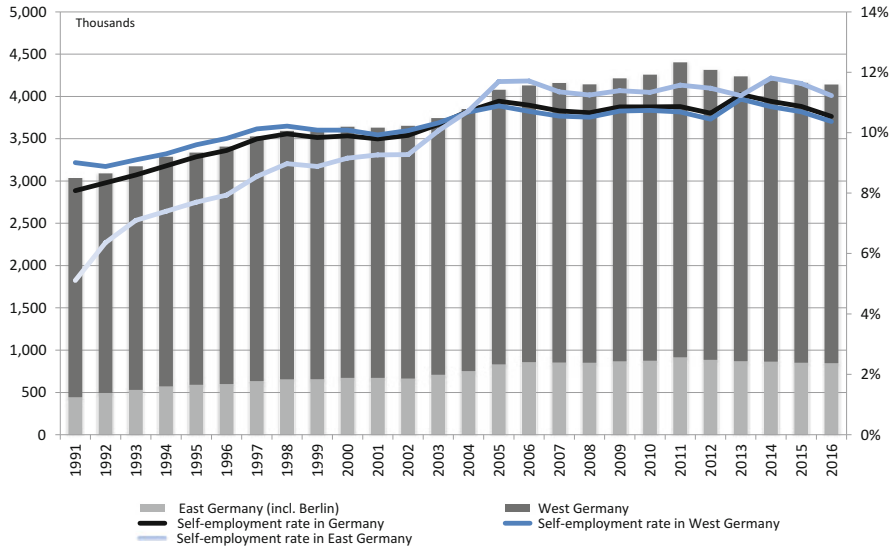
**Fig. 5.1** Self-employed individuals, absolute numbers and self-employment rates, 1991–2016 (Source: own calculations based on the German Micro-Census)
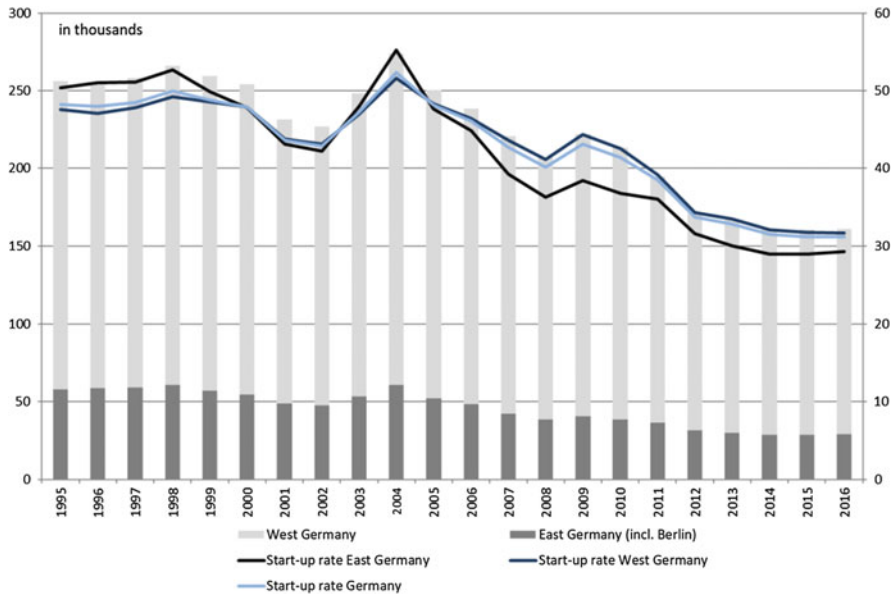


**Fig. 5.2** Entries into self-employment, absolute numbers and start-up rates, 1995–2016 (Source: ZEW-Firm Panel)

large number of start-ups in East Germany during this period, the new firms were, on average, smaller (for details, see IWH 2010) and less successful when compared to their West German counterparts (Brixy and Grotz 2004; Fritsch 2004). It is also remarkable that a relatively high share of the newly emerging businesses in East Germany were in industries such as retailing, hospitality and catering, which are characterized by low entry barriers in terms of financial resources and required qualifications (for details, see Fritsch et al. 2012).

## 5.4   Differences in the Personal Determinants of Start-ups in East and West Germany

There are good reasons to assume that East Germany's socialist legacy negatively affected its people's attitudes toward entrepreneurship, and both their willingness and ability to start an own firm. One source of such a negative effect is the implied reduction of opportunities for contact with entrepreneurial role models caused by the sharp decrease in entrepreneurship during the socialist regime. A second potential source of such an effect could have come from the massive anti-capitalistic propaganda campaigns, especially indoctrination of young people in their educational programs. This propaganda may have resulted in negative attitudes towards entrepreneurship, thereby reducing the willingness of East Germans to become self-employed (Bauernschuster et al. 2012; Fritsch and Rusakova 2012). Third, since East Germans had relatively few incentives or opportunities to accumulate financial capital, they had, on average, much fewer available resources than their West German counterparts. Fourth, people who were educated and worked in a socialist centrally planned economy may lack certain skills that are necessary for, or at least conducive to, successful entrepreneurship. Thus, there are a number of potential reasons that explain the rather low levels of self-employment rates in East Germany directly after German unification.

Given the rapid convergence of entrepreneurial activities in East Germany to West Germany's level, it appears that over time more East Germans were able to access the resources required to begin an own business venture. Because a western style market economy was introduced in East Germany directly after the fall of the Berlin Wall, Baumol's (1990) argument that certain types of entrepreneurs are more likely to be active in a given institutional framework would lead us to expect few pronounced differences in the personal characteristics of East and West German business founders. Hence, the analysis of individual-level determinants of entrepreneurial choice in East and West Germany may provide further insights into the role an institutional framework plays in supporting entrepreneurship.

We use data from the German Socio-Economic Panel (SOEP), a representative and well-accepted yearly household survey in Germany (for a description of the data, see Wagner et al. 2007), for our investigation of the differences between East and West Germans with regard to their decision to start an own business or not. The

analysis is based on the waves 1999–2014 of the SOEP. We exploit the panel character of the data and perform random effects probit analyses. We do not apply the fixed effects panel technique because a number of the independent variables show no, or merely small changes over time, using this method would assign considerable parts of their influence to the fixed effects. The dependent variable assumes the value 1 if a person has set up an own business in the year of the interview and equals zero otherwise.[5] Independent variables that may be relevant for the decision to start an own business (see Parker 2009a, for an overview) and for which the SOEP provides information are age, years of formal education, gender, marital status, gross labor income and the share of time in unemployment in the total time of labor market experience. We interacted all individual control variables with a dummy indicating an East German respondent.[6] The right column in Table 5.1 displays the interaction effect, while the left column shows the main effect, which represents the coefficient estimate for West German respondents. Statistical significance of an interaction effect means that there is a difference in the effect size for East Germans. Insignificance of the interaction term indicates equal effect size of the respective control variable for East and West German respondents.

We find a positive effect of the time spent in unemployment in the overall labor market experience. In accordance with the majority of previous analyses (see Parker 2009b), males are more likely to become self-employed than females in both East and West Germany. There is also the usual inverted U-shape relationship between age and self-employment. With the exception of marital status, the interaction effects for East German persons are not statistically significant (Table 5.1). This indicates that the characteristics of founders in East and West Germany are rather similar (Table 5.1). Hence, under the identical framework of formal institutions, roughly the same types of individuals chose the employment option of productive entrepreneurship. This finding may be regarded as further confirmation of Baumol's (1990) hypothesis.

Although the analysis does not reveal any significant interaction effects between a respondent's age and his or her propensity to become self-employed, we might find some revealing differences if we focus on the East German age cohorts. Considering that older East Germans spent a longer period of time being indoctrinated by the socialist regime and had longer exposure to massive anti-capitalistic propaganda campaigns, one might expect a lower propensity among this age group to engage in entrepreneurial activity. Working in a centrally planned economic system they had little opportunity to gain knowledge about the functioning of a market economy and, quite frequently, a considerable part of the work experience that they had acquired under socialism turned out to be useless in the newly emerging system (Bird et al.

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[5]The sample is restricted to employed individuals between 18 and 65 years of age. Civil and military servants as well as helping family members are excluded from the analysis.

[6]Respondents are assigned to East and West Germany if they lived in the respective part of the country at the time of the survey and before German unification in 1990. Hence, we exclude respondents who moved from the East to the West and vice versa.

**Table 5.1** The impact of personal characteristics on the probability of start-up in East and West Germany over time

| Dependent variable: Probability to start-up a firm (Y = 1) | West | East (interaction effects) |
|---|---|---|
| East German origin (1 = yes, 0 = no) | −0.003 | |
| | (0.023) | |
| Age (years) | 0.001** | 0.001 |
| | (0.000) | (0.001) |
| Age (years), squared | −0.000** | −0.000 |
| | (0.000) | (0.000) |
| Years of formal education | 0.000 | −0.002 |
| | (0.002) | (0.003) |
| Years of formal education, squared | 0.000 | 0.000 |
| | (0.000) | (0.000) |
| Male (1 = yes, 0 = no) | 0.002** | 0.003 |
| | (0.001) | (0.003) |
| Married (1 = yes, 0 = no) | −0.001 | 0.003* |
| | (0.001) | (0.001) |
| Gross labor income (log) (t − 1) | −0.003*** | −0.000 |
| | (0.001) | (0.001) |
| Share of time unemployed in total labor market experience | 0.005** | 0.001 |
| | (0.002) | (0.001) |
| Year Dummies | Yes*** | |
| Log pseudo likelihood | −1094.296 | |
| Wald chi2 | 71.00*** | |
| Number of observations | 42,043 | |

Notes: Dependent variable: Founded a firm in the respective time-period, yes = 1, no = 0. Random effects probit analyses. Marginal effects are shown; robust standard errors in parentheses. ***: statistically significant at the 1% level; **: statistically significant at the 5% level; *: statistically significant at the 10% level

1994; Gathmann 2005; Wyrwich 2013). Older West Germans, however, had more time to recognize and act on entrepreneurial opportunities, as well as to accumulate the resources necessary for starting an own business. In order to investigate the presence of such an age effect we analyze the probability of being self-employed among different age groups based on the SOEP.

We analyze the probability of self-employment for relatively young and relatively old people between 1999 and 2014 in order to detect whether age-related effects decrease over time (Table 5.2). The analysis shows that there is no East-West difference for those SOEP respondents who are younger than 40 years old while there is a strong negative East effect among older respondents. Thus, it appears to be the older East Germans who are particularly underrepresented in entrepreneurship.[7] The results on control variables resemble those of Table 5.1.

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[7]Findings of a related study (Wyrwich 2013) show that the negative origin effects among East Germans are more pronounced for self-employed people with dependent employees than for solo

**Table 5.2** Analyses of determinants of self-employment over time[a]

| Dependent variable: | Age (years) | |
| Probability to be self-employed (Y = 1) | 18–39 | 40–65 |
| --- | --- | --- |
| East German origin (1 = yes, 0 = no) | 0.000 | −0.014*** |
| | (0.003) | (0.004) |
| Age (years) | 0.007* | 0.023*** |
| | (0.004) | (0.005) |
| Age (years), squared | −0.000 | −0.000*** |
| | (0.000) | (0.000) |
| Years of formal education | 0.008 | 0.013 |
| | (0.008) | (0.009) |
| Years of formal education, squared | −0.000 | −0.000 |
| | (0.000) | (0.000) |
| Male (1 = yes, 0 = no) | 0.017*** | 0.034*** |
| | (0.003) | (0.004) |
| Married (1 = yes, 0 = no) | −0.005 | −0.001 |
| | (0.003) | (0.005) |
| Share of time unemployed in total labor market experience | −0.027*** | −0.051* |
| | (0.009) | (0.031) |
| Year Dummies | Yes | Yes |
| Log pseudo likelihood | −2957.3114 | −4051.8741 |
| Wald Chi2 | 177.77*** | 199.64*** |
| Number of observations | 28,779 | 41,006 |

[a]The case number is stronger than in Table 5.1 because it is not controlled for gross labor income, which often has missing values. It does not make sense to include this control in this table because being self-employed (dependent variable) affects income

Notes: Dependent variable: Self-employment status (yes = 1, no = 0). Probit analyses. Marginal effects are shown; robust standard errors in parentheses. ***: statistically significant at the 1% level; **: statistically significant at the 5% level; *: statistically significant at the 10% level

The results of our analysis on the relationship between age and entrepreneurship suggest that the socialist legacy left an imprint on East Germans, even though the levels of entrepreneurship in East and West have become quite similar. Hence, the distinctiveness of entrepreneurship in post-socialist East Germany is not limited to entrepreneurial choice but also pertains to entrepreneurial success. Analyses of the survival of new businesses in East and West Germany show a higher risk of failure for start-ups in East Germany (Brixy and Grotz 2004). It is interesting to note that of the surviving East German start-ups, the businesses that tend to have a stronger growth rate are those that have West German involvement (Wyrwich 2010). It is not hard to imagine that this is another indication that 40 years of a socialist legacy had a

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self-employment. This result is remarkable because such differences in the probability of self-employment cannot be solely explained with an effect of East German origin. Additionally, there must be other reasons.

negative impact on the relevant entrepreneurial abilities of many East Germans founders.

Further differences between people in East and West Germany are found when analyzing the diversity and structure of their skills. According to the theory of "balanced skills" (Lazear 2004, 2005), entrepreneurs are generalists who need a variety of skills to run a business. Furthermore, the skills should be "balanced" because the successful starting of a firm may depend on whether the weakest skill becomes a bottleneck and in turn may shape the propensity to start up. Empirical analyses show that East Germans have, on average, less diversified skill sets, and a significantly lower number of expert skills than their West German counterparts (Fritsch et al. 2014). The less diversified skill sets of East German entrepreneurs contribute to explaining the lower performance of East German firms. Most employees in socialist economies (such as that found in East Germany) required a low skill set because their jobs had a high degree of specialization and they had little opportunity to change jobs (see, e.g., Hitchens et al. 1993, 1995). Thus, the on average lower skill balance of East Germans may be regarded another legacy of the socialist regime. Moreover, even after German unification a large number of East German firms became branches of West German companies that often used the East German branch as an "extended work bench" where the employees needed relatively few skills.

## 5.5   Regional Differences in Entrepreneurship

Looking at the regional distribution of self-employment, we find significant differences, indicating that region-specific factors play a prominent role. In fact, even in September 1989, after 40 years of socialist regime and just before the East German transition to a market economic system, there were significant regional differences with regard to the share of self-employed people in the GDR. At that time, the self-employment rate varied between 0.4% and 3.2% (Fig. 5.3). Specifically, regions in the southern part of East Germany such as Chemnitz, Zwickau, and Dresden had a considerably above average level of self-employment, whereas self-employment rates were especially low in regions with a high employment share in agriculture and in those areas where local industry was strongly shaped by socialist industrial policy and regional planning (e.g., Bitterfeld, Eisenhuettenstadt, Hoyerswerda, and Schwedt; for details see Wyrwich 2012, 2014).

A comparison of self-employment rates on the eve of the East German transition to a market economy with the respective shares of self-employment in the years 1907 and 1925 shows a high degree of correspondence.[8] The positive relationship between the self-employment rate in 1907 and 1925 is particularly pronounced in those regions in the south of East Germany that show high levels of self-employment

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[8]For the definition of the historical self-employment rates see Sect. 3.2.1.
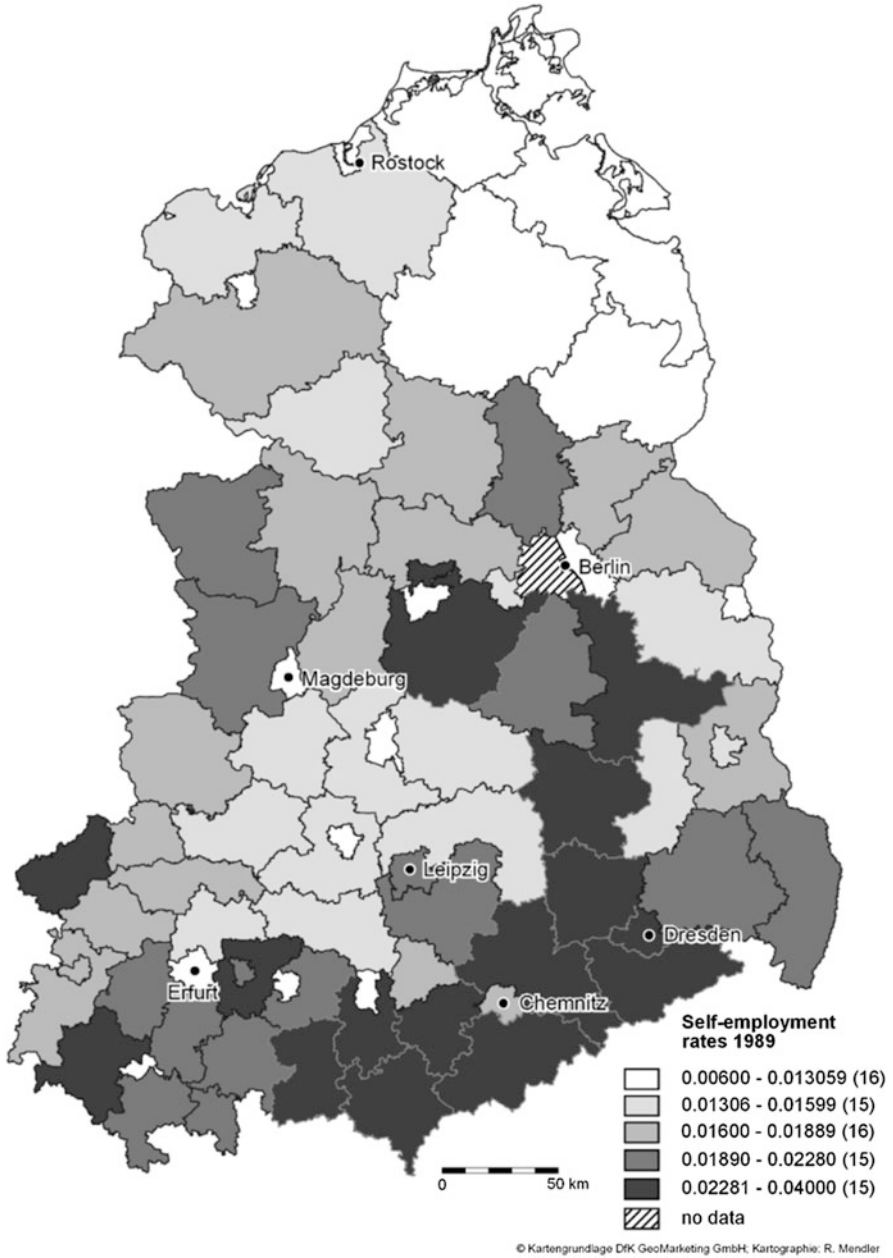
**Fig. 5.3** Regional differences of self-employment in the GDR in 1989 (Source: own calculations on the basis of official GDR statistics, Statistik der Deutschen Demokratischen Republik 1990)

in 1989, even when we control for regional conditions such as population density, the share of employees with tertiary education, and share of manufacturing employment (Table 5.3). This suggests that the regional levels of self-employment that still existed at the end of the GDR era have historical roots. It is also quite remarkable that even when we include home workers (*Heimgewerbetreibende*) in the historical self-employment rates, we still see a positive effect.

Since the rigorous anti-entrepreneurship policies implemented during the GDR era largely prevented any new entries of private firms, the regional variation in private-sector activity in 1989 can be regarded as a result of different levels of resistance to political attempts to abolish private firms. Hence, on the eve of the transition to a market economy, there was considerable variation across East German regions with regard to self-employment or, in other words, an entrepreneurial culture. Thus, our result suggests that a number of severe historical shocks—such as World War II and separation of the country into an eastern and a western part, as well as four decades of socialism—could not completely eradicate the regional culture of entrepreneurship that existed in the pre-socialist period.

However, as previously mentioned, the scope of private sector activities varied across sectors. During the GDR era, it was particularly manufacturing trades and handicrafts where self-employment was allowed. Indeed, the effect of self-employment in 1925 is even more pronounced when restricting the measure to the manufacturing sector (Table 5.3). On the one hand, self-employment in manufacturing may require a higher level of entrepreneurial ability to overcome entry barriers compared to, for example, a business in small-scale services. Thus, self-employment in manufacturing might be an especially well-suited indicator of the historical geography of entrepreneurial talent and culture. On the other hand, if self-employment in the GDR was restricted specifically to manufacturing trades, then this more noticeable effect may also capture the notion that in areas with high pre-socialist shares of manufacturing more self-employment could be preserved. So, the coefficient estimate may not only capture a cultural component but also a sector-specific effect. Be as it may, we can conclude that self-employment has survived the socialist period, especially in those regions that had an entrepreneurial tradition in the manufacturing sector before the socialist GDR regime came into existence.[9]

Data on start-up activity is obtained from the Foundation Panel of the Centre for European Economic Research (Zentrum für Europäische Wirtschaftsforschung, ZEW) in Mannheim (for details, see Almus et al. 2002; Bersch et al. 2014). This dataset provides the most reliable information on East German start-up activities in

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[9]It should be also noted that the employment share in manufacturing in 1989 correlates positively with the self-employment rate. A high manufacturing share in 1989 mirrors a high pre-socialist specialization in manufacturing. The share of highly skilled employees relates negatively to the self-employment rate in 1989. One main reason may be the strong anti-entrepreneurial indoctrination at universities. As previously mentioned, the ideological conditioning of university graduates was supported by a pronounced tendency to admit only those persons to higher education that declared conformity with socialist values (see Connelley 2000; Fritsch and Rusakova 2012).

**Table 5.3** Regression analysis on self-employment rates across East German regions in 1989

| Dependent variable: Self-employment rate 1989 | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| Share of self-employed in non-agricultural private sectors in total employment 1907 | 0.413*** | | | | | |
| | (0.130) | | | | | |
| Share of self-employed in manufacturing industries in total employment 1907 | | 0.354*** | | | | |
| | | (0.0980) | | | | |
| Share of self-employed in non-agricultural private sectors in total employment 1925 | | | 0.170 | | | |
| | | | (0.375) | | | |
| Share of self-employed in manufacturing industries in total employment 1925 | | | | 0.551** | | |
| | | | | (0.252) | | |
| Share of self-employed (incl. home workers) in non-agricultural private sectors in total employment 1925 | | | | | 0.380** | |
| | | | | | (0.177) | |
| Share of self-employed (incl. home workers) in manufacturing industries in total employment 1925 | | | | | | 0.383*** |
| | | | | | | (0.113) |
| Share of highly skilled employees 1989 | −0.300** | −0.279** | −0.358** | −0.362*** | −0.359*** | −0.299** |
| | (0.137) | (0.137) | (0.141) | (0.126) | (0.130) | (0.131) |
| Share of manufacturing employment 1989 | 0.300** | 0.240* | 0.429*** | 0.351*** | 0.329** | 0.219* |
| | (0.127) | (0.132) | (0.126) | (0.130) | (0.132) | (0.125) |
| Dummies for type of region (n = 7) | Yes*** | Yes*** | Yes*** | Yes** | Yes*** | Yes*** |
| Constant | −3.856*** | −3.734*** | −4.284*** | −3.024*** | −3.962*** | −3.598*** |
| | (0.423) | (0.407) | (0.781) | (0.823) | (0.464) | (0.442) |
| F-Value | 6.87*** | 7.31*** | 4.58*** | 6.43*** | 6.02*** | 6.64*** |
| $R^{2\ adj}$ | 0.340 | 0.351 | 0.270 | 0.323 | 0.309 | 0.361 |

Notes: OLS regressions. Robust standard errors in parentheses. ***: statistically significant at the 1% level; **: statistically significant at the 5% level. NUTS 3 regions (districts = Kreise, n = 72). Some districts had to be merged because it was not possible to assign historical data adequately to these districts separately. All continuous variables are log-transformed

the early 1990s on a regional basis (see Sect. 3.2.2 for details). The data show that the level of new business formation in East Germany during the transition process also shows great variation across regions (Fig. 5.4). Particularly high levels of new business formation can be found in regions adjacent to Berlin and in larger cities such as and similar to Dresden, Chemnitz and Leipzig. Start-up rates tend to be rather low in rural regions and in places strongly shaped by socialist economic policies, such as Bitterfeld and Hoyerswerda.[10]

In Tables 5.4 and 5.5 we regress start-up activity in different years on historical self-employment rates. In contrast to the analyses in Chap. 4, we include initial conditions in September 1989 and run the analysis at the level of districts.[11] We are also able to consider the year 1990 by referring to the data of the ZEW and by measuring the start-up rate as number of start-ups over population of working age. The analysis shows that the historical self-employment rates in 1907 and 1989 have a positive effect on start-up activity after transition.[12]

Our additional analyses reveal some remarkable trends over time. The effect size for the self-employment rates found in 1907 and 1989 is relatively similar for the early transition period (1990–1994). The effect of the self-employment rate found in 1989 decreases slightly as time goes on, while the coefficient for the self-employment rate found in 1907 increases after the year 2000. This pattern is astonishing because one would expect that the effect of a variable would decrease the more distant it is from the observation period. One obvious explanation for this pattern is that start-up activity in the early years after re-unification was marked by transition-specific effects that are hard to capture ("transition noise"). After these specific effects vanished, the effect of historically grown entrepreneurship culture became more dominant.[13] Vanishing transition effects that are difficult to capture, may also explain that the explanatory power of the regression models increases the more distant the observation period. The share of highly skilled employees has a positive effect in these estimates. This finding, however, is not robust.[14] Altogether, the overall pattern corresponds to our findings that East Germans who hold a university degree have a relatively low propensity to start a business (Sect. 5.3).

The results for the historical self-employment rates indicate that a comparatively high level of self-employment can have an enduring influence on start-up activity despite tremendous ruptures of the economic and political environment, such as two World Wars, the division of Germany into two separate states, four decades of a

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[10]The high start-up rates in the north (e.g. in the Rostock area) are presumably due to the privatization of the formerly state-owned tourism industry.

[11]Additionally we include dummy variables for the type of region based on the settlement structure (urbanization and centrality) as classified by the Federal Institute for Research on Building, Urban Affairs and Spatial Planning (BBSR).

[12]There is a similar pattern when employing the year 1925.

[13]At the same time, the decrease in the coefficient estimate for the self-employment rate found in 1989 indicates that there are components other than culture that are measured by this variable.

[14]The coefficient estimate becomes insignificant when employing the self-employment rate found in 1925 as the indicator for historical entrepreneurship culture.
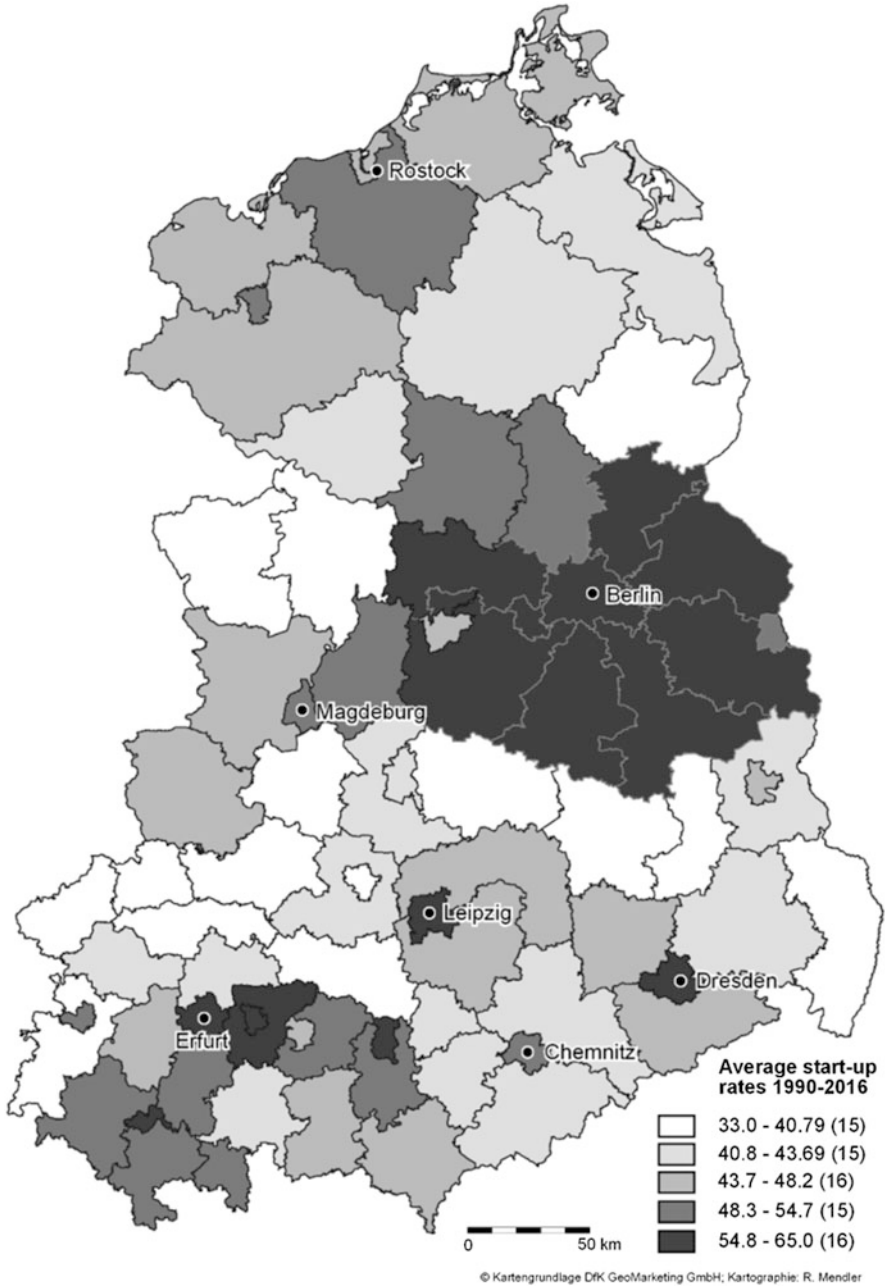
**Fig. 5.4** Average number of start-ups between 1990 and 2016 per 1000 inhabitants between 20 and 64 years old

**Table 5.4** Regression analyses of the effect of historical self-employment rates in East Germany after the regime switch: 1990–1999

| Dependent variable: Start-up rate | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| | 1990 | | Average 1990–1994 | | Average 1995–1999 | |
| Share of self-employed in non-agricultural private sectors in total employment 1907 | 0.242 | | 0.214** | | 0.351*** | |
| | (0.157) | | (0.0895) | | (0.107) | |
| Self-employment rate 1989 | | 0.268**** | | 0.227**** | | 0.253** |
| | | (0.0806) | | (0.0586) | | (0.106) |
| Share of highly skilled employees 1989 | 0.137** | 0.193** | 0.125*** | 0.171*** | 0.174** | 0.219*** |
| | (0.0677) | (0.0886) | (0.0455) | (0.0511) | (0.0707) | (0.0558) |
| Share of manufacturing employment 1989 | −0.178 | −0.0994 | −0.180* | −0.113 | −0.276** | −0.185 |
| | (0.127) | (0.146) | (0.104) | (0.111) | (0.113) | (0.144) |
| Dummies for type of region (n = 7) | Yes | Yes | Yes | Yes | Yes | Yes |
| Federal State Dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Location at the border of West Germany (1 = yes) | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** |
| Constant | −3.764*** | −2.901*** | −4.126*** | −3.416*** | −4.174*** | −3.608*** |
| | (0.384) | (0.492) | (0.204) | (0.321) | (0.262) | (0.535) |
| F-Value | 2.74*** | 4.24*** | 4.68*** | 5.70*** | 10.11*** | 15.43*** |
| $R^2$ adj | 0.294 | 0.327 | 0.371 | 0.410 | 0.491 | 0.469 |

Notes: OLS regressions. Robust standard errors in parentheses. ***: statistically significant at the 1% level; **: statistically significant at the 5% level. NUTS 3 regions (districts = Kreise, n = 72). Some districts had to be merged because it was not possible to assign historical data adequately to these districts separately. All continuous variables are log-transformed

**Table 5.5** Regression analyses of the effect of historical self-employment rates on self-employment rates in East Germany after the regime switch: 2000–2014

| Dependent variable: Start-up rate | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| | Average 2000–2014 | Average 2000–2004 | Average 2005–2009 | Average 2005–2009 | Average 2010–2014 | Average 2010–2014 |
| Share of self-employed in non-agricultural private sectors in total employment 1907 | 0.265*** | | 0.273*** | | 0.305*** | |
| | (0.0962) | | (0.0759) | | (0.0702) | |
| Self-employment rate 1989 | | 0.196* | | 0.191** | | 0.180** |
| | | (0.102) | | (0.0817) | | (0.0808) |
| Share of highly skilled employees 1989 | 0.0723 | 0.108** | 0.0697 | 0.103*** | 0.181*** | 0.210*** |
| | (0.0711) | (0.0519) | (0.0505) | (0.0371) | (0.0441) | (0.0488) |
| Share of manufacturing employment 1989 | −0.313** | −0.244* | −0.226** | −0.156 | −0.219** | −0.146 |
| | (0.120) | (0.142) | (0.100) | (0.129) | (0.0856) | (0.115) |
| Dummies for type of region (n = 7) | Yes | Yes | Yes | Yes | Yes | Yes |
| Federal State Dummies | Yes | Yes | Yes | Yes | Yes | Yes |
| Location at the border of West Germany (1 = yes) | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** |
| Constant | −4.696*** | −4.242*** | −4.816*** | −4.410*** | −4.812*** | −4.523*** |
| | (0.245) | (0.496) | (0.224) | (0.418) | (0.191) | (0.425) |
| F-Value | 7.99*** | 9.61*** | 6.66*** | 8.23*** | 9.49*** | 7.47*** |
| $R^2$ adj | 0.524 | 0.513 | 0.503 | 0.477 | 0.541 | 0.494 |

Notes: OLS regressions. Robust standard errors in parentheses. ***: statistically significant at the 1% level; **: statistically significant at the 5% level. NUTS 3 regions (districts = Kreise, n = 72). Some districts had to be merged because it was not possible to assign historical data adequately to these districts separately. All continuous variables are log-transformed

socialist regime and the shock of transitioning to a market economic system. This suggests the presence and long-lasting persistence of a regional entrepreneurial culture that can be thought of as a 'positive collective programming of the mind' (Beugelsdijk 2007, p. 190), or an 'aggregate psychological trait' (Freytag and Thurik 2007, p. 123) of the population oriented towards entrepreneurial values such as individualism, independence and achievement.

The results of our analyses of self-employment in the GDR suggest that in some areas individuals were more resistant to the anti-entrepreneurship policies of the socialist government than in other areas. Indeed, data on the proportion of craftsmen who joined socialist handicraft cooperatives (*Produktionsgenossenschaften des Handwerks* = PG) show lower shares in regions with a pronounced entrepreneurial tradition (Wyrwich 2012). Furthermore, empirical evidence indicates that there was a considerable degree of intergenerational continuity in self-employment in the GDR (Pickel 1992). Thus, entrepreneurial attitudes might have been passed on across generations leading to persistence of self-employment and the survival of a regional entrepreneurial culture.

## 5.6    Summary and Conclusions

Our analyses of self-employment in East Germany after 40 years of a socialist regime lead to several remarkable results. Self-employment and entrepreneurship in East Germany—after having been suppressed for a significant period of time—seem to have recovered. In particular, we found considerable support for Baumol's (1990) hypothesis that the allocation of people into productive entrepreneurship is strongly shaped by the ruling formal institutions. However, after the rapid introduction of the formal institutional framework of a market economy, it took a period of about 15 years before the East German self-employment rate reached the West German level.

Forty years of socialism, as well as the subsequent shock transformation to a market economy have, however, left their marks on East Germany. Socialization and work experience in a centrally planned socialist economy had a negative effect on the propensity to found an own business that can be particularly identified among older and better-educated East Germans. We also find that East Germans tend to have fewer skills than their West German counterparts, which may be the conse-quence of the type of work organization that prevailed in the socialist economy. This lower skill variety may have a negative effect on the propensity to start-up and, possibly, also on the success of a newly founded business. There is also a strong indication that the high unemployment rates during the East German transformation to a market economy led to a relatively high share of start-ups that were primarily motivated by necessity. These results indicate that the socialist legacy, as well as the subsequent shock transformation, resulted in a specific kind of regional growth

regime in which the drivers of growth differ from those in the western part of the country (Audretsch and Fritsch 2002; Fritsch 2004).[15]

Another important finding from our analyses is that regional differences in the level of self-employment seem to be rather persistent over long periods of time. Specifically, we are able to show a significantly positive relationship between the current regional self-employment rate, the self-employment level at the end of the GDR era in 1989, and the level of self-employment prior to World War II. This indicates a long-lasting regional imprinting that is able to survive harsh external shocks such as fundamental changes of the formal institutional framework, and may be regarded as a regional culture of entrepreneurship. We are able to show that the effect of the socialist legacy differed according to the strength of such a regional entrepreneurship culture. This is not in contradiction to Baumol's (1990) hypothesis, but demonstrates the important role of informal institutions—such as a culture of entrepreneurship—that tends to change very slowly and is considerably more persistent than formal rules (North 1994; Williamson 2000).

Our analysis raises a number of questions that should be investigated in future research. One of these issues is an analysis of the regional dimension of new business formation in other former socialist Eastern European transition countries. Do other Eastern European countries transitioning out of a former socialist regime display similar regional patterns of new business formation? Can start-up activity in other post-socialist countries also be explained by pre-socialist conditions? A study by Becker et al. (2016) provides evidence for such a long-term persistence of informal institutions in these countries. The authors compare Eastern European regions with and without affiliation to the Habsburg Empire. They show that having been a part of the Habsburg Empire in the past relates to higher levels of trust among the population today with a lower degree of corruption of police and courts.

Analyzing such patterns requires a better understanding of long-lasting imprints, such as a culture of entrepreneurship. What creates such a culture? How does it emerge and evolve? How is it transferred across generations? A particularly important question has to do with the effect of a long established and persistent culture of entrepreneurship on economic development. Our analyses show that regions with high historic levels of self-employment tend to have high levels of self-employment today, and transitioned more quickly to active entrepreneurship during the transformation process. This might be an indication that these entrepreneurial regions also managed the other challenges of the transformation process quite well (Kawka 2007). However, further research is necessary before we can definitively answer this important question. Fortunately, past and continuing developments in East and West Germany provide many opportunities for further analyses of such questions.

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[15]Another aspect of a socialist legacy in East Germany is the performance of the economy. Despite massive policy support and subsidization, most East German firms still have enormous problems when competing on international markets. More than 20 years after the beginning of the transformation process the average level of labor productivity amounts to only about 80% of the West German level.

# Appendix

**Table 5.6** Summary statistics: Survey data analysis

|  | Mean | Standard deviation | Minimum | Maximum |
|---|---|---|---|---|
| Starting up a firm (Yes = 1) | 0.01 | 0.098 | 0 | 1 |
| Being self-employed (Yes = 1) | 0.066 | 0.248 | 0 | 1 |
| East German origin (Yes = 1) | 0.398 | 0.489 | 0 | 1 |
| Age (years) | 41.368 | 12.858 | 18 | 64 |
| Years of formal education | 12.288 | 2.491 | 7 | 18 |
| Share of time unemployed in total labor market experience | 0.082 | 0.175 | 0 | 1 |
| Married (Yes = 1) | 0.57 | 0.495 | 0 | 1 |
| Female (Yes = 1) | 0.524 | 0.499 | 0 | 1 |
| Gross labor income (log) $(t-1)$ | 2199.164 | 1489.63 | 0 | 21,500 |

**Table 5.7** Summary statistics: Regional analysis

|  | Mean | Standard deviation | Minimum | Maximum |
|---|---|---|---|---|
| Start-up rate | 47.549 | 25.137 | 14.168 | 237.018 |
| Share of self-employed in non-agricultural private sectors in total employment 1907 | 0.138 | 0.034 | 0.075 | 0.26 |
| Share of self-employed in manufacturing industries in total employment 1907 | 0.079 | 0.029 | 0.032 | 0.203 |
| Share of self-employed in non-agricultural private sectors in total employment 1925 | 0.104 | 0.014 | 0.071 | 0.152 |
| Share of self-employed in manufacturing industries in total employment 1925 | 0.05 | 0.007 | 0.034 | 0.07 |
| Share of self-employed (including home workers) in non-agricultural private sectors in total employment 1925 | 0.118 | 0.027 | 0.072 | 0.251 |
| Share of self-employed (including home workers) in manufacturing industries in total employment 1925 | 0.064 | 0.026 | 0.035 | 0.202 |
| Self-employment rate 1989 | 0.018 | 0.005 | 0.007 | 0.03 |
| Share of highly skilled employees 1989 | 0.066 | 0.03 | 0.037 | 0.204 |
| Share of manufacturing employment 1989 | 0.457 | 0.099 | 0.241 | 0.656 |

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# Chapter 6
# Regional Entrepreneurship Culture and Growth

## 6.1 Introduction

Theory, as well as mounting empirical evidence, strongly suggests that entrepreneurship is related to regional growth and development (for an overview, see Fritsch 2013). However, until now, most studies about how entrepreneurship influences growth suffer from a "hen-egg" problem. Is it entrepreneurship that drives growth or does regional growth foster entrepreneurship?

In this chapter we consider exogenous variations in regional entrepreneurship rates that is due to a regional "spirit" or a "culture of entrepreneurship" to identify a causal effect of entrepreneurship on regional development. To a considerable extent, regional differences in entrepreneurship are related to characteristics that are fairly easily measured, such as industry structure, qualification of the workforce, and population density, as well as the regional knowledge stock and regional innovation activity (Sutaria and Hicks 2004; Fritsch and Falck 2007; Sternberg 2011). However, little is known about those region-specific factors that are more intangible or "in the air", such as a regional spirit or a culture of entrepreneurship. A culture of entrepreneurship can be understood as norms, values, and codes of conduct that promote social acceptance and approval of entrepreneurial activities resulting in high self-employment rates which persist over time (e.g., Beugelsdijk 2007; Andersson and Koster 2011; Kibler et al. 2014).

There is a growing body of research about the role played by cultural norms and values in economic development (for an overview, see Nunn 2009). It is found that historically grown cultural differences across countries and regions can persist over long periods of time and may explain differences in economic development. Nisbett and Cohen (1996), for instance, document how a distinct "culture of honor" in the US South, attributed to different settlement patterns during colonization, still exists today. In a similar vein, Guiso et al. (2006, 2016) show that persistent differences in

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Parts of this chapter are based on Fritsch and Wyrwich (2017).

social capital within Italy can be traced back to medieval times. Tabellini (2008, 2010) finds evidence for a link between historically determined norms and values held by specific population groups and economic growth across Europe.

This chapter investigates the relationship between a regional culture of entrepreneurship, start-up activity, and regional development. We argue that a regional entrepreneurship culture does not just appear out of thin air, but that there are historical sources of a region's entrepreneurial culture, or lack thereof. Hence, we identify a regional entrepreneurship culture by means of historical self-employment rates in the year 1925. Our results show that historical self-employment rates affect start-up activity more than 50 years later despite drastic changes in the socio-economic environment and significant changes in the governing formal institutions. This pattern indicates the prevalence of a long-lasting entrepreneurial culture. We also find that regions with a pronounced entrepreneurial culture tend to have relatively higher employment growth.

We exploit regional variation in entrepreneurship culture to estimate the causal effect of start-up activity on employment growth. A novelty of this study is that we circumvent the potential endogeneity problem inherent in an analysis of the role of start-up activity for growth by applying an instrumental variables approach based on historical self-employment rates. Our main contribution is to present empirical evidence demonstrating that part of the effect of regional start-up activity on growth can be attributed to a regional culture of entrepreneurship. Altogether, the results of our empirical analysis show that a regional entrepreneurial culture and start-up activity can make an important positive contribution to the region's economic performance.

The remainder of the chapter is organized as follows. Section 6.2 presents literature on how persistent cultural values impact economic development. We then provide an overview of relevant empirical evidence from earlier studies (Sect. 6.3). Results of the empirical analysis of the relationship between entrepreneurial culture and regional development are presented in Sect. 6.4. Our concluding statements are presented in Sect. 6.5.

Research on entrepreneurship has not yet systematically studied the effect of persistent entrepreneurship on economic performance. While there is a well-documented persistence of spatial differences in entrepreneurial activities that can be interpreted as a persistence of an entrepreneurial culture (see our discussions in Chaps. 2 and 4), it is not well understood how entrepreneurial activity that is caused by a persistent culture of entrepreneurship affects economic development.

## 6.2   Regional Culture of Entrepreneurship, New Business Formation, and Regional Development

Many empirical studies find that the level of self-employment and, particularly, new business formation has a positive effect on regional growth in most regions and time periods, especially in the longer run (for an overview, see Fritsch 2013). Theory, as well as empirical evidence suggests that this effect is driven by the competition between newcomers and incumbents. The more intense the competitive threat posed by start-ups to incumbents and the more the incumbents react to this challenge by improving their products and processes, the larger the positive effects on a region's economic performance (Fritsch and Changoluisa 2017). Specifically, entrepreneurial initiative that manifests in new business formation may facilitate flexibility of the regional economy and a productive response to external challenges such as severe changes in the socio-economic environment.

Once again, both theory and empirical evidence suggests that regions with high start-up rates will have higher growth rates. However, regressing regional growth on start-up rates at the beginning of the period of analysis poses an endogeneity problem because new business formation might be a symptom of growth rather than a source (see Anyadike-Danes et al. 2011). For example, growth may encourage larger markets and structural change that create additional entrepreneurial opportunities.

Glaeser et al. (2015) attempt to dispel endogeneity concerns by using an indicator of regional entrepreneurial culture taken from a much earlier time period that they assume is not the cause of current economic growth. The measure they use is a region's distance from coal mines that were operating in the early twentieth century. The idea behind using this indicator is based on the observation that coal mining areas were characterized by large-scale plants and relatively low levels of self-employment. Glaeser et al. (2015) argue that geographic proximity to historical mines at the beginning of the twentieth century is negatively related to the emergence of an entrepreneurial culture over time, leading to relatively low current levels of entrepreneurship. They justify their identification strategy by citing Chinitz (1961). Chinitz compares the economic structures of Pittsburgh and New York City and explains the low levels of self-employment in Pittsburgh with the presence of large-scale industries such as coal mining and steel, which, in turn, contributed to the emergence of an entrepreneurship-inhibiting climate that has to some degree persisted until today. Glaeser et al. (2015) find that there is indeed a negative relationship between proximity to historical mines and the level of entrepreneurship today that may be due to a lack of an entrepreneurial culture.

## 6.3   Historical Self-Employment as a Measure
##         for a Regional Entrepreneurial Culture

We identify the effect of entrepreneurship on growth by using a regional culture of entrepreneurship as the instrument. In contrast to Glaeser et al. (2015), we measure entrepreneurial tradition and culture by using historical self-employment rates. This raises the question of how far historical self-employment rates can be regarded as a measure of entrepreneurship culture.

One may be tempted to measure an entrepreneurship culture by the regional distribution of current values and norms of behavior. Such an indicator is, however, not suited to measure a historically grown culture of entrepreneurship. Regional differences in the share of people with an entrepreneurial personality may be an outcome of a historical tradition of entrepreneurship, economic development and migration to certain places. A reasonable first-best approach would be having historical information on beliefs and values that explain current entrepreneurship. Unfortunately, such historical data on beliefs and values do not exist. Therefore, we choose the second-best option and assume that the historical self-employment rate correlates strongly with entrepreneurial norms and values in the local population. Moreover, the number of self-employed people represents the number of entrepreneurial role models in a region. As mentioned in Sect. 2.3, role models are decisive to the transmission of entrepreneurship and therefore a key channel for its persistence. Thus, our culture measure is solidly grounded in the literature.

Since the historical self-employment rate might also be explained by factors other than entrepreneurial culture, we will control for an array of regional characteristics in order to see whether that part of historical self-employment that is not running through other economic variables but represents the local cultural transmission channel is still affecting current entrepreneurship. Thus, we argue that not historical self-employment per se, but its long-run effect on start-up activity indicates the prevalence of an entrepreneurial culture.

We use the historical self-employment rate in German regions for 1907 and 1925 as an instrument to measure the effect of start-up activity after WWII on regional growth. We expect that regions with high historical levels of self-employment will have high levels of new business formation today. The disruptive shocks that shook the German economy between 1907 and today (see Sect. 3.1) rule out the possibility that current economic development is influenced by anything other than the effect of historical levels of self-employment on current entrepreneurship. This exclusion restriction is the most important condition for the credibility of an instrument. We believe that the regional variations in historical levels of self-employment in 1907 and 1925 are an appropriate instrument to circumvent the endogeneity problem when investigating the effect of entrepreneurship on economic growth. In other words, because of the massive disruptions that occurred in Germany in the twentieth century, it is the current level of start-up activity that is the key influence in current regional growth, and not the self-employment rates that existed several decades earlier.

## 6.4 Empirical Analysis

The spatial framework of our analysis includes 70 planning regions of West Germany. East Germany and Berlin are excluded because East Germany experienced a completely different type of development over the course of the twentieth century, in that it was under a socialist regime for about 40 years, and thus requires a separate analysis (Fritsch et al. 2014). Unfortunately, the small number of East German planning regions does not allow an analysis of this part of the country comparable to that possible for West Germany. Our data on new business formation are from the Establishment History File of the German Social Insurance Statistics. This dataset contains every establishment in Germany that employs at least one person obliged to make social insurance contributions (Gruhl et al. 2012). Establishments that consist of only the owner (solo self-employment) are not included in these data. In contrast to previous studies, we employ a novel and more reliable method of identifying start-ups based on workflow analyses (Hethey and Schmieder 2010).

This section presents the empirical analysis of the impact a regional entrepreneurship culture has on growth. We also report investigations into the role of mining activities as a source of an entrepreneurship culture (Sect. 6.4.4), an issue that has been recently argued in the literature.

### 6.4.1 Estimation Approach

Our framework and hypotheses are centered on identifying a causal relationship between entrepreneurship—based on the historical regional entrepreneurial culture identified through regional self-employment levels—and economic growth. The basic model for investigating the effect of entrepreneurship on economic growth is

$$\frac{Emp_r^{t+n}}{Emp_r^t} = \beta E_r^t + Z_r + \varepsilon_r \qquad (6.1)$$

where *Emp* is employment in the private sector (log) in year $t$ in region $r$. We use employment growth because this is the most reliable available metric for regional development at the level of planning regions, the units of our analysis. The measure of current entrepreneurship, $E_r^t$, is the logged annual number of start-ups in a region divided by the regional workforce (number of employees).[1] Due to the

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[1]This follows the labor market approach for calculating start-up rates (Audretsch and Fritsch 1994). We do not include the number of unemployed because this information is not available at a regional level for the early years of our analysis. Not including the unemployed in the denominator of the start-up rate should not lead to any serious distortion because unemployed persons who set up a business typically do so out of necessity and are unlikely to have dependent employees. Since our

log-transformation, one can interpret the effect of changes in the start-up rate on employment growth as elasticities.[2] In our main analysis, we investigate employment growth for the longest possible time period for which we have data available, 1976–2014 taking the start-up rate in 1976 as a proxy for entrepreneurship. The coefficient $\beta$ measures the effect of new business formation on employment growth. More precisely, it shows how a change in the level of new business formation by 1% is related to employment changes in percent. $Z_r$ represents a vector of control variables designed to capture the role of regional factors other than start-up activity for economic development.

To rule out a reverse effect of employment growth on start-up activity we apply instrumental variable regressions. Hence, we use only that part of the regional variation of start-up activity at the beginning of the observation period that can be explained by an entrepreneurial culture. The first-stage specification is

$$E_r^t = \gamma E_r^{25} + Z_r^{first} + \varepsilon_r^{first} \tag{6.2}$$

where $E_r^{25}$ is the self-employment rate in 1925 in our main specifications. As a robustness check, we consider the self-employment rate in 1907 which is, however, less fine-grained (for details, see Chap. 3). The same controls are included at both stages of the estimation procedure. We employed the Huber-White procedure in all regressions to account for heteroskedasticity. The general empirical strategy follows a recent paper by Burchardi and Hassan (2013) who assessed differences in regional development across West German planning regions.

We control for several indicators of historical and current regional conditions. On the side of the historical variables, we assess the role of industry structure on historical self-employment rates (e.g. differences in minimum efficient sizes and entry barriers), as well as for a potential persistence of the regional industry mix. In this respect, we consider the employment share in manufacturing in 1925. Furthermore, we consider a variable indicating the distance to a coal field, which is intended to control for effects of natural resource endowments.[3] The variable is zero when a region hosted at least one coal mine. Start-up activity in coal-mining areas should be relatively low since starting firms in large-scale industries like mining is extremely capital intensive and requires a high minimum efficient size to operate successfully in the market (e.g. Geroski 1995). The distance to coal mines is also likely to

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data captures start-ups with at least one employee, most of the businesses set up by unemployed are not included anyway.

[2] We estimate log(emp(t = 2010)/emp(t = 1976)) which is the same as log emp(t = 2010) – log emp (t = 1976).

[3] The coalfields considered are those in the Ruhr area, the Saarland, and the Middle German field (Halle-Leipzig). The information is based on the atlas by Châtel and Dollfus (1931).

determine the co-location of large-scale industries that were in need of coal (Stuetzer et al. 2016).[4]

We also control for the role of social capital and religion in 1925. To this end, we consider the population share of Protestant adherents in 1925 to account for differences in entrepreneurial propensity that might be related to the Protestant work ethic (Weber 1904). In alternative specifications we also control for the population share of Jews. Differences in the local social capital might also explain differences in the level of self-employment (Westlund and Bolton 2003), but there is no straightforward control for social capital in our dataset at hand. As an alternative, we considered the share of votes for right-wing parties in the 1928 elections. Recent evidence shows that the rise of right-wing and Nazi parties in Weimar Germany is positively related to the density of civic activities (Satyanath et al. 2017), which, in turn, can be regarded as a proxy for social capital.[5] Social capital access, as measured by civic activities and club memberships, can have a positive effect on entrepreneurship (Bauernschuster et al. 2010). In order to check for the role of industry structure, we make use of further industry employment shares in 1925 in robustness checks.[6]

On the side of current regional characteristics, we include the level of employment in 1976, population density, a measure for regional market potential, as well as dummies for Federal States. Employment in 1976 represents the economic situation at the outset of the analyzed growth period and specifically controls for the effects the historical rate of entrepreneurship in 1925 may have had on regional development. Population density can be regarded as a "catch-all" variable for diverse characteristics of the regional environment, since it is correlated with several other metrics that might have an effect on the level of entrepreneurship and regional development. It represents all kinds of agglomeration economies and diseconomies, as well as regional human capital. While population density is highly correlated with inputs to the economic development process, we also check to see whether specific inputs matter for entrepreneurship despite controlling for agglomeration economies. We considered separate variables capturing financial development (the employment

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[4]Additionally, hosting a mine might have caused problems of structural change and negatively affect regional development over time.

[5]The results of our analyses are similar when using voter turnout as an alternative indicator for social capital (e.g., Putnam 1993). The election data are based on the publicly available raw data as provided by Falter and Haenisch (1990). The share of right wing votes in 1928 includes the number of votes for the DNVP (*Deutsche Nationale Volkspartei*) and the NSDAP (*Nationalsozialistische Deutsche Arbeiterpartei*), which is the party that emerged out of the "Hitler movement". In alternative models we use only the share of NSDAP votes and the share of right-wing votes in 1924 that comprises votes for DNVP and NSFP (*Nationalsozialistische Freiheitspartei*), which was a sort of predecessor of the NSDAP.

[6]The industry controls account for the regional structure of manufacturing and comprise the employment share in the public sector, in mining, construction, and the remaining manufacturing industries within the region. We did not consider the share of agriculture because this would introduce severe multicollinearity problems due to its extremely high correlation with population density. We did not consider current industry shares because they are presumably more likely to be an outcome of entrepreneurial culture and start-up activity since 1925 than a "control".

share of the sector "commercial trades and banking" in 1925), innovation input (share of R&D employees in 1976), and knowledge spillover (distance to universities established before 1900).[7] Because regional growth may be influenced by spatial proximity to other regions, we include a Harris-type market potential function intended to account for spatial dependencies among regions. This variable is defined as the distance-weighted sum of the total population in all other districts (see Redding and Sturm 2008; Suedekum 2008).

Federal State dummies are intended to capture differences related to the institutional framework and to policy across regions. We also included a dummy variable indicating whether a region shared a common border with the GDR in order to capture more precisely potential regional differences in the impact of German division and subsequent reunification.

We additionally control for the growth trend prior to 1976 by including regional employment growth between 1925 and 1976. This variable is intended to account for a possible influence of in-migration and economic development after 1925 since it could be argued that entrepreneurially-minded people and people seeking jobs select into regions with an entrepreneurial culture. A development that may have particularly influenced the entrepreneurial culture and regional development in West German regions is the massive inflow of expellees from former German territories after World War II. These people may have affected the regional levels of entrepreneurship for at least two reasons. First, those expellees with a more entrepreneurial mindset might have decided to settle in regions with a high entrepreneurial culture. Second, problems of integration into regional labor markets may have pushed a relatively large number of expellees into starting their own ventures. This could then have had effects on levels of regional new business formation in the mid-1970s. If such an effect is relevant, then this part of entrepreneurial activity in the mid-1970s cannot be considered a consequence of the destination region's entrepreneurial tradition because expellees were socialized in other regions. Therefore, we control for the population share of expellees by making use of the 1950 census data that provide information on the occupational status of expellees (Census 1950, various volumes).[8]

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[7]There is evidence that innovation inputs and access to finance are highly concentrated, even if controlling for population density (e.g. Audretsch and Feldman 1996; Furman et al. 2002; Carlino et al. 2007). However, in our context all variables to capture innovation inputs and access to finance are highly correlated with population density making the latter indeed a reasonable "catch-all" variable.

[8]We also considered an interaction of the share of expellees with the start-up rate in 1925 in the first stage to check whether the first stage relationship is weaker in locations with important in-migration. The interaction does not affect our main results. The definition of variables, summary statistics, and a correlation matrix are provided in Table 6.7 to Table 6.9 in the Appendix.

### 6.4.2  Entrepreneurship Culture and Start-Up Activity: The First-Stage Relationship

Table 6.1 presents the results for the first-stage regression that explains regional start-up activity in the mid-1970s by the level of self-employment in 1925, our measure for entrepreneurship culture. The model in the first column only includes the historical self-employment rate. In the model in Column II, historical variables are added to control for other potential long-term effects on start-up activity. We consider industry structure, natural resource availability, our proxy for social capital, and religion. Column III includes controls that capture the economic conditions of regions in the mid-1970s and the potential impact of German division. In this respect, we include the level of employment in 1976 and regional growth between 1925 and 1976, population density, market potential, the share of R&D employees, the population share of expellees in 1950, and a dummy marker indicating whether the region shares a common border with East Germany. Finally, Column IV includes dummy variables for Federal States to capture unobserved institutional differences.

All models show a strong relationship between historical self-employment and the start-up rate in 1976, while most of the control variables are insignificant. Most notably, the coefficient for population density is statistically significant with a positive sign. Market potential appears to have a significantly negative relationship to the start-up rate. Furthermore, there is a negative relationship between the share of R&D employees and start-up activity.[9] It is notable that the coefficient for the self-employment rate in 1925 is relatively stable, despite including control variables and significant changes in the adjusted $R^2$ of the model (from 0.11 to 0.65). This stability indicates that the historical self-employment rate represents a cultural transmission channel. Apparently, it is not just an artefact influenced by some other persistent structural factors that influence both the start-up rate in 1976 and the historical self-employment rate. Furthermore, the results show that any correlation between the self-employment rate in 1925 and other regional characteristics is not decisive for the relationship between our measure for entrepreneurship culture and start-up activity 50 years later.

Taken together, the results suggest that a region's entrepreneurial culture is positively related to start-up activity in later years. The value of the F-statistics in all models is above the critical rule-of-thumb value of 10, indicating that using the historical self-employment rate as our instrument for explaining new business formation in later years is appropriate.

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[9]There is a significant positive effect for this variable found in earlier work that analyze start-up rates in later years (Fritsch and Wyrwich 2014). There is also a positive relationship between the share of R&D employees and start-up activity for the period between 1990 and 2010 (not reported). A possible reason for the differences in the results may be an increase of R&D activities in smaller firms over the last decades that might be more likely to induce start-up activity as compared to R&D-activities in large firms. Unfortunately, we cannot test this conjecture with the dataset at hand.

**Table 6.1** Results of first-stage regressions

| *Dependent variable*: Start-up rate 1976 | I | II | III | IV |
|---|---|---|---|---|
| Self-employment rate 1925 | 0.466*** | 0.498*** | 0.571*** | 0.498*** |
|  | (0.131) | (0.124) | (0.105) | (0.119) |
| Employment share in manufacturing 1925 |  | −0.142** | −0.172*** | −0.137* |
|  |  | (0.056) | (0.061) | (0.074) |
| Distance to coal mine 1907 |  | −0.001 | −0.004 | −0.001 |
|  |  | (0.009) | (0.011) | (0.020) |
| Share of right-wing votes 1928 |  | −0.069*** | −0.038 | −0.078 |
|  |  | (0.025) | (0.024) | (0.049) |
| Population share of Protestants 1925 |  | 0.064 | 0.032 | 0.080 |
|  |  | (0.043) | (0.039) | (0.063) |
| Employment 1976 |  |  | −0.011 | −0.017 |
|  |  |  | (0.038) | (0.045) |
| Employment growth 1925–1975 |  |  | −0.006 | 0.025 |
|  |  |  | (0.171) | (0.184) |
| Population density 1974 |  |  | 0.175*** | 0.188*** |
|  |  |  | (0.053) | (0.067) |
| Market potential 1974 |  |  | −0.420*** | −0.475*** |
|  |  |  | (0.100) | (0.161) |
| Share of R&D-employees |  |  | −0.073 | −0.044 |
|  |  |  | (0.050) | (0.072) |
| Population share of expellees 1950 |  |  | −0.148** | −0.161** |
|  |  |  | (0.062) | (0.069) |
| Adjacent border with GDR |  |  | −0.108* | −0.135** |
|  |  |  | (0.057) | (0.064) |
| Federal State dummies |  |  |  | Yes** |
| Constant | −4.460*** | −4.526*** | −0.742 | −0.116 |
|  | (0.292) | (0.317) | (1.498) | (2.241) |
| First stage F-Statistics | 12.74*** | 16.22*** | 29.87*** | 17.53*** |
| F-value | 12.74*** | 7.31*** | 13.39*** | 26.64*** |
| $R^{2\,adj}$ | 0.113 | 0.383 | 0.582 | 0.647 |

Notes: Robust standard errors in parentheses. Number of observations is 70 planning regions. ***: Statistically significant at the 1% level; **: statistically significant at the 5% level; *: statistically significant at the 10% level. Data on population are not consistently available for the years 1975 and 1976

Before turning to the results of the instrumental variable regressions, we take a look at the reduced-form relationship between entrepreneurship culture and economic growth to see whether regions with an entrepreneurial culture are also typified by above-average employment growth.

Table 6.2 presents the results for the different specifications, which include the same variables as Table 6.1, except that employment growth between 1976 and 2014

**Table 6.2**  Reduced-form relationship

| *Dependent variable*: Employment change 1976–2014 | I | II | III | IV |
|---|---|---|---|---|
| Self-employment rate 1925 | 0.378** | 0.401*** | 0.382*** | 0.467*** |
| | (0.151) | (0.112) | (0.120) | (0.119) |
| Employment share in manufacturing 1925 | | −0.145*** | −0.107 | −0.210*** |
| | | (0.0538) | (0.0796) | (0.0776) |
| Distance to coal mine 1907 | | 0.0144* | 0.0195 | −0.0240 |
| | | (0.00833) | (0.0126) | (0.0279) |
| Share of right-wing votes 1928 | | −0.0628*** | −0.0618*** | −0.0390 |
| | | (0.0208) | (0.0205) | (0.0286) |
| Population share of Protestants 1925 | | −0.0158 | −0.0270 | 0.0186 |
| | | (0.0352) | (0.0360) | (0.0488) |
| Employment 1976 | | | 0.0643 | 0.0300 |
| | | | (0.0429) | (0.0510) |
| Employment growth 1925–1975 | | | −0.0805 | −0.0509 |
| | | | (0.178) | (0.149) |
| Population density 1974 | | | −0.0891 | −0.0561 |
| | | | (0.0642) | (0.0750) |
| Market potential 1974 | | | 0.201* | −0.0597 |
| Share of R&D-employees | | | (0.101) | (0.124) |
| | | | 0.0540 | 0.0831 |
| | | | (0.0566) | (0.0607) |
| Population share of expellees 1950 | | | −0.0200 | 0.0207 |
| | | | (0.0469) | (0.0490) |
| Adjacent border with GDR | | | −0.0471 | −0.0909* |
| | | | (0.0490) | (0.0505) |
| Federal State dummies | | | | Yes*** |
| Constant | 1.084*** | 0.766** | −2.122 | 1.815 |
| | (0.331) | (0.291) | (1.519) | (1.849) |
| F-value | 6.27*** | 19.57*** | 9.12*** | 5.14*** |
| $R^{2\ adj}$ | 0.083 | 0.510 | 0.568 | 0.677 |

Notes: Robust standard errors in parentheses. Number of observations is 70 planning regions. ***: Statistically significant at the 1% level; **: statistically significant at the 5% level; *: statistically significant at the 10% level. Data on population are not consistently available for the years 1975 and 1976

is now the outcome variable. The coefficient of interest, the self-employment rate in 1925, is positive and statistically significant at the 1% level in all specifications. The results clearly show that regions with an entrepreneurial culture did indeed exhibit higher employment growth in post-war West Germany.

### 6.4.3  Instrumental Variables Estimates

We next instrument the start-up rate at the beginning of the period of analysis with the historical self-employment rate and investigate the effect of new business formation on economic growth. All of the models presented in Table 6.3 shows that the coefficient estimate for start-up activity, calculated by using entrepreneurship culture in the first stage to predict start-up activity, is positive and statistically significant. According to most of the estimates a 10% change of the start-up rate is associated with a change of employment growth of 7 to nearly 9.5%.[10]

Altogether, the effect of start-up activity on employment growth is statistically significant and economically relevant. On average, a 10% higher self-employment rate in 1925 is associated with a greater than 7% increase of employment growth more than 50 years later.[11]

### 6.4.4  Robustness Checks

We tested the robustness of our results in several ways. One type of robustness check involved using alternative definitions of our main indicators, such as the start-up rate and employment growth (see Sect. 6.4.4.1). We also investigated the influence of additional control variables (Sect. 6.4.4.2).

#### 6.4.4.1  Alternative Definitions of Main Indicators

It could be argued that our outcome variable in the first stage, the start-up rate, simply reflects regional differences in industry structure. To account for this concern, we employed sector-adjusted start-up rates (for details, see Ashcroft et al. 1991; Audretsch and Fritsch 2002) instead of the actual ones. This adjustment corrects for the effect of industry structure in 1976 on the level of new firm formation. The sector-adjusted start-up rate captures the level of start-up activity that is not due to differences in regional industry structures. This start-up rate reflects a regional residual over and above expected location correlation of start-ups due to industry

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[10]A 10% change in the start-up rate reflects 48% of its standard deviation at the sample mean (mean = 4.215; S.D. = 0.8828; 10% of mean = 0.421; 10% of mean/S.D. = 0.477 ~ 48%).

[11]In the second stage models, the level of employment at the beginning of the period of analysis is not statistically significant. The coefficient for population density is significantly negative, reflecting a general employment trend of agglomerations in West Germany during the period under investigation (see, e.g. Suedekum 2006). The effect of the measure of market potential is significantly positive, indicating the economic benefits of a more central location. Prior employment growth between 1925 and 1976, as well as the share of self-employed expellees in 1950, have no robust statistically significant effect. The historical control variables are also not related to employment growth.

**Table 6.3**  Results of instrumental variables regressions

| Dependent variable: Employment change 1976–2014 | I | II | III | IV |
|---|---|---|---|---|
| Start-up rate 1976 | 0.811** | 0.804** | 0.670*** | 0.939*** |
|  | (0.389) | (0.328) | (0.194) | (0.286) |
| Employment share in manufacturing 1925 |  | −0.031 | 0.008 | −0.082 |
|  |  | (0.075) | (0.079) | (0.094) |
| Distance to coal mine 1907 |  | 0.015 | 0.022 | −0.023 |
|  |  | (0.011) | (0.015) | (0.030) |
| Share of right-wing votes 1928 |  | −0.007 | −0.037* | 0.034 |
|  |  | (0.036) | (0.022) | (0.054) |
| Population share of Protestants 1925 |  | −0.067 | −0.048 | −0.057 |
|  |  | (0.048) | (0.040) | (0.079) |
| Employment 1976 |  |  | 0.072* | 0.046 |
|  |  |  | (0.042) | (0.053) |
| Employment growth 1925–1976 |  |  | −0.076 | −0.074 |
|  |  |  | (0.132) | (0.161) |
| Population density 1974 |  |  | −0.206*** | −0.233*** |
|  |  |  | (0.058) | (0.086) |
| Market potential 1974 |  |  | 0.482*** | 0.387* |
|  |  |  | (0.141) | (0.202) |
| Share of R&D-employees |  |  | 0.103** | 0.125** |
| Population share of expellees 1950 |  |  | (0.050) | (0.054) |
|  |  |  | 0.079 | 0.172** |
|  |  |  | (0.062) | (0.074) |
| Adjacent border with GDR |  |  | 0.025 | 0.036 |
|  |  |  | (0.061) | (0.075) |
| Federal State dummies |  |  |  | Yes*** |
| Constant | 4.702** | 4.406** | −1.626 | 2.036 |
|  | (2.138) | (1.859) | (1.711) | (2.061) |
| Wald Chi$^2$ | 4.35** | 34.27*** | 75.24*** | 291.57*** |
| R$^{2\ adj}$ | 0.021 | 0.059 | 0.405 | 0.351 |

Notes: Robust standard errors in parentheses. Number of observations is 70 planning regions. ***: Statistically significant at the 1% level; **: statistically significant at the 5% level; *: statistically significant at the 10% level. Data on population are not consistently available for the years 1975 and 1976

structure. Replicating the instrumental variables regressions with sector-adjusted start-up rates leads to no particular difference with respect to the significance of the coefficient estimates for the historical self-employment rate (Model I in Table 6.4).[12] The same holds if we use an alternative start-up rate where the number

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[12]Alternatively, we adjusted the start-up rate based on the industry structure in 1925. The respective sector-adjusted start-up rate captures differences in start-up activity that are not due to initial

**Table 6.4**  Alternative start-up rates, employment growth measures, and instruments

|  | I | II | III | IV |
|---|---|---|---|---|
| Instrument |  Self-employment rate 1925 | | | Self-employment rate 1907 |
| Dependent variable | Employment growth | | Employment growth in full time equivalents | Employment growth |
|  | 1976–2014 | 1976–2014 | 1976–2014 | 1976–2014 |
| Sector-adjusted start-up rate 1976 | 1.184*** |  |  |  |
|  | (0.340) |  |  |  |
| Start-up rate 1976 (start-ups/private sector employment) |  | 0.742*** |  |  |
|  |  | (0.197) |  |  |
| Start-up rate 1976 |  |  | 0.931*** | 0.508** |
|  |  |  | (0.287) | (0.231) |
| Controls (Tables 6.1, 6.2 and 6.3; column IV) | Yes | Yes | Yes | Yes |
| Constant | 6.520*** | 0.881 | 1.357 | 1.650 |
|  | (2.274) | (1.992) | (2.096) | (1.763) |
| Wald Chi$^2$ | 408.70*** | 366.16*** | 326.03*** | 459.22*** |
| First Stage F-Statistics | 27.12*** | 22.76*** | 17.55*** | 19.59*** |
| R$^{2\ adj}$ | 0.546 | 0.417 | 0.346 | 0.572 |

Notes: Robust standard errors in parentheses. Number of observations is 70 planning regions. ***: Statistically significant at the 1% level; **: statistically significant at the 5% level; *: statistically significant at the 10% level. First stage regressions are not reported for brevity. The set of controls comprises the same variables as in Tables 6.1, 6.2 and 6.3 (column IV). Full results can be obtained upon request

of new firms is divided by the private sector employment in 1976 instead of the total employment (Model II in Table 6.4).[13]

It could be argued that employment in the 1970s is much different than in the 2000s (e.g. the practice of working part time has become more prevalent). To account for this possibility, we reran the analysis using full-time equivalents instead of the actual number of employees in the respective years. The results vary very little from those of our original approach (Model III in Table 6.4).[14] Finally, we used the

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differences in industry structures in 1925. There is a strong first-stage as well as a second-stage relationship for this version of the start-up rate.

[13]One may argue that employees in the private sector are more likely to start firms than employees in the public sector. Hartog et al. (2002) provide empirical evidence for a higher level of risk aversion of civil servants that probably results in a lower propensity to set up a business (see also Özcan and Reichstein 2009). It could, however, also be the case that the level of private sector employment in the mid-1970s is an outcome of a historically high self-employment rate. The results do not change when focusing on private sector employment growth only.

[14]For measuring full-time equivalents, we assumed a weight of 0.5 to part-time employees and added full-time employees and weighted part-time employment.

self-employment rate from 1907 instead of 1925 as a historical instrument. Again, there is a very strong first-stage relationship, while the coefficient estimate at the second stage suggests a somewhat lower effect on employment growth (Model IV).

### 6.4.4.2 Including Further Control Variables

In further robustness checks, we included a number of additional historical variables in our main model that, however, introduce some multicollinearity. This is why we did not include these variables in the main models. One type of additional controls are variables for the historical industry structure, namely the employment shares in construction, in commercial trades and banking and in the public sector in 1925. The employment share in commercial trades and banking can be regarded as a proxy for access to finance that might have an influence on the self-employment rates in 1925. We also controlled for the distance to universities that were founded prior to the year 1900 to capture knowledge production and diffusion of knowledge across space, which, in turn, may have influenced the regional level of self-employment around this time. We distinguish between distance to classical or regular universities and distance to a technical university. Next to the population share of Protestants to control for religion, we also included the respective share of Jews in 1925. We also considered information on the share of destroyed housing stock in WWII as utilized in the housing census from the housing census as of 1950 (*Gebaeude- und Wohnungszaehlung*; Statistisches Bundesamt 1956). It is remarkable that the two-stage relationship between entrepreneurship culture, start-up activity, and regional development proves to be robust when these additional controls are included (see Table 6.5).

In further robustness checks we tested in more detail for the potential effects of German division into East and West after World War II. In order to rule out specific effects of German unification in 1990, we also restricted the analysis to employment growth in the period from 1976 to 1989 (model V in Table 6.5). Neither approach led to significant changes of our results concerning the two-stage relationship between entrepreneurship culture, start-up activity, and employment growth.

We also investigate whether the econometric residual that remains after regressing the historical self-employment rate on the rich set of the previously used historical data is positively related to entrepreneurship in 1976. This residual that is unexplained by structural factors could be regarded as representing the regional "spirit" or the mental attitude toward entrepreneurship among the local population that is "in the air" thus reflecting the intangible part of a "culture of entrepreneurship".[15] Table 6.10 in the Appendix provides a set of second stage

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[15]As stated earlier, the interplay between high levels of social acceptance of entrepreneurship, widespread self-employment, and the resulting role model effects can make a regional entrepreneurship culture—once established—self-perpetuating. It should be noted here that the prevalence of local entrepreneurial role models is captured by the historical self-employment rate but not by the "entrepreneurial residual" in 1925.

**Table 6.5** Including further historical control variables

| Dependent variable | I | II | III | IV | V |
|---|---|---|---|---|---|
| | | | | | Employment growth 1976–1989 |
| | Employment growth 1976–2014 | | | | |
| Start-up rate 1976 | 0.878*** | 0.826*** | 0.768*** | 0.952*** | 0.617*** |
| | (0.240) | (0.243) | (0.249) | (0.314) | (0.183) |
| Controls (Tables 6.1, 6.2 and 6.3; column IV) | Yes | Yes | Yes | Yes | Yes |
| Employment share in construction 1925 | −0.136 | −0.153 | −0.093 | −0.120 | −0.096 |
| | (0.161) | (0.159) | (0.167) | (0.175) | (0.099) |
| Employment share in commercial trades and banking 1925 | 0.394** | 0.329 | 0.288 | 0.303 | 0.159 |
| | (0.177) | (0.205) | (0.202) | (0.208) | (0.106) |
| Employment share in public sector 1925 | −0.629*** | −0.578*** | −0.579*** | −0.626*** | −0.243** |
| | (0.166) | (0.185) | (0.183) | (0.207) | (0.111) |
| Population share of Jews 1925 | | 0.027 | 0.014 | 0.007 | −0.002 |
| | | (0.028) | (0.028) | (0.029) | (0.017) |
| Distance to university 1900 | | | −0.002 | 0.005 | −0.003 |
| | | | (0.010) | (0.012) | (0.008) |
| Distance to technical university 1900 | | | −0.018** | −0.015* | −0.011** |
| | | | (0.007) | (0.009) | (0.006) |
| War-time destruction 1945 | | | | 0.071 | 0.030 |
| | | | | (0.044) | (0.027) |
| Constant | 2.918 | 3.656* | 3.506* | 5.606** | 3.699** |
| | (1.806) | (1.872) | (1.868) | (2.416) | (1.502) |
| Wald Chi$^2$ | 438.45*** | 564.07*** | 442.98*** | 587.89*** | 348.33*** |
| First stage F-statistics | 15.70*** | 16.70*** | 14.12*** | 11.61*** | 11.61*** |
| R$^{2\ adj}$ | 0.593 | 0.617 | 0.650 | 0.602 | 0.637 |

Notes: Robust standard errors in parentheses. Number of observations is 70 planning regions. ***: Statistically significant at the 1% level; **: statistically significant at the 5% level; *: statistically significant at the 10% level. First stage regressions are not reported for brevity. The set of controls comprises the same variables as in Tables 6.1, 6.2 and 6.3 (column IV). Full results can be obtained upon request

regressions. As an instrument for start-up activity, we used the econometric residual that remains when regressing the historical self-employment rate on the entire number of variables on regional conditions in the early twentieth century used in Models III to V of Table 6.5. The models of Table 6.10 in the Appendix show that start-up activity that is due to the part of self-employment in 1925 that is not explained by structural conditions around this time has a positive effect on employment growth.[16] This finding suggests that entrepreneurship that is due to the

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[16]It turns out that there is a positive and significant relationship between this residual and growth in OLS estimation. This relationship becomes, however, insignificant when introducing the start-up rate into the regression model.

**Table 6.6**  Start-up activity and employment growth: OLS estimates in comparison to IV estimates

|  | I | II | III |
|---|---|---|---|
|  | OLS | OLS | IV (self-employment rate 1925) |
| Start-up rate 1976 | 0.332** |  | 0.952*** |
|  | (0.134) |  | (0.314) |
| Sector-adjusted start-up rate 1976 |  | 0.766*** |  |
|  |  | (0.227) |  |
| Controls (Table 6.5 column IV) | Yes | Yes | Yes |
| Constant | 4.435* | 7.959** | 6.902*** |
|  | (2.348) | (3.058) | (2.557) |
| F-Value/Wald Chi$^2$ | 4.11*** | 5.09*** | 685.38*** |
| First Stage F-Statistics | – | – | 11.21*** |
| $R^{2\ adj}$ | 0.717 | 0.764 | 0.602 |

Notes: Robust standard errors in parentheses. Number of observations is 70 planning regions. ***: Statistically significant at the 1% level; **: statistically significant at the 5% level; *: statistically significant at the 10% level. Data on population are not consistently available for the years 1975 and 1976

intangible part of entrepreneurship culture in 1925 has a positive effect on employment growth.

### 6.4.4.3   Comparing the OLS and IV Estimates

In this section, we reflect on potential differences in coefficient estimates across the OLS and IV regressions to dispel concerns regarding the validity of our instrument. On the one hand, one could argue that the OLS estimates should be upward biased (higher than the IV estimates) since growing regions may have more start-ups. This positive endogenous component is not measured by a valid instrument for entrepreneurship that is exogenous to employment growth. On the other hand, there might be an excessive amount of necessity start-ups due to low economic prospects in regions with low or negative employment growth. Employment growth of a region is determined by the growth prospects of local industries. If a local industry is shrinking it may spur necessity start-ups. This negative endogenous component would create a downward bias of the OLS estimates. In our main specifications, the IV estimates are larger than the OLS estimates (Table 6.6, Columns I, II and III), which might be explained by shrinking industries inducing necessity start-ups. Sector-adjusting start-up rates should assuage this negative endogenous component in the OLS model.[17] Comparing the coefficient estimate for the sector-adjusted start-up rate of the OLS model with the alternative IV approach reveals that both are of similar size. This finding suggests that concerns regarding a bias of IV coefficient can be largely dispelled.

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[17]Note that it also accounts for different entry conditions across industries.

## 6.5    Summary and Conclusions

We exploited the long-term effect of a high level of regional self-employment in 1925 on entrepreneurship to identify the effect of entrepreneurship on subsequent regional performance, specifically employment growth. We argue that any long-term effect of historical self-employment rates on entrepreneurship indicates the prevalence of an entrepreneurship culture. The empirical analysis is for West Germany during the period beginning in 1976 and ending in 2014. A detailed analysis of the relationship between the historical level of self-employment and changes in the current level of employment reveals that the informal institution of a culture of entrepreneurship is persistent and can endure severe shocks to the socio-economic framework, including devastating wars and abrupt changes of the political-institutional regime. Accordingly, regions with high levels of self-employment in 1925 tend to continue to experience high levels of new business formation more than 50 years later. Our results clearly confirm that a culture of entrepreneurship creates an environment that supports new business formation that, in turn, has a positive effect on regional growth. We conclude that a regional culture of entrepreneurship is an important resource for regional development.

The persistence of regional entrepreneurship implies not only long-term benefits once an entrepreneurial culture has developed, it also strongly suggests that establishing an entrepreneurial culture may require long periods of time. Hence, attempting to create a regional entrepreneurial culture can be viewed as an investment in a kind of capital stock that can have long-lasting positive effects. These results give rise to the question of how policy can be designed to stimulate the development of an entrepreneurial culture, a question that is not easily answered due to our current lack of knowledge. Sources of an entrepreneurship culture may be deeply rooted in economic history, and any attempts to explain the emergence of a regional entrepreneurship culture will need to reach far back into the past. However, economic history is considerably influenced by political and institutional factors, which may provide lessons for policy today.

Of particular interest is our finding that the effect of new business formation that can be attributed to exogenous variation in entrepreneurial culture is stronger than the general OLS coefficient estimate of start-up activity. One reason for these differences may be interregional dissimilarities in industry structure. The difference between the OLS and the IV estimates mostly vanishes if we adjust the level of start-up rates for interregional differences in industry structure. Another explanation for this difference in the estimated coefficients could be that the environment in regions with a pronounced entrepreneurial culture is supportive of high-quality start-ups, as well as of a "productive" reaction by regional incumbents to challenges posed by newcomers, both of which should stimulate growth. The smaller OLS coefficient reflects the possibility that other sources of regional start-up activity might contravene the positive influence of entrepreneurial culture, for example, policies that encourage an influx of ill-prepared founders.

We argue that the important channels and mechanisms through which culture affects start-up activity and growth relate primarily to opportunity-based entrepreneurship. However, many start-ups are not created to explicitly exploit an entrepreneurial opportunity. The growth effects of such start-ups are presumably much lower than those of opportunity-based new businesses that may be particularly stimulated by an entrepreneurship culture. Too many of the former type of start-ups could reduce the effect of overall start-up activity on growth. This suggests that encouraging new business formation in regions that lack an adequate entrepreneurial culture might not be the most appropriate course of action. In such regions it could be more effective to foster a positive entrepreneurial climate first (Kibler et al. 2014; Westlund et al. 2014). Furthermore, the framework of formal institutions that is relevant for new business formation (e.g., bankruptcy laws tuned to the needs of start-ups, low entry barriers, supportive infrastructure) should be designed in an entrepreneurship-friendly way.

An entrepreneurship culture appears to be an important regional factor that drives not only the level of new business formation, but also its effect on growth. Therefore, further research should investigate the moderating role of an entrepreneurship culture on the type of emerging new businesses and their effects on development. Another avenue of future research is analyzing domestic and international migration flows and worker mobility that played a significant role for regional growth over the last decades (e.g., Storper and Scott 2009; Cheshire and Magrini 2009). Migration within a country increases employment in some regions at the cost of other regions. One interesting question is what types of employees are attracted to start-up activity. Apart from that, the role a regional entrepreneurship culture plays in influencing structural change is another interesting topic for further research. Our results demonstrate that the historical self-employment rate affects current start-up activity. At a second stage they might not only affect growth but also structural change (see, Noseleit 2013, 2015). Thus, the structural change that can be attributed to entrepreneurship and an entrepreneurial culture may play an important role for growth. Future research along these lines might help us to better understand the evolution and change of regional industry structures. We have demonstrated that a regional entrepreneurial culture is a generator of entrepreneurship, which, in turn, has a positive effect on regional development. Searching for the sources of this culture and its ability to persist in spite of drastic changes to the socio-economic environment, will assist us in designing and developing policies aimed at creating an entrepreneurship-friendly environment, or even establishing an entrepreneurial culture.

# Appendix

**Table 6.7** Definition of explanatory variables

| Variable | Definition |
| --- | --- |
| Employment growth | Employment 2014/Employment 1976[a] |
| Minimum distance to coal mine 1907 | Distance of planning regions (county average) to a coal mine in 1907 in km |
| Self-employment rate 1925 | Number of self-employed persons in nonagricultural private sectors over all employees[b] |
| Employment shares 1925 | Number of employees in certain industries over regional workforce[b] |
| Population share of Protestants/Jews 1925 | Number of Protestants/Jews over regional population[b] |
| Distance to (technical) university 1900 | Distance of planning regions (county average) to a region that hosted a (technical) university in 1900 |
| Share of right-wing votes 1928 | Share of votes for right-wing parties (DNVP, NSDAP) in the general elections of 1928[c] |
| Population share of expellees 1950 | Number of expellees over regional population[d] |
| Adjacent border with GDR | Planning region shares a common border with the socialist German Democratic Republic (GDR) after World War II |
| Employment growth 1925–1976 | Change in employment between 1925 and 1976[b, e] |
| Start-up rate | Number of start-ups in a region over regional employment*10000; Number of start-ups per region over regional private sector employment*10000; Sector-adjusted start-up rates based on shift-share techniques over regional employment*10000[a] |
| Employment | Number of employment[a] |
| Share of R&D-employees | Number of employees with a tertiary degree working as natural scientist or engineer over regional employment[a] |
| Population density | Number of inhabitants in a region per square kilometer[e] |
| Market potential | Distance weighted (1/distance) sum of population in all other regions[e] |
| War time destruction 1945 | Share of significantly demolished houses over total housing stock in 1945[f] |

Source: (a) Social Insurance Statistics; (b) Statistik des Deutschen Reichs (1927); (c) Falter and Haenisch (1990); (d) Census (1950) (various volumes); (e) Federal Statistical Office. (f) Housing census (1950)/Statistisches Bundesamt (1956). All variables are log-transformed in the regression models

**Table 6.8** Summary statistics for self-employment rates, start-up rates, and other regional conditions in West Germany

|  | Mean | Standard deviation | Minimum | Maximum |
|---|---|---|---|---|
| Employment growth 1976–2014 | 1.3 | 0.238 | 0.865 | 2.017 |
| Employment growth full time equivalents 1976–2014 | 1.179 | 0.22 | 0.78 | 1.859 |
| Start-up rate 1976 | 41.948 | 8.697 | 29.165 | 80.794 |
| Sector adjusted start-up rate 1976 | 44.076 | 7.881 | 28.717 | 66.931 |
| Start-up rate 1976 (start-ups/private sector employment) | 52.909 | 12.802 | 36.292 | 105.987 |
| Self-employment rate (SER) 1925 | 0.11 | 0.014 | 0.06 | 0.139 |
| Self-employment rate (SER) 1907 | 0.121 | 0.021 | 0.081 | 0.167 |
| Employment 1976 (/1000) | 0.012 | 0.001 | 0.011 | 0.014 |
| Employment growth 1925–1976 | 0.971 | 0.231 | 0.526 | 1.766 |
| Employment share in manufacturing 1925 | 0.25 | 0.089 | 0.117 | 0.485 |
| Employment share in commercial trades and banking 1925 | 0.067 | 0.031 | 0.031 | 0.185 |
| Employment share in public sector 1925 | 0.096 | 0.028 | 0.054 | 0.177 |
| Employment share in construction 1925 | 0.047 | 0.01 | 0.028 | 0.064 |
| Minimum distance to a coal mine 1907 | 106.869 | 97.323 | 0 | 357.198 |
| Share of right-wing votes 1928 | 0.129 | 0.092 | 0.044 | 0.617 |
| Population share of Jews 1925 | 0.006 | 0.005 | 0 | 0.031 |
| Population share of Protestants 1925 | 0.492 | 0.326 | 0.012 | 0.98 |
| Distance to technical university 1925 | 96.377 | 54.316 | 1 | 254.005 |
| Distance to of university 1925 | 63.788 | 38.815 | 1 | 164.577 |
| Population density 1974 | 5.347 | 0.686 | 4.237 | 7.125 |
| Market potential 1974 | 12.691 | 0.263 | 12.11 | 13.289 |
| Population share of expellees 1950 | 0.182 | 0.085 | 0.039 | 0.389 |
| War-time destruction 1945 | 0.19 | 0.155 | 0.013 | 0.687 |
| Share of R&D-employees 1976 | 0.009 | 0.005 | 0.002 | 0.025 |
| Adjacent border with GDR | 0.129 | 0.337 | 0 | 1 |

**Table 6.9** Correlation of self-employment rates, start-up rates, and other regional conditions in West Germany

| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Start-up rate 1976 | | | | | | | | | | | | | | |
| 2 | Self-employment rate 1925 | 0.417*** | | | | | | | | | | | | | |
| 3 | Self-employment rate 1907 | 0.287** | 0.336*** | | | | | | | | | | | | |
| 4 | Employment 1976 | −0.181 | 0.118 | 0.733*** | | | | | | | | | | | |
| 5 | Employment growth 1925–1976 | −0.3437*** | −0.258** | −0.065 | 0.309*** | | | | | | | | | | |
| 6 | Employment share manufacturing 1925 | −0.337*** | −0.306** | −0.043 | 0.228* | 0.486*** | | | | | | | | | |
| 7 | Minimum distance to a coal mine 1907 | −0.485*** | −0.402*** | 0.057 | 0.464*** | 0.641*** | 0.509*** | | | | | | | | |
| 8 | Share of right-wing votes 1928 | 0.414*** | 0.296** | 0.328*** | −0.018 | −0.411*** | −0.196 | −0.352*** | | | | | | | |
| 9 | Population share of Protestants 1925 | −0.171 | 0.036 | 0.217* | 0.349*** | −0.026 | −0.139 | 0.011 | 0.18 | | | | | | |
| 10 | Population density 1974 | −0.516*** | −0.363*** | 0.109 | 0.389*** | 0.206* | 0.174 | 0.369*** | | | | | | | |
| 11 | Market potential 1974 | −0.502*** | −0.32*** | −0.239** | 0.255** | 0.813*** | 0.522*** | 0.68*** | | | | | | | |
| 12 | Population share of expellees 1950 | −0.367*** | −0.475*** | −0.298** | 0.037 | 0.529*** | 0.249** | 0.519*** | | | | | | | |
| 13 | Share of R&D-employees 1976 | 0.2* | 0.08 | 0.143 | 0.043 | −0.394*** | 0.002 | −0.385*** | | | | | | | |
| 14 | Adjacent border with GDR | −0.135 | −0.221* | 0.127 | 0.344*** | 0.684*** | 0.621*** | 0.504*** | | | | | | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 9 | Population share of Protestants 1925 | −0.141 | 0.552**** | | | | |
| 10 | Population density 1974 | −0.565**** | −0.081 | 0.249** | | | |
| 11 | Market potential 1974 | −0.693**** | −0.186 | 0.209* | 0.74*** | | |
| 12 | Population share of expellees 1950 | 0.448**** | 0.385*** | 0.105 | −0.476*** | −0.565*** | |
| 13 | Share of R&D-employees 1976 | −0.13 | −0.121 | 0.15 | 0.641*** | 0.372*** | −0.308*** |
| 14 | Adjacent border with GDR | 0.081 | 0.336*** | 0.259** | −0.202* | −0.186 | 0.333*** | −0.167 |

Notes: ***: statistically significant at the 1% level; **: statistically significant at the 5% level; *: statistically significant at the 10% level. Correlations for other variables used in the analysis are not reported for brevity

**Table 6.10** Results of instrumental variables regressions (Instrument: Entrepreneurial residual 1925)

| Dependent variable | |
|---|---|
| Employment change 1976–2010 | I |
| Start-up rate 1976 | 0.773*** |
| | (0.244) |
| Controls Table 6.3 (Column IV) | Yes |
| Wald Chi$^2$ | 331.67*** |
| First Stage F-Statistics (Instrument: Entrepreneurial residual 1925) | 21.98*** |
| $R^{2\ adj}$ | 0.457 |

Notes: Robust standard errors in parentheses. Number of observations is 70 planning regions. ***: Statistically significant at the 1% level; **: statistically significant at the 5% level; *: statistically significant at the 10% level. Y = "Yes". Constant suppressed

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# Chapter 7
# The Role of Knowledge

## 7.1  Regional Knowledge and Entrepreneurship

Knowledge is a key source for start-ups, particularly in innovative industries (Acs et al. 2009, 2013; Fritsch 2011; Fritsch and Aamoucke 2013, 2017). Accordingly, new businesses in general, and innovative start-ups in particular, can be regarded as manifestations of knowledge spillovers from extant knowledge sources (Acs et al. 2009, 2013). There are at least two reasons to expect that geographic proximity plays an important role in the process of entrepreneurial knowledge spillovers. First, new knowledge does not flow freely across space, but tends to be regionally bounded (Anselin et al. 1997; Asheim and Gertler 2006; Boschma 2005). Second, founders have a pronounced tendency to locate their firms in close spatial proximity to their former workplace, or near where they reside (Figueiredo et al. 2002; Dahl and Sorenson 2009). Hence, the regional knowledge stock, the regional workforce, and the regional conditions for entrepreneurship are all important factors in the emergence of innovative new businesses.

While a number of studies have shown the importance of regional knowledge for innovative start-ups (Audretsch et al. 2005; Fritsch and Aamoucke 2013, 2017), the historical roots of the current knowledge base and their role for innovative entrepreneurship have remained largely unexplored.[1] Clearly, knowledge does not suddenly fall on regions 'from heaven', but emerges and develops over longer periods of time shaping types of regional activity and industry structures.

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This chapter is based on Fritsch and Wyrwich (2018).

[1] For an overview of studies that find long-term persistence of entrepreneurship, see Fritsch and Wyrwich (2017b). Most studies that investigate the sources of regional knowledge and entrepreneurship (e.g., Grabher 1993; Saxenian 1994, and the contributions in Braunerhjelm and Feldman 2006) are on a case-study basis so that the results can hardly be generalized. Recent quantitative approaches based on larger sets of regions analyze the evolution of industries and industrial path-dependencies in regions in the medium run (e.g., Klepper 2009; Boschma 2017).

We investigate the extent to which a historical tradition of entrepreneurship and the historical knowledge base of a region contribute to new business formation in innovative industries today. We focus on innovative entrepreneurship for two reasons. First, there is good reason to assume that innovative entry that exerts fierce competitive pressure on incumbents is particularly important for stimulating regional growth (Fritsch 2011). Second, the knowledge intensity inherent in innovative new businesses makes them a well-suited source for analyzing the role of regional knowledge for entrepreneurship. The aim of this study is to gain a better understanding of the historical roots of contemporaneous regional differences in innovative entrepreneurship. We want to contribute to answering the following question: "Why do some regions have better prospects of gaining from knowledge-based developments than others?" Based on the knowledge spillover theory of entrepreneurship (Acs et al. 2009, 2013), we hypothesize that there is a stronger persistence of innovative entrepreneurship in regions that had a relatively large knowledge base and high levels of self-employment in science-based industries at the outset of the twentieth century.

In Sect. 7.2, we briefly survey the literature dealing with the role of regional knowledge and an entrepreneurial tradition of entrepreneurship. Section 7.3 introduces our measures of the historical knowledge base and gives an overview of the spatial distribution of innovative start-ups. The results of the empirical analyses of the effects of historical knowledge and entrepreneurship on the formation of innovative new businesses today are presented in Sect. 7.4. Section 7.5 discusses these results, concludes and draws implications for policy and for further research.

## 7.2  The Role of History: Knowledge Trajectories and Entrepreneurial Tradition

The basic idea of the knowledge spillover theory of entrepreneurship (Acs et al. 2009, 2013) is that knowledge, particularly new knowledge, is an important source of entrepreneurial opportunities. For this reason, a large and dynamically growing knowledge base should have the potential to provide rich opportunities for many start-ups. This should be especially true for innovative new businesses as they are particularly dependent on knowledge inputs. Consistent with these considerations, research has documented a pronounced relationship between indicators of regional knowledge and new business formation (particularly with start-ups in innovative and knowledge-intensive industries), such as the presence of academic institutions and the level of R&D activities (Audretsch et al. 2005; Fritsch and Aamoucke 2013, 2017).

Since a larger part of the available knowledge is tacit, it is attached to people and, therefore, regionally bounded. Due to this stickiness of tacit knowledge, it tends to remain in the local population and is transferred across generations. This characteristic, as well as the continuity of well-established institutions of higher education and research (such as universities), influences the persistence and scope of regional

knowledge levels and knowledge profiles over longer periods of time. Hence, there are significant differences in the amount and character of the available knowledge across regions.

The knowledge spillover theory of entrepreneurship (Acs et al. 2009, 2013) argues that a rich regional knowledge base does not automatically give rise to new businesses, but that entrepreneurial people who recognize and seize the available opportunities are also required.[2] Hence, the propensity of the regional population to start a venture is important for entrepreneurial spillovers to occur. Empirical studies have identified a number of factors that appear to be conducive to entrepreneurial behavior, such as qualification of the workforce, employment in small businesses (e.g., Chinitz 1961; Parker 2009) and personality traits of the regional population (Stuetzer et al. 2017; see Chap. 8). Research has particularly highlighted the role of social acceptance of entrepreneurial behavior (Etzioni 1987; Kibler et al. 2014), or a regional entrepreneurship culture (Beugelsdijk 2007; Fritsch and Wyrwich 2014, 2017b). Chinitz (1961) argues that an entrepreneurial culture is more likely to emerge in areas with high employment shares in small businesses. This argument is further developed in Stuetzer et al. (2016). In a nutshell, workers in small firms are in closer contact with an entrepreneurial role model and can acquire entrepreneurial skills more easily than workers in large firms. Such role model effects may trigger a positive perception of entrepreneurship and hence stimulate a personal decision to start a firm.[3]

Analyzing the role of history for new business formation in innovative industries today, we combine measures of historical entrepreneurship with indicators of regional industry structures, combined with information on the presence of universities. In particular, we investigate whether these factors are complementary in their effect on current new business formation. Our data suggests that, not only regional differences in entrepreneurship, but also regional differences of the knowledge stock and the level of knowledge generation tend to be rather persistent over time. Our main hypothesis is that it is not the historical knowledge base, per se, but it is the interaction of this knowledge base with an entrepreneurial tradition that has an enduring effect on the formation of innovative new businesses today.

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[2]Saxenian's (1994) comparison of the computer industry in Silicon Valley and the East Coast provides an impressive example of the role of entrepreneurship for the successful commercialization of knowledge.

[3]Based on an empirical analysis of the development of the German Ruhr area, which is dominated by large-scale industries, Grabher (1993) argues that the old established incumbents may show a tendency to suppress the emergence of novel ideas and entrepreneurship.

## 7.3   Historical Regional Knowledge

Our main indicators for the historical regional knowledge base are the presence of higher education institutions in the early twentieth century and, alternatively, the minimum distance of regions to a higher education institution. We distinguish between 'classical' universities and technical universities and form two binary variables for the presence of a classical university or a technical university in the region before the year 1900.[4] The idea behind the distance measures is that knowledge spillovers are found to be highly localized and sticky (Anselin et al. 1997; Fritsch and Aamoucke 2013). Thus, the spillover effects of technical universities and classical universities should decay with increasing geographic distance. A further advantage of the distance measure is that it rules out that the spillover effect is driven by the low number of regions with technical universities and classical universities, as indicated by the binary variables.

Technical universities in Germany began to emerge in the mid-nineteenth century. In contrast to classical universities, they had a focus on natural sciences and engineering, and were much more oriented towards the commercial application of knowledge (Drucker 1998, p. 21). While it was rather unusual for German classical universities at that time to have cooperative links with private firms, the pronounced collaboration of technical universities with the private sector could have made the figure of the entrepreneur more legitimate in regions hosting a technical university and may in this way have been conducive to higher levels of self-employment. Table 7.1 provides an overview of the universities founded prior to 1900.

All technical universities in Germany that existed in the year 1900 emerged from technical colleges (*Polytechnische Hochschulen*) that were founded earlier in the nineteenth century as a reaction to the rapidly growing general demand for scientific research and education (Drucker 1998; Carlsson et al. 2009). The main political force behind the upgrading of technical colleges to technical universities was the German Association of Engineers (*Verband Deutscher Ingenieure*, VDI).[5] All technical colleges that became technical universities before 1900 were located in the capital cities of the Federal States (for details see König 2006; Manegold 1989). There is no indication that they were strategically placed primarily in regions with high levels of self-employment. Today, technical universities in Germany represent just one specific type of higher education institution that has relatively strong links to private sector firms.

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[4]There were three classical universities founded between 1900 and 1925 (University of Frankfurt/ M. in 1914, University of Cologne in 1919 and University of Hamburg in 1919). These university foundings are not considered in order to keep the indicator consistent for the years 1907 and 1925.

[5]A main aim of the initiatives to upgrade technical colleges was to overcome the lower social status of engineers as compared to university graduates. Moreover, upgrading technical colleges to technical universities was regarded an important means for improving the education of engineers (see König 2006).

**Table 7.1** List of universities in Germany founded prior to the year 1900

| Type of higher education institution | Size (number of students 1911) | Type of higher education institution | Size (number of students 1911) |
|---|---|---|---|
| *Classical universities* | | *Classical universities* | |
| Berlin | 7.585 | Gießen | 1.315 |
| Munich | 6.942 | Greifswald | 1.165 |
| Leipzig | 4.088 | Erlangen | 1.104 |
| Bonn | 3.805 | Rostock | 9.20 |
| Freiburg | 3.080 | | |
| | | *Technical universities* | |
| Goettingen | 2.476 | Munich | 2.376 |
| Heidelberg | 2.452 | Berlin | 1.959 |
| Marburg | 2.240 | Darmstadt | 1.231 |
| Halle | 2.209 | Karlsruhe | 1.052 |
| Kiel | 2.063 | Dresden | 1.022 |
| Tuebingen | 1.979 | Hannover | 8.36 |
| Muenster | 1.969 | Stuttgart | 5.80 |
| Jena | 1.902 | Aachen | 5.57 |
| Wuerzburg | 1.449 | Brunswick | 3.70 |

Notes: The planning region Mittelhessen hosts two classical universities (Marburg and Gießen). Based on the sum of students the planning region is counted as hosting a large classical university in the analysis
Source: Deutsche Hochschulstatistik (1929)

There are at least three reasons why the presence of higher education institutions in the early twentieth century is a meaningful indicator of the historical knowledge base. First, universities play an important role for the absorption, storage and diffusion of knowledge, and they are also engaged in the generation of new knowledge. Second, they provide innovation-related inputs and contribute to the regional stock of human capital (Schubert and Kroll 2016) that plays an important role for identifying entrepreneurial opportunities. Third, universities are key actors—brokers and gatekeepers—in local innovation systems (e.g., Graf 2011; Kauffeld-Monz and Fritsch 2013). Thus, we believe that the presence of a university fairly captures differences in the regional knowledge base and the quality of human capital as compared to regions that do not have higher education institutions.[6]

We construct measures of science-based entrepreneurship in the years 1907 and 1925 (for details, see Chap. 3). For 1925, this is the number of self-employed in: machine, apparatus, and vehicle construction, electrical engineering, precision mechanics, optics, chemicals and rubber and asbestos. These industries are regarded as science-based and knowledge-intensive. Individuals self-employed in these industries in 1925 constitute 3.23% of all the self-employed. For the empirical analysis, the number of self-

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[6]At the same time, we agree that there could have been differences in the quality of universities in the early twentieth century which we cannot measure. Please note that there is no regional variation in literacy levels in Germany between 1907 and 1925, since schooling was compulsory.

employed is divided by the total number of employees in the region. The industry classifications used in 1907 differ from and are less detailed then those used in 1925. For 1907, we classify machine construction and instruments as well as chemical industries as science-based, and divide the number of establishments in these industries by the total number of employees. The share of establishments in these industries is 3.27%.

Figure 7.1 shows the spatial distribution of the self-employment rate in science-based industries in the years 1907 and 1925, as well as the distribution of classical and technical universities. In both years, we find relatively high levels of self-employment in science-based industries in the southwest (Baden-Wuerttemberg), and in some regions in the east, particularly to the southwest of Berlin. The relatively low self-employment rates in the Ruhr area north of Cologne, a region that was dominated by large-scale industries for a long time, is also noteworthy. Most of the relatively few technical universities were located in regions with high levels of self-employment in science-based industries. This pattern is more pronounced in 1925.

Figure 7.2 shows the average start-up rates in technology-intensive industries during 2000–2016 (for details on start-up data, see Chap. 3) in accordance to the definition by Gehrke et al. (2010). We again find relatively high rates in the southwest of the country. High levels of new business formation in technology-intensive industries can also be found around Hamburg and, again, to the southwest of Berlin. There is a remarkable correspondence of the presence of a technical university in the year 1900 and current rates of innovative new business formation. Table 7.5 in the Appendix lists the definitions of the variables used in the analysis, and Table 7.6 presents summary statistics for these variables.[7]

## 7.4  Results

### 7.4.1  Persistence of Regional Knowledge

In a first step of our analysis we investigate the persistence of regional knowledge. A first indication of the persistence of regional knowledge intensity is that all of the universities that were present in 1900 still exist today. To further explore the persistence of regional knowledge we regress the information on the presence of a university in the year 1900 on two indicators for innovation activity today: the number of patents per person employed,[8] and the employment share of R&D employees.[9] Population density in the year 1907 is included as a "catch-all" variable

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[7]For a correlation matrix, see Fritsch and Wyrwich (2018, Table A2).

[8]Patents (per 10,000 working population) are taken from the REGPAT data base, and are assigned to the region where the inventor has his or her residence. If a patent has more than one inventor, the count is divided by the number of inventors and each inventor is assigned his or her share of that patent.

[9]Data on the share of R&D employees is from the German Employment Statistics, which covers all employees subject to compulsory social insurance contributions (Spengler 2008). R&D employees are defined as those with tertiary degrees working as engineers or natural scientists.
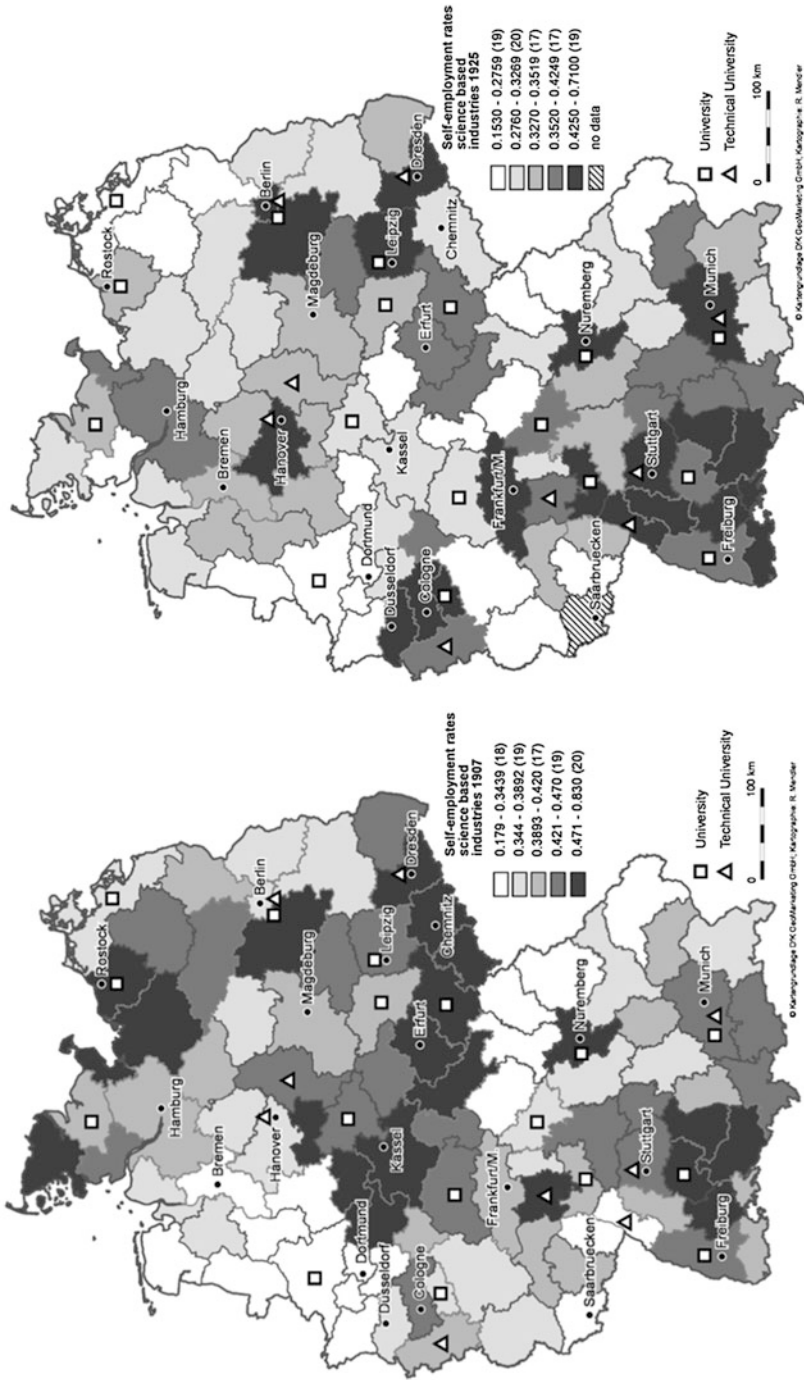
**Fig. 7.1** Spatial distribution of the self-employment rate in science-based industries in the years 1907 (left) and 1925 (right)
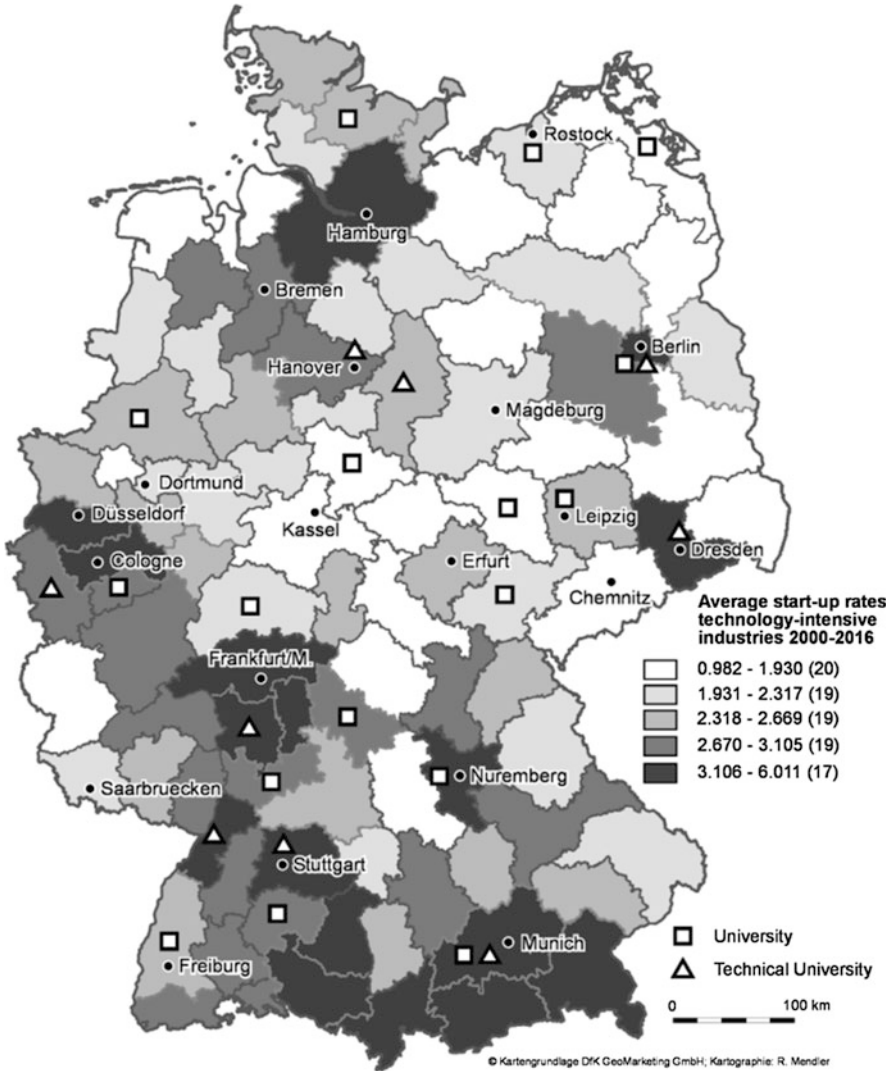
**Fig. 7.2** Average yearly start-up rates in Germany 2000–2016 technology-intensive industries

that controls agglomeration effects and general economic conditions such as wage level, house prices, etc. Dummy variables for the Federal States are intended to capture differences in state-level policies that may affect entrepreneurship. We also include the employment share in manufacturing in the year 1907 to control for the effects of the regional industry structure. The distance to the nearest coalfield is intended to control for effects of natural resource endowments.[10] Since all continuous

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[10]The coalfields considered are those in the Ruhr area, the Saarland, and the Middle German field (Halle-Leipzig) (see Châtel and Dollfus 1931).

variables are logged, the respective coefficients can be interpreted as elasticities that indicate the relative importance of the respective measure.

We find that both indicators for the historical knowledge base (the presence of a classical university and/or of a technical university) are highly significant (Table 7.2). The coefficients for the presence of a technical university are much larger than those for the presence of a classical university, suggesting a relatively strong effect of a regional tradition in natural sciences and engineering. The estimated coefficients indicate that regions with a technical university have 81% more patents per working population today than regions without any university (Model I in Table 7.2). For classical universities this effect is about 36%. The presence of a technical university increases the employment share of R&D employees by 57%, while the presence of a classical university increases this share by 25% compared to regions without a classical university or technical university (Model III in Table 7.2). The estimates also clearly suggest (Models II and IV in Table 7.2) that geographic proximity to classical universities and technical universities matters. A 1% increase in the distance from a classical university reduces the patenting rate by 0.1%, while a 1% increase in the distance from a technical university is associated with a drop of 0.2%. The effects are slightly smaller for the employment share of R&D employees (0.06% for classical universities; 0.13% for technical universities). The results are robust when considering regional control variables for the year 1925 instead of 1907 (Table 7.2, Models V, VI, VII and VIII). These results clearly demonstrate a pronounced persistence of regional knowledge intensity over rather long periods of time. In an additional analysis, we distinguished between large and small classical universities and technical universities in terms of the number of students registered in 1911.[11] We split the data at the median value, which implies that classical universities with less than 2000 students are marked as small, while the respective threshold for technical universities is 1000 students. The results indicate that the effects of historical knowledge on today's innovation activities are stronger for larger classical and technical universities.[12]

### 7.4.2   Persistence of Entrepreneurship

Table 7.3 shows the main results of our analysis of the effects of historical knowledge and historical self-employment rates on regional levels on new business formation in innovative industries. We do not consider indicators of modern day regional entrepreneurship and knowledge because these measures are probably

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[11]This information is available from historical university statistics (Deutsche Hochschulstatistik 1929).

[12]Due to the rather small number of observations, one should not over interpret the results of the distinction made between small/large universities. The classification of universities by size is provided in Table A1 in Fritsch and Wyrwich (2018). The results of the empirical analysis are shown in Table A3 of the respective article.

**Table 7.2** Persistence of regional knowledge

| Dependent variable | I | II | III | IV | V | VI | VII | VIII |
|---|---|---|---|---|---|---|---|---|
| | Controls 1907 | | | | Controls 1925 | | | |
| | Patents per working age population | | Employment share of R&D employees | | Patents per working age population | | Employment share of R&D employees | |
| Distance to university founded before 1900 | −0.098*** | | −0.063*** | | −0.100*** | | −0.064*** | |
| | (0.033) | | (0.013) | | (0.033) | | (0.013) | |
| Distance to technical university founded before 1900 | −0.203*** | | −0.135*** | | −0.206*** | | −0.137*** | |
| | (0.054) | | (0.014) | | (0.054) | | (0.015) | |
| University founded before 1900 (Yes = 1) | | 0.367** | | 0.245*** | | 0.015 | | 0.257*** |
| | | (0.146) | | (0.056) | | (0.138) | | (0.054) |
| Technical university founded before 1900 (Yes = 1) | | 0.801*** | | 0.578*** | | −0.004 | | 0.591*** |
| | | (0.255) | | (0.068) | | (0.069) | | (0.070) |
| Population density | −0.062 | −0.0316 | 0.163*** | 0.176*** | −0.0124 | 0.762*** | 0.164*** | 0.175*** |
| | (0.138) | (0.146) | (0.044) | (0.049) | (0.131) | (0.245) | (0.045) | (0.051) |
| Distance to nearest coalfield | −0.018 | −0.030 | 0.042** | 0.0351 | 0.007 | 0.386** | 0.055** | 0.049** |
| | (0.068) | (0.070) | (0.020) | (0.024) | (0.067) | (0.149) | (0.022) | (0.025) |
| Employment share in manufacturing | 0.828*** | 0.909*** | 0.370** | 0.415*** | 0.690*** | 0.822*** | 0.351*** | 0.392*** |
| | (0.277) | (0.297) | (0.142) | (0.146) | (0.229) | (0.258) | (0.109) | (0.116) |
| Federal State dummies | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** |
| Constant | −1.490 | −3.325*** | −5.988*** | −7.142*** | −0.972 | −2.763*** | −5.809*** | −6.948*** |
| | (1.230) | (1.157) | (0.545) | (0.552) | (1.087) | (1.018) | (0.426) | (0.440) |
| Mean Variance-Inflation Factor (VIF) | 3.02 | 3.78 | 3.02 | 3.78 | 3 | 3.75 | 3 | 3.75 |
| $R^2$ adj | 0.779 | 0.764 | 0.720 | 0.699 | 0.780 | 0.766 | 0.733 | 0.713 |

Notes: N = 92. Robust standard errors in parentheses. ***: statistically significant at the 1% level; **: statistically significant at the 5% level; *: statistically significant at the 10% level. All continuous variables are log-transformed

**Table 7.3** The role of historical entrepreneurial tradition and regional knowledge for start-ups in technology-intensive industries today

| Dependent variable | I | II | III | IV | V | VI | VII | VIII |
|---|---|---|---|---|---|---|---|---|
| | Self-employment rates 1907 | | | | Self-employment rates 1925 | | | |
| Self-employment rate in science-based industries | 0.329*** | 0.288** | 0.357*** | 0.313** | 0.528*** | 0.536*** | 0.549*** | 0.549*** |
| | (0.118) | (0.129) | (0.118) | (0.133) | (0.083) | (0.101) | (0.080) | (0.102) |
| Self-employment rate in non-science based non-agricultural private sector industries | | 0.123 | | 0.132 | | −0.030 | | −0.000 |
| | | (0.193) | | (0.201) | | (0.194) | | (0.196) |
| Distance to university founded before 1900 | −0.015 | −0.016 | | | −0.008 | −0.008 | | |
| | (0.013) | (0.013) | | | (0.009) | (0.010) | | |
| Distance to technical university founded before 1900 | −0.060*** | −0.059*** | | | −0.046*** | −0.046*** | | |
| | (0.019) | (0.019) | | | (0.014) | (0.015) | | |
| University founded before 1900 (Yes = 1) | | | 0.054 | 0.057 | | | 0.023 | 0.023 |
| | | | (0.053) | (0.052) | | | (0.038) | (0.040) |
| Technical University founded before 1900 (Yes = 1) | | | 0.247*** | 0.242*** | | | 0.195*** | 0.195*** |
| | | | (0.088) | (0.089) | | | (0.061) | (0.062) |
| Population density | 0.093 | 0.089 | 0.102 | 0.099 | 0.053 | 0.051 | 0.056 | 0.056 |
| | (0.063) | (0.063) | (0.066) | (0.066) | (0.039) | (0.043) | (0.040) | (0.044) |
| Distance to nearest coalfield | −0.007 | −0.007 | −0.011 | −0.011 | −0.010 | −0.010 | −0.012 | −0.012 |
| | (0.026) | (0.026) | (0.027) | (0.027) | (0.020) | (0.020) | (0.021) | (0.021) |
| Employment share in manufacturing | 0.244 | 0.191 | 0.268 | 0.211 | 0.031 | 0.032 | 0.036 | 0.036 |
| | (0.215) | (0.244) | (0.220) | (0.248) | (0.080) | (0.081) | (0.081) | (0.081) |
| Dummies for Federal States | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** |
| Constant | −6.211*** | −6.252*** | −6.432*** | −6.475*** | −5.130*** | −5.132*** | −5.280*** | −5.280*** |
| | (0.712) | (0.724) | (0.743) | (0.755) | (0.482) | (0.481) | (0.490) | (0.491) |
| $R^2$ adj | 0.660 | 0.661 | 0.650 | 0.652 | 0.746 | 0.746 | 0.742 | 0.742 |

Notes: Dependent variable is the average start-up rate in innovative industries in the period 2000–2016. Robust standard errors in parentheses. The number of observations is 92 regions in all models. ***: statistically significant at the 1% level; **: statistically significant at the 5% level; *: statistically significant at the 10% level. All continuous variables are log-transformed

caused by historical levels and may cause multicollinearity problems with the measures of historical entrepreneurship and knowledge.[13] All models indicate that the historical self-employment rate in science-based industries in 1907 and 1925 has a positive effect on entrepreneurship in technology-intensive industries today, while historical self-employment in non-science based industries is insignificant. According to these estimates, a 1% higher historical regional entrepreneurship rate in science-based industries in 1907 is associated with a 0.3% increase in high-tech entrepreneurship in the same region today. The respective effect for the employment share in science-based industries in the year 1925 is 0.5%.[14]

Distance to a technical university founded before 1900 is negatively related to contemporaneous high-tech entrepreneurship, while there is no significant relationship with distance to a classical university. An increase in the distance to technical universities by 1% reduces current technology-intensive entrepreneurship by about 0.04% or 0.05% (Models I, II, V and VI in Table 7.3). The positive role of technical universities is confirmed when introducing binary indicators for university presence instead of the distance measures.

The coefficient estimates in the table suggests that regions hosting a technical university around this time also have an up to 24% higher start-up rate in technology-intensive industries today (Models III, IV, VII and VIII in Table 7.3). There is no significant effect of classical universities or of the control variables.[15]

In order to analyze the interplay of entrepreneurial tradition and the regional knowledge base, we interact our indicators for historical entrepreneurship with the measures for the historical regional knowledge base (Table 7.4). For ease of interpretation, we focus on the binary indicators for the presence of a classical university or a technical university. In the models of Table 7.4 the constitutive term of the self-employment rate represents the effect of historical self-employment in regions that had no classical university or technical university in 1900. In terms of effect size, there is a positive and significant effect of historical science-based entrepreneurship

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[13]Again, all estimated coefficients can be interpreted as elasticities that indicate the relative importance of the respective measure since all continuous variables are log-transformed.

[14]As a robustness check, we also interacted the historical self-employment measures with a dummy variable indicating a location in East Germany. There is a significant positive effect for science-based entrepreneurship in the 1925 specifications of the base line models. There is no difference when controlling for the employment share in science-based industries (see Table A4 and A5 in Fritsch and Wyrwich 2018). Since the interaction variables remained insignificant in general, we conclude that the historical self-employment effect is not moderated by the substantial difference in entrepreneurship policies during German separation. Apart from that, a positive interaction for those regions where economic structure and institutions were destroyed to a larger degree indicates that persistent effects of historical self-employment predating these changes are due to cultural not structural components.

[15]In a robustness check we added the two academies of mining (*Bergakademie Clausthal* and *Bergakademie Freiberg*) to the technical universities that existed in the year 1900 (see Table A6 in Fritsch and Wyrwich 2018). Both institutions are borderline cases of a technical university in the year 1900. Considering both institutions as technical universities does not change the results in a meaningful way.

**Table 7.4** The interaction between historical entrepreneurial tradition and regional knowledge and its role for start-ups in technology-intensive industries today

| Dependent variable | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| | Self-employment rates 1907 | | | Self-employment rates 1925 | | |
| Self-employment rate in science-based industries | 0.301** | 0.307** | 0.336** | 0.527*** | 0.545*** | 0.533*** |
| | (0.137) | (0.128) | (0.133) | (0.109) | (0.105) | (0.113) |
| Self-employment rate in non-science based non-agricultural private sector industries | 0.134 | 0.057 | 0.022 | 0.028 | 0.024 | 0.050 |
| | (0.207) | (0.209) | (0.215) | (0.191) | (0.205) | (0.206) |
| University founded before 1900 (Yes = 1) | 0.728 | 2.045*** | 0.377 | −0.180 | −0.647 | −0.989 |
| | (1.925) | (0.693) | (1.817) | (0.793) | (0.872) | (0.965) |
| Technical University founded before 1900 (Yes = 1) | 2.151 | 2.080** | −0.462 | 3.675** | 4.985*** | 7.513*** |
| | (2.385) | (0.938) | (2.902) | (1.613) | (1.845) | (1.470) |
| Self-employment rate in science-based industries X University 1900 | 0.122 | | −0.364 | −0.035 | | −0.060 |
| | (0.347) | | (0.341) | (0.141) | | (0.153) |
| Self-employment rate in science-based industries X Technical university 1900 | 0.349 | | −0.636 | 0.641** | | 0.570** |
| | (0.430) | | (0.706) | (0.294) | | (0.233) |
| Self-employment rate in non-science based non-agricultural private sector industries X University 1900 | | 0.947*** | 1.104*** | | −0.293 | −0.293 |
| | | (0.325) | (0.326) | | (0.387) | (0.406) |
| Self-employment rate in non-science based non-agricultural private sector industries X Technical university 1900 | | 0.917* | 1.384** | | 2.159** | 1.903** |
| | | (0.463) | (0.652) | | (0.827) | (0.803) |
| Population density | 0.094 | 0.093 | 0.107 | 0.043 | 0.061 | 0.051 |
| | (0.069) | (0.067) | (0.068) | (0.043) | (0.045) | (0.045) |
| Distance to nearest coalfield | −0.011 | −0.016 | −0.017 | −0.023 | −0.014 | −0.024 |
| | (0.028) | (0.024) | (0.023) | (0.021) | (0.022) | (0.021) |
| Employment share in manufacturing | 0.211 | 0.219 | 0.231 | 0.052 | 0.030 | 0.042 |
| | (0.252) | (0.245) | (0.249) | (0.082) | (0.082) | (0.083) |

(continued)

**Table 7.4** (continued)

| Dependent variable | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| | Self-employment rates 1907 | | | Self-employment rates 1925 | | |
| Dummies for Federal States | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** |
| Constant | −6.517*** | −6.576*** | −6.522*** | −5.202*** | −5.272*** | −5.167*** |
| | (0.774) | (0.753) | (0.752) | (0.532) | (0.520) | (0.540) |
| $R^{2\ adj}$ | 0.654 | 0.684 | 0.689 | 0.752 | 0.751 | 0.758 |

Notes: Dependent variable is the average start-up rate in innovative industries in the period 2000–2016. Robust standard errors in parentheses. The number of observations is 92 regions in all models. ***: statistically significant at the 1% level; **: statistically significant at the 5% level; *: statistically significant at the 10% level. All continuous variables are log-transformed. Please note that constitutive variables of interactions must not be interpreted as mean effects. The coefficients measure the effect for the case that the other constitutive variable is zero

for these regions that resembles the findings of Table 7.3. The interaction of historical self-employment in science-based industries with the classical university and technical university dummy variables yields no significant interaction terms. Thus, when comparing regions that hosted a university in 1900 with regions that did not, there is no difference in the effect of science-based entrepreneurship on current innovative entrepreneurship.

Interacting non-science based entrepreneurship with the dummies for the presence of a classical university or a technical university yields an interesting pattern. The insignificance of the constitutive term of historical non-science based entrepreneurship indicates that this type of self-employment had no long-term effect on technology-intensive entrepreneurship today in those regions that did not host a university in the year 1900. However, the results of the estimates using data for the year 1907 reveal a significantly positive effect for the interaction of historical non-science based self-employment with the presence of a classical university. There is a somewhat weaker relationship for technical universities (Models II and III in Table 7.4).

In the models with data for 1925 we find significantly positive effects of the interaction between the presence of a technical university and the self-employment rate in science-based industries, as well as with non-science based industries. There is, however, no significant relationship for the interaction between both types of self-employment and the presence of a classical university. A 1% increase in non-science based self-employment in 1907 implies a 1% to 1.5% higher start-up rate in high-tech entrepreneurship today (Models II and III in Table 7.4). For 1925, we find an even higher effect of nearly 2.2% (Models V and VI in Table 7.4).[16]

A technical note concerns the technical university and classical university dummy variables. In interaction models these binary variables measure the specific effect of the local presence of classical universities or technical universities for the hypothetical case that the self-employment rate(s) are zero. Therefore, the coefficients of the dummy variables for classical universities and technical universities in Table 7.4 cannot be interpreted as an effect at the mean value (for details see Brambor et al. 2006). Plotting marginal effects of hosting a university at different levels of the self-employment rates reveals that there is a positive stand-alone effect in regions with high levels of historical entrepreneurship.[17]

Altogether, the results suggest that entrepreneurial tradition interacts with knowledge of a more applied character (presence of a technical university), but also with knowledge of a more general character as represented by the presence of a classical university. The insignificance of the interactions between science-based

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[16]We ran models with only one interaction term to rule out that the results are driven by using more than one interaction term. This method does not change the results. Splitting the sample of classical universities and technical universities into smaller and larger institutions reveals that the persistent effect of regional knowledge is driven by larger universities (see Table A7 and A8 in the Appendix of Fritsch and Wyrwich 2018).

[17]The plots can be found in the Appendix of Fritsch and Wyrwich (2018). This includes Figure A1 to A16 including a supportive table for reading the plots.

entrepreneurship and the presence of a classical university in 1907 confirms the well-known fact that German classical universities in the early twentieth century had a rather low propensity to cooperate with private firms (Manegold 1989; König 2006). Although the links between technical universities and private sector firms at that time were much more pronounced, these relationships were more commonly developed with well-established larger firms. Given the relatively low propensity of employees of large firms to spin-off (Elfenbein et al. 2010; Parker 2009), knowledge spillovers emerging from cooperation between large firms and universities are less likely to be commercialized via entrepreneurship. The significant interaction between the local presence of a technical university and the level of science-based entrepreneurship in 1925, nearly 20 years later, suggests that this pattern changed during the years between 1907 and 1925.

The considerable correlation between population density and the employment share in manufacturing (r = 0.7), may give rise to multicollinearity concerns. However, the mean VIF presented for all models is ca. 3, which suggests that multicollinearity is not a critical concern here.[18] For the year 1925, information about the employment share of science-based industries is also available. This variable is highly correlated with the employment share in manufacturing (r = 0.68). Considering this variable instead of the employment share in manufacturing does not change the main results. The coefficient for the share itself is not significantly different from zero. This clearly indicates that it is not the historical presence of science-based industries as such that is important for persistence of entrepreneurship, but the prevalence of self-employment in these industries.[19]

As a further step of analysis we investigate the effect of the universities that were founded before the year 1900 with those that were established at a later point in time. Particularly in the 1960s and 1970s, the German university system was significantly extended by adding several new locations. We introduce dummy variables indicating regions hosting a classical university or technical university founded after 1900. We additionally interact our historical entrepreneurship measures also with the binary markers for universities. The results demonstrate that new universities are not related to high technology entrepreneurship.[20] This pattern suggests that the historical knowledge base is more important for the effect of entrepreneurial tradition on today's technology-intensive entrepreneurship than the newly created universities.

Altogether, the results demonstrate that there is a positive relationship between the historical level of science-based entrepreneurship and current start-up activity in innovative industries. There is also an interesting interaction between the level of

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[18]To err on the side of caution, we run all models without the employment share in manufacturing as a robustness check. The results of this exercise reveal no meaningful differences to the set of models presented in Tables 7.3 and 7.4 (see Table A9 and A10 in the Appendix of Fritsch and Wyrwich 2018).

[19]For results, see Table A11, and A12 in the Appendix of Fritsch and Wyrwich (2018).

[20]For results, see Table A14 and A15 in Fritsch and Wyrwich (2018).

non-science based entrepreneurship and the presence of a university. This interaction is particularly pronounced for applied knowledge, as indicated by the presence of a technical university, while the effect of more general knowledge (presence of a classical university) seems to decrease over time.

## 7.5  Discussion

Analyzing the effect of historical levels of knowledge and entrepreneurship on the formation of innovative new businesses today, we found a number of highly significant relationships that indicate a strong persistence of both regional knowledge and entrepreneurship. One important result is that a history of academic knowledge in natural sciences and engineering, as indicated by the presence of a technical university in the year 1900, has a pronounced effect on the rate of innovative start-ups today, showing remarkable long-term effects of a relatively strong regional knowledge base. We also found a positive effect of recently founded universities on innovative entrepreneurship. This effect is, however, smaller than the effect of institutions that were already in place in the year 1900. This result suggests that the unfolding of the effects of universities on the local economy may require longer periods of time.

A second important result is that our analyses clearly indicate that it is the historical self-employment rate in science-based industries, and not the level of self-employment in non-science based non-agricultural industries, that has a long-lasting effect on innovative entrepreneurship. However, in regions that hosted a classical or a technical university, non-science based self-employment seems to be conducive to technology-intensive start-ups today. Our results suggest that a historically-grown regional knowledge base and a tradition of science-based entre-preneurship, as well as the interaction between the knowledge base and the level of general self-employment are important parts of the landscape for explaining entre-preneurial activities in innovative industries today. These findings are consistent with the knowledge spillover theory of entrepreneurship (Acs et al. 2009, 2013).

Our study has, of course, a number of limitations. First, we have no information about the quality of the universities that existed in the early twentieth century that might provide important insights about their effect on the economy in their region. Moreover, we have no data that would allow us to judge if parts of the effects that we observe are caused by particularly high government transfers at that time. Another limitation is that we do not have any direct measures of a historical entrepreneurship culture, such as the treatment of self-employment in the local media or the entrepreneurship-friendliness of the local government.

A major challenge for further research is to identify the sources of a regional culture of entrepreneurship and how it is transferred over time despite disruptive changes of the framework conditions. It would be interesting to know how regional entrepreneurship cultures have emerged. Hypotheses in this regard stress the role of geographic location, the conditions of the soil and the inheritance law that prevailed

in a region (e.g., Freytag and Thurik 2007; Stuetzer et al. 2016). For example, a popular explanation for the pronounced entrepreneurial spirit that is still found in many areas of Baden-Wuerttemberg in southwest Germany argues that the inheritance law in this region created incentives to shift economic activity from agriculture toward some type of craft businesses and this characteristic led to a relatively large number of small businesses (for details, see Fritsch and Wyrwich 2014, 2017a). In contrast, the Ruhr area with its rich coal deposits, was dominated by coal mining for a long time and is characterized by related large-scale industries that prevented the emergence of an entrepreneurship culture (Grabher 1993).[21]

We believe that the basic results of our analysis can be applied to any number of other countries, and that our results convey two important messages for policy makers. First, fostering entrepreneurship in conjunction with a strong regional knowledge base can have long-lasting positive effects on innovative entrepreneurship. Thus, knowledge-intensive regions with a long tradition in entrepreneurship are likely to have better prospects for development. Second, if areas that were particularly entrepreneurial and knowledge-intensive more than 100 years ago do still breed many innovative new businesses, it may be difficult for entrepreneurial laggards to catch up in the short and medium run. However, the effect of historical factors is in no way deterministic. There are regions that were entrepreneurial in the past but lost that characteristic later on, while other regions developed high levels of entrepreneurial activity within relatively short periods of time (for examples, see Sorenson 2017). From a policy perspective, the main questions are: How to foster an entrepreneurship culture? How to improve the regional knowledge base? How to promote the interaction between the knowledge base and entrepreneurship?

A promising starting point for the creation of an entrepreneurship culture is to install an entrepreneurship-friendly institutional framework (see Andersson and Henrekson 2015; Elert et al. 2017; Fritsch and Wyrwich 2017b; Henrekson and Rosenberg 2001). Although there is hardly any way for policy to directly affect informal institutions such as a culture of entrepreneurship (Rodríguez-Pose 2013), it can create formal institutions that steer informal institutions in a certain direction. Well-designed tax policies, for example, could increase the level of entrepreneurship. In this respect, Darnihamedani et al. (2018) show that governments can stimulate innovative entrepreneurship by relieving the tax burden levied against individuals and businesses that reap the rewards of innovation. Measures that could indirectly spur a positive public opinion about entrepreneurship and entrepreneurial behavior are awareness campaigns, e.g., portraying successful entrepreneurs in the media.

Fostering education and other well-designed entrepreneurship-enabling policies may create the knowledge spillovers that are required to achieve economic growth in a knowledge-based entrepreneurial society. For example, as Dilli and Westerhuis (2018) show, closing the gender gap in science education, technology, engineering

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[21]This type of explanation seems to hold for similar regions in the UK and US. For details see Chinitz (1961) and Stuetzer et al. (2016).

and mathematics can facilitate innovative entrepreneurial activity. Finally, policy measures that promote networking among actors, particularly between public research institutes and private sector firms, could be helpful for the creation, recognition and realization of entrepreneurial opportunities. In any case, policy makers should be aware that creating an entrepreneurship culture is a long-term task, but that its effect—once established—is long-lasting.

# Appendix

**Table 7.5** Definition of variables

| Variable | Definition |
| --- | --- |
| Patents (per 10,000 workforce population) | Number of patents over workforce population aged between 18 and 64 years old |
| Employment share of R&D employees | Number of employees working as natural scientists or engineer over all employees |
| Start-up rate technology-intensive industries (per 10,000 workforce population) | Number of start-ups in technology-intensive industries over population in workforce aged between 18 and 64 years old |
| Classical university founded before 1900 (Yes = 1) | Region hosting a classical university (*Universitaet*) founded prior to the year 1900 |
| Technical university founded before 1900 (Yes = 1) | Region hosting a technical University (*Technische Hochschule*) founded prior to the year 1900 |
| Distance to classical university founded before 1900 | Distance in km |
| Distance to technical university founded before 1900 | Distance in km |
| Self-employment rate in science-based industries 1907 | Total number of establishments in science-based industries ("machine, apparatus, and instruments" and "chemical industry") over all employees |
| Self-employment rate in non-agricultural non-science based private sector industries 1907 | Total number of establishments in non-agricultural private sector industries (excluding science-based industries) over all employees |
| Self-employment rate in science-based industries 1925 | Total number of self-employed persons in knowledge-intensive industries ("machine, apparatus, and vehicle construction", "electrical engineering, precision mechanics, optics", "chemicals", and "rubber- and asbestos") over all employees |

<div align="right">(continued)</div>

**Table 7.5**   (continued)

| Variable | Definition |
|---|---|
| Self-employment rate in non-agricultural non-science based private sector industries 1925 | Total number of self-employed persons in non-agricultural private sector industries (excluding science-based industries) over all employees |
| Population density 1907/1925 | Population 1907/1925 per square km |
| Distance to nearest coalfield | Distance in km. Information is based on Châtel and Dollfus (1931) |
| Employment share in manufacturing 1907/25 | Number of employees in manufacturing industries over all employees |
| Employment share in science-based industries 1925 | Number of employees in science-based industries divided by all employees |

Note: Freelance professions are not considered in the historical self-employment rates because they are included in the "state" sector and cannot be disentangled

**Table 7.6**   Descriptive statistics

|  | Mean | Standard deviation | Minimum | Maximum |
|---|---|---|---|---|
| Patents (per 10,000 workforce population) | 3.56 | 4.11 | 0.14 | 29.64 |
| Employment share of R&D employees | 0.01 | 0.01 | 0.01 | 0.04 |
| Start-up rate technology-intensive industries (per 10,000 workforce population) | 2.518 | 0.739 | 0.983 | 6.011 |
| Classical university founded before 1900 (Yes = 1) | 0.18 | 0.39 | 0 | 1 |
| Technical university founded before 1900 (Yes = 1) | 0.1 | 0.3 | 0 | 1 |
| Distance to classical university founded before 1900 | 60.98 | 39.6 | 0 | 163.58 |
| Distance to technical university founded before 1900 | 95.99 | 53.47 | 0 | 253.01 |
| Self-employment rate in science-based industries 1907 | 0.41 | 0.1 | 0.18 | 0.83 |
| Self-employment rate in non-agricultural non-science based private sector industries 1907 | 12.11 | 2.3 | 7.88 | 20.72 |
| Self-employment rate in science-based industries 1925 | 0.35 | 0.1 | 0.15 | 0.71 |
| Self-employment rate in non-agricultural non-science based private sector industries 1925 | 10.48 | 1.28 | 5.89 | 13.58 |
| Population density 1907 | 4.72 | 0.73 | 3.52 | 7.98 |
| Population density 1925 | 4.84 | 0.78 | 3.65 | 8.4 |
| Distance to nearest coalfield | 102.42 | 89.1 | 0 | 357.2 |
| Employment share in manufacturing 1907 | 35.9 | 11.48 | 17.26 | 69.88 |
| Employment share in manufacturing 1925 | 26.16 | 9.61 | 11.67 | 54.75 |

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# Chapter 8
# Traditions of Self-Employment and the Entrepreneurial Personality Profile of the Population

## 8.1 Traditions of Self-Employment and the Entrepreneurial Personality Profile

Throughout the previous chapters of this book we have argued that the effect of a historical tradition of regional self-employment on economic performance indicates the presence of an entrepreneurship culture that is long lasting. Previous entrepreneurship research on the conceptualization and effects of culture has mainly focused on broad cultural values and dimensions with mixed and often disappointingly inconsistent results (Hayton and Cacciotti 2013).

In this chapter we investigate the effect of culture by using data based on the personality profile of the local population. Applying a trait psychology approach to culture (McCrae 2001; Hofstede and McCrae 2004), we conceptualize an entrepreneurship culture as the aggregate psychological trait of the local population (Davidsson 1995; Davidsson and Wiklund 1997; Freytag and Thurik 2007). Based on the Big Five approach of assessing a person's personality structure, we determine the score of the ideal entrepreneurial personality profile. Having established our ideal profile, we calculate the relative score of the population of a specific region and weigh it against our ideal. We then relate this aggregate measure of the regional population's entrepreneurial personality profile with historical levels of entrepreneurship. The highly significant positive relationship that we find is consistent with our hypothesis that a regional tradition of self-employment indicates a culture of entrepreneurship that tends to be long lasting.

In the following, we first introduce the measure of the entrepreneurial personality profile of the regional population based on the Big Five approach (Sect. 8.2). Section 8.3 reports analyses of the relationship between the personality profile of the regional population and historical levels of self-employment. We investigate the relationship between the entrepreneurial personality profile and current levels of new

business formation and innovation (Sect. 8.4). The final section (Sect. 8.5) concludes.

## 8.2  The Personality Profile as a Measure for a Regional Culture of Entrepreneurship

The Big Five approach attempts to measure a person's personality structure using five characteristics (McCrae and Costa 2008). These five personality traits tend to be rather stable over a person's lifetime beginning in the mid-1920s and carrying through until old age. This characteristic stability does not, however, imply that change is not possible. At the individual level, research often reveals that entrepreneurs score relatively high on extraversion, conscientiousness, and openness but score relatively low on agreeableness and neuroticism (Caliendo et al. 2014; John et al. 2008; Zhao and Seibert 2006). By combining these five traits we can create an intraindividual entrepreneurial Big Five profile (an entrepreneurial constellation of Big Five traits within the individual) that indeed predicts entrepreneurial skill growth, motivation, self-identity, intention, and behavior at the individual level (Obschonka and Stuetzer 2017; Schmitt-Rodermund 2004).

The personality approach of defining and measuring a regional culture of entrepreneurship (based on aggregate regional values of the entrepreneurial personality profile), has the advantage of being premised on established individual-level research about how effective these types of personality profiles are at predicting individual behavior and choices (Hofstede and McCrae 2004; McCrae 2001). It also corresponds with the results of aggregate regional level research, which indicates that there are region-specific variations in personality types (Bleidorn et al. 2016; Rentfrow et al. 2008; Talhelm et al. 2014).

In line with earlier research on the entrepreneurial personality profile, we construct an overall indicator for an entrepreneurial personality fit based on the Big Five personality traits measured at the individual level (Obschonka and Stuetzer 2017). We analyze German data from the global Gosling–Potter Internet project. This project collects personality data in a number of countries (http://www.outofservice. com; see Rentfrow et al. 2008, for details). Respondents indicated the extent to which they agreed or disagreed with 44 statements using a five-point Likert-style rating scale. The database for Germany consists of ca. 90,000 survey respondents aged between 20 and 64 years over the time period 2003–2015. Individual respondents were allocated to a planning region based on their current residence by using their ZIP code. Our indicator measures the deviation from the statistical reference profile of an entrepreneurial personality structure (highest scores on extraversion, conscientiousness, and openness; lowest scores on agreeableness and neuroticism). This fixed reference profile is determined by the permissible outer limits of each of the Big Five traits as defined by our entrepreneurial personality profile.

To calculate the index, we first compute each person's squared differences between the reference values and his or her personal values on each of the five scales. For instance, if a person scores 3 on neuroticism, the squared difference is 9 (because the reference value is 0). Second, the five squared differences are summed for each person. Third, the algebraic sign of this sum is reversed (e.g. a value of 20 becomes $-20$). The resulting value serves as the final variable of the entrepreneurial personality profile, whereby a higher value in this final score signals a stronger entrepreneurial personality profile. These individual scores on the profile are then aggregated to the regional level (average score based on respondents' current residence) to achieve the regional value for the local entrepreneurship culture. This index of the entrepreneurship culture of regions has a mean of $-19.39$ (standard deviation: 0.563) across German planning regions.

Figure 8.1 shows that there are considerable differences in the population's entrepreneurial personality profile across the German planning regions. There are particularly high values for the regions of Baden-Wuerttemberg located in the southwest of the country, confirming a common preconception regarding this area. Relatively high values can also be found for Duesseldorf, Kassel, Rostock, and regions south-west of Berlin and south of Munich. Many of the regions with a low aggregate entrepreneurial personality profile are characterized by large-scale heavy industries, such as mining and steel. This finding corroborates results for Great Britain (Stuetzer et al. 2016) and the US (Stuetzer et al. 2017). Low-level entrepreneurial personality profiles are also found in larger areas north and east of Berlin, around Magdeburg and in parts of Thuringia, as well in regions east and west of Nuremberg (see Fritsch et al. 2018, for a more detailed presentation).

## 8.3   Historical Self-Employment and Entrepreneurial Personality Profile

Comparing the narrowly defined self-employment rate that excludes agriculture and homeworkers in the year 1925 and the entrepreneurial personality fit of today's population, we find a significant positive relationship even when a set of control variables is included (Table 8.1, Models I and II and Fig. 8.2a). This result clearly confirms the conjecture that the historical level of regional self-employment (excluding agriculture and homeworkers) is a source of a regional entrepreneurship culture as seen in the aggregate psychological trait of today's population (Freytag and Thurik 2007). It is quite remarkable that there is no statistically significant relationship between the historical level of homeworking and self-employment in agriculture and the entrepreneurial personality fit (Table 8.1, Models III and IV and Fig. 8.2b). This clearly indicates that marginal forms of entrepreneurship (see Sect. 3.2.1 for details) have no long-lasting effect on a region's culture of entrepreneurship. Since historical self-employment in agriculture and homework is also never
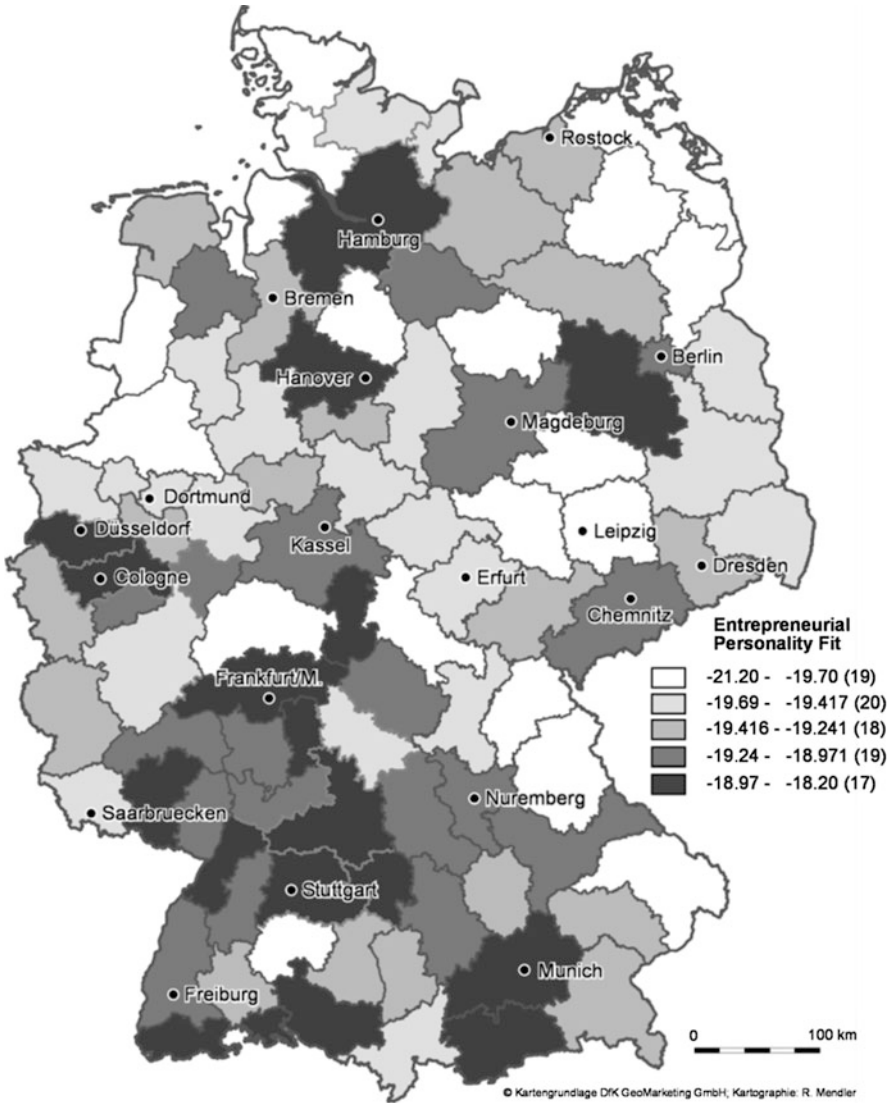
**Fig. 8.1** Regional distribution of the entrepreneurial personality profile in Germany

statistically significant in our further analyses, we have chosen not to present the results for this group.

Looking at the relationship between population density and the entrepreneurial personality fit, we find a pronounced positive relationship (Fig. 8.3; $R = 0.25$ statistically significant at the 5% level). This is consistent with the commonly held perception that people living in high-density areas are characterized by a more pronounced entrepreneurial personality fit (e.g. Florida 2002; Florida et al. 2017).

**Table 8.1** Relationship between self-employment 1925 and the entrepreneurial personality fit of today's population[a]

| Dependent variable: Entrepreneurial personality fit | I | II | III | IV | V | VI |
|---|---|---|---|---|---|---|
| | 1925 | | | | 1907 | |
| Self-employment rate, excluding farmers and home workers | 0.366*** | 0.368*** | | | 0.375*** | 0.239** |
| | (0.114) | (0.104) | | | (0.107) | (0.116) |
| Rate of homeworkers and farmers | | | −0.091*** | −0.036 | | |
| | | | (0.033) | (0.058) | | |
| Population density in 1925/1907 | | 0.089*** | | 0.028 | | 0.048 |
| | | (0.031) | | (0.063) | | (0.047) |
| Distance to university founded before 1900 | | −0.010 | | −0.017 | | −0.012 |
| | | (0.013) | | (0.012) | | (0.013) |
| Distance to technical university founded before 1900 | | 0.008 | | 0.003 | | 0.003 |
| | | (0.009) | | (0.009) | | (0.009) |
| Employment share of manufacturing in 1925/1907 | | 0.047 | | 0.085 | | 0.094 |
| | | (0.052) | | (0.057) | | (0.180) |
| Federal State dummies | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** |
| Constant | −4.690*** | −4.983*** | −5.672*** | −5.446*** | −4.733*** | −5.026*** |
| | (0.239) | (0.179) | (0.101) | (0.257) | (0.208) | (0.354) |
| $R^2$ adj | 0.414 | 0.538 | 0.438 | 0.492 | 0.463 | 0.517 |

Notes: OLS regressions. Robust standard errors in parentheses. ***: statistically significant at the 1% level; **: statistically significant at the 10% level. All continuous variables are log transformed (except for entrepreneurial personality fit, which assumes negative values). N = 92
[a]Including both self-employment rates in one regression leads to nearly identical results

(a)



(b)
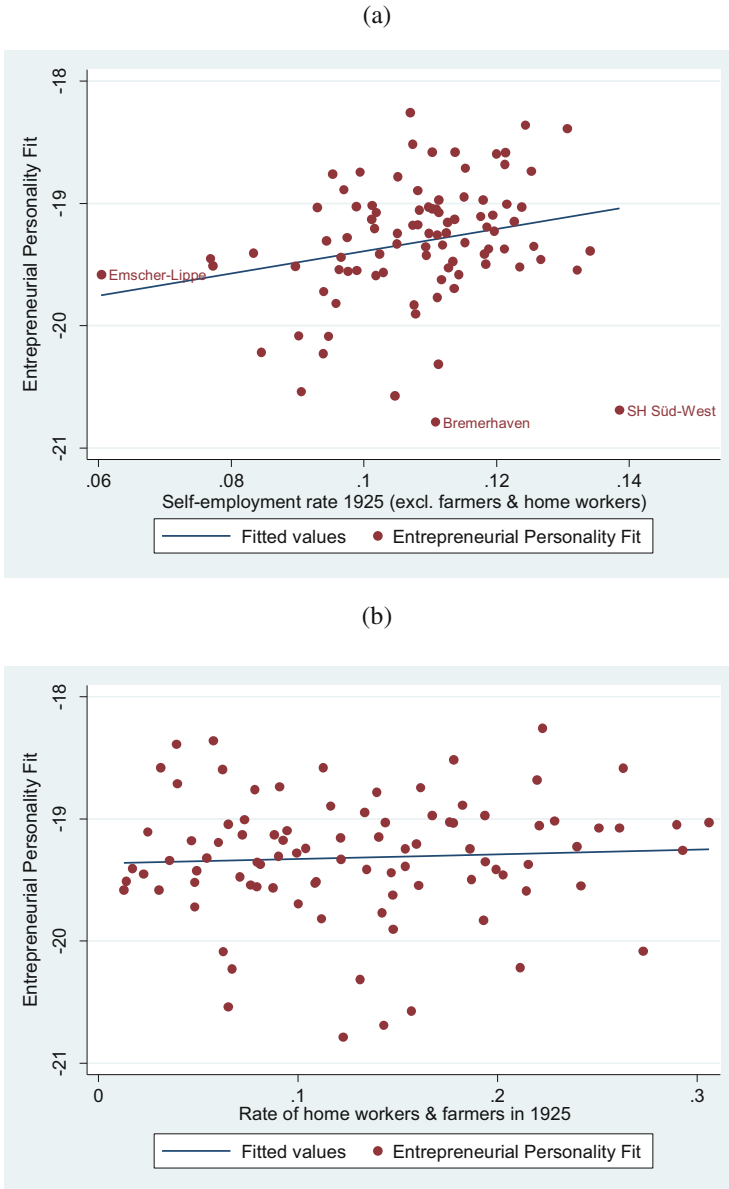


**Fig. 8.2** Different definitions of self-employment in 1925 and the entrepreneurial personality fit of today's population in German planning regions
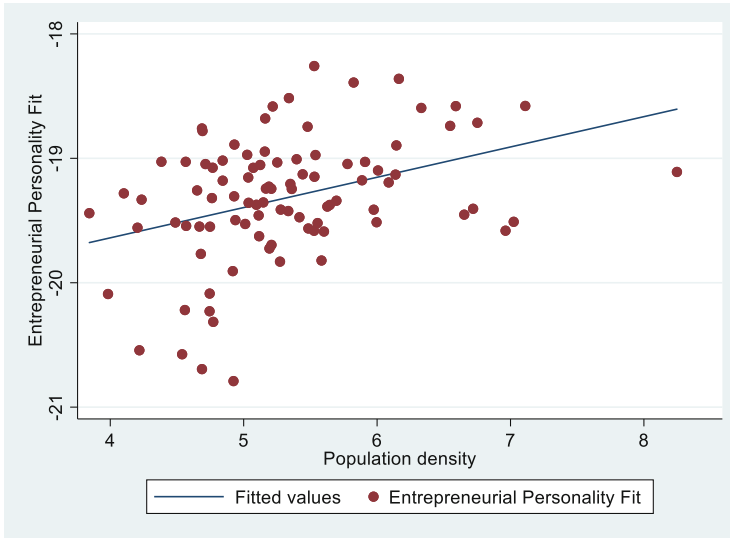
**Fig. 8.3** Entrepreneurial personality fit of today's population and population density in German planning regions

In the models of Table 8.1, there is no robust effect of population density. The Federal State dummies are again highly statistically significant, whereas the rest of the control variables remain insignificant. The coefficients for the distance to universities remain insignificant.

There is also a significant positive relationship between the entrepreneurial personality fit of the regional population and the current level of new business formation in accordance with the ZEW Enterprise panel (Model I in Table 8.2) (for details on start-up data, see Chap. 3). However, the coefficient of the entrepreneurial personality fit of the regional population loses some significance if the set of controls for the year 1925 or 1907 is included in the model (Model II). Adding the historical self-employment rate of 1925 actually leads to a weaker significance of our measure of the entrepreneurial personality fit, while the historical self-employment rate is significant. Being cognizant of the fact that we found a noteworthy correlation between the historical self-employment rate and the current population's share of people with an entrepreneurial personality profile (Table 8.1), the weak significance of the entrepreneurial personality fit in Model III of Table 8.2 may indicate that the current entrepreneurship culture of a region can be explained by the historical level of entrepreneurship.

**Table 8.2** Relationship between self-employment in 1925, entrepreneurial personality fit of today's population, and new business formation

| Dependent variable: Start-up rate | I | II | III | IV |
|---|---|---|---|---|
| | 1925 | | | 1907 |
| Self-employment rate, excluding farmers and home workers | | | 0.297** | 0.190* |
| | | | (0.113) | (0.112) |
| Entrepreneurial personality fit | 0.108*** | 0.081** | 0.061* | 0.078** |
| | (0.035) | (0.033) | (0.036) | (0.037) |
| Population density in 1925/1907 | | 0.051* | 0.077** | 0.033 |
| | | (0.028) | (0.032) | (0.046) |
| Distance to university founded before 1900 | | −0.011 | −0.007 | −0.007 |
| | | (0.012) | (0.012) | (0.012) |
| Distance to technical university founded before 1900 | | 0.002 | 0.006 | 0.003 |
| | | (0.009) | (0.009) | (0.009) |
| Employment share of manufacturing in 1925/1907 | | 0.083 | 0.053 | 0.145 |
| | | (0.055) | (0.054) | (0.184) |
| Federal State dummies | Yes*** | Yes*** | Yes*** | Yes*** |
| Constant | − | − | − | − |
| | 3.307*** | 3.896*** | 3.866*** | 3.474*** |
| | (0.687) | (0.675) | (0.689) | (0.884) |
| $R^{2\ adj}$ | 0.438 | 0.531 | 0.561 | 0.556 |

Notes: OLS regressions. Robust standard errors in parentheses. ***: statistically significant at the 1% level; ***: statistically significant at the 5% level. All continuous variables are log-transformed (except entrepreneurial personality fit, which assumes negative values). N = 92

## 8.4   Entrepreneurship Personality Profile, New Business Formation and Innovation Activity

At its very core, entrepreneurship includes behaviors such as creativity, recognition of opportunities, taking initiative, readiness to assume risk, and introducing new ideas, products, and services to the market. These behavioral elements are not only conducive to setting up one's own business but should also be particularly relevant for innovation activity—the process of transforming new ideas and knowledge into concrete products and services that are accepted on the marketplace. As in Chap. 7, we use two types of indicators for regional innovation activity today to investigate their relationship with a regional culture of entrepreneurship. The first metric is the share of R&D employees in the regional workforce, which is available for the period 2000–2014. The second indicator is the patent rate, which is measured by the number of patents per member of the working population, and is available for the period 2000–2012. The annual average of both variables is employed as the outcome variable in the regression analysis (Figs. 8.4 and 8.5).

We find a clear statistical relationship between the historical self-employment rate and our two measures of regional innovation activity (Table 8.3). However, this relationship becomes considerably weaker, or even insignificant, if controls for the
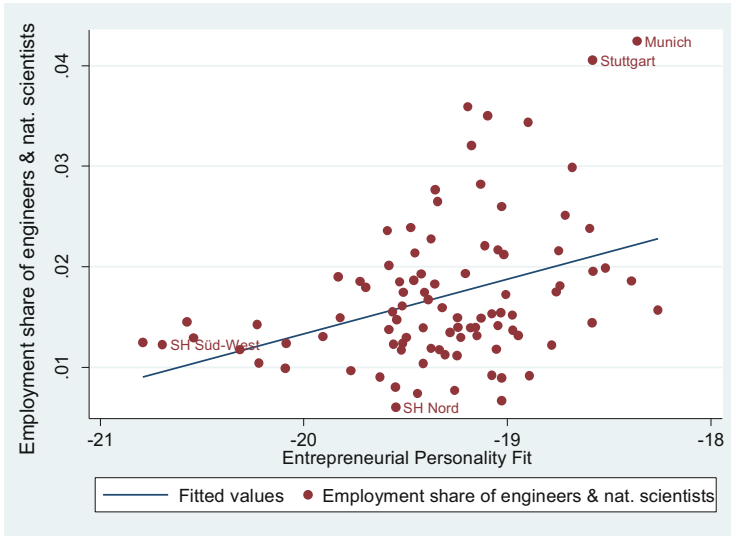
**Fig. 8.4** Entrepreneurial personality fit and average share of R&D employees 2000–2014
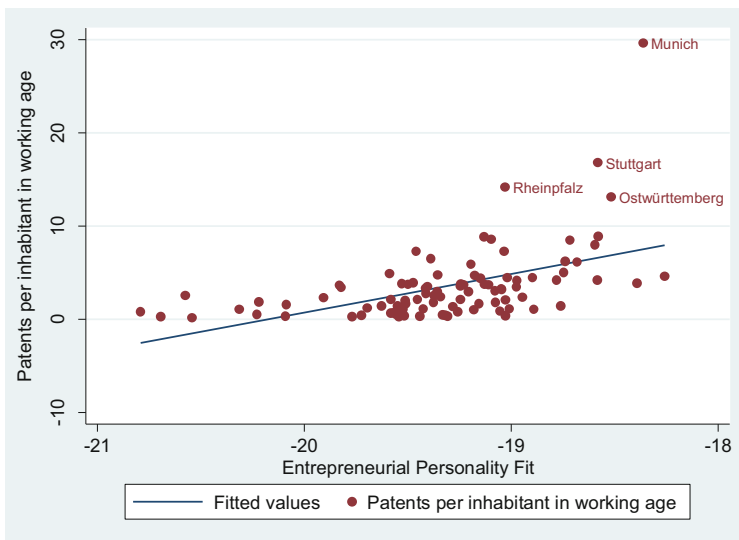


**Fig. 8.5** Entrepreneurial personality fit and average number of patents per inhabitant in working age 2000–2012

distance to higher education institutions and industry structure in the year 1925 are included. The results particularly suggest that there is not only persistence of entrepreneurship over longer periods of time, but also persistence in the regional presence of knowledge and of innovation activity. Judged by the levels of statistical significance, the distance to a technical university has a stronger negative effect than

**Table 8.3** Relationship between entrepreneurial personality fit and innovation activity today

| Dependent variables | Employment share of R&D employees | | Patent rate | |
|---|---|---|---|---|
| | I | II | III | IV |
| Entrepreneurial personality fit | 0.179** | 0.030 | 0.611*** | 0.446*** |
| | (0.072) | (0.053) | (0.163) | (0.144) |
| Population density in 1925/1907 | | 0.100** | | −0.102 |
| | | (0.039) | | (0.092) |
| Distance to university founded before 1900 | | −0.129*** | | −0.126** |
| | | (0.015) | | (0.049) |
| Distance to technical university founded before 1900 | | −0.053*** | | −0.073*** |
| | | (0.013) | | (0.027) |
| Employment share of manufacturing in 1925/1907 | | 0.246** | | 0.948*** |
| | | (0.110) | | (0.207) |
| Federal State dummies | Yes*** | Yes*** | Yes*** | Yes*** |
| Constant | −0.857 | −2.992*** | 12.270*** | 11.895*** |
| | (1.470) | (1.035) | (3.253) | (2.851) |
| $R^{2\ adj}$ | 0.315 | 0.695 | 0.687 | 0.809 |

Notes: OLS regressions. Robust standard errors in parentheses. ***: statistically significant at the 1% level; ***: statistically significant at the 5% level. All continuous variables are log transformed (except for entrepreneurial personality fit, which assumes negative values). N = 92

the distance to a classical university. Taking the entrepreneurial personality fit as an indicator of a regional culture of entrepreneurship, we also find a positive and statistically significant relationship with current innovation activities (Table 8.3). Focusing on the share of R&D employment, the entrepreneurial personality fit does not remain statistically significant when the historical controls are added. Thus, the relationship between entrepreneurship culture and innovation activity seems to be more robust for innovation output (patents) than for innovation input (share of R&D employees). The historical self-employment rates are weakly related to current innovation activities when considering historical controls (Table 8.4). Controlling for historical self-employment hardly changes the relationship between entrepreneurial personality fit and innovation activity, when considering the full set of historical controls.

## 8.5   Discussion and Conclusions

Our investigation of the histories of regional entrepreneurship, entrepreneurship culture, and innovation has led to several interesting results. First of all, self-employment in agriculture, as well as marginal forms of self-employment such as homework, do not seem to be the building blocks of a regional culture of entrepreneurship. Any impact this type of self-employment has on a regional entrepreneurial

**Table 8.4** Relationship between self-employment 1907, 1925, entrepreneurial personality fit and innovation activity today

| | Share of R&D employees | | Patent rate | | Share of R&D employees | | Patent rate | |
|---|---|---|---|---|---|---|---|---|
| | I | II | III | IV | V | VI | VII | VIII |
| Dependent variable: | 1925 | | | | 1907 | | | |
| Self-employment rate, excluding farmers and home workers | 0.602* | 0.205 | 1.248** | 0.358 | 0.843*** | 0.184 | 1.620*** | 0.826* |
| | (0.307) | (0.267) | (0.500) | (0.461) | (0.283) | (0.236) | (0.488) | (0.421) |
| Entrepreneurial personality fit | 0.137* | 0.017 | 0.525*** | 0.423*** | 0.120* | 0.033 | 0.500*** | 0.433*** |
| | (0.072) | (0.056) | (0.168) | (0.154) | (0.070) | (0.051) | (0.167) | (0.162) |
| Population density in 1925/1907 | | 0.117** | | −0.071 | | 0.087 | | −0.010 |
| | | (0.046) | | (0.109) | | (0.057) | | (0.128) |
| Distance to university founded before 1900 | | −0.126*** | | −0.120** | | −0.126*** | | −0.120** |
| | | (0.016) | | (0.049) | | (0.015) | | (0.049) |
| Distance to technical university founded before 1900 | | −0.050*** | | −0.068** | | −0.052*** | | −0.078*** |
| | | (0.014) | | (0.028) | | (0.014) | | (0.028) |
| Employment share of manufacturing in 1925/1907 | | 0.225* | | 0.913*** | | 0.369 | | 0.723 |
| | | (0.113) | | (0.214) | | (0.366) | | (0.513) |
| Federal State dummies | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** | Yes*** |
| Constant | −0.434 | −2.972*** | 13.147*** | 11.931*** | −0.398 | −2.451** | 13.152*** | 12.213*** |
| | (1.414) | (1.010) | (3.171) | (2.828) | (1.387) | (1.096) | (3.278) | (3.349) |
| $R^{2\ adj}$ | 0.340 | 0.697 | 0.703 | 0.810 | 0.402 | 0.687 | 0.733 | 0.782 |

Notes: OLS regressions. Robust standard errors in parentheses. ***: statistically significant at the 1% level; ***: statistically significant at the 5% level. N = 92

culture is rather weak, and at best, short term. Second, where we find higher historical levels of regional self-employment, there is a more pronounced fit of the entrepreneurial personality profile in today's population. Both measures, historical level of self-employment and entrepreneurial personality fit of the population, can be regarded as indicators of a regional culture of entrepreneurship. The results of our analyses suggest that the historical level of self-employment is a main source of the current entrepreneurial personality fit. This is indicated by the empirical regularity that the coefficient estimates for the personality fit are no longer significant when including historical self-employment levels in the regression framework. Third, regions with higher levels of historical self-employment and a more pronounced entrepreneurial personality fit of the population have higher levels of innovation activity. It is our contention that innovation activity may be an important driver of future growth. This finding is consistent with the result that regions with higher levels of historical self-employment experience higher growth (Fritsch and Wyrwich 2017, 2018). Hence, the results confirm the key role of entrepreneurship in regional development.

A main conclusion that can be drawn from these results is that a regional culture of entrepreneurship, new business formation, and innovative activities today have distinct historical roots. The transmission mechanisms of an entrepreneurship culture, however, remain unknown and warrant exploration in future research. The multiple disruptive shocks that impacted Germany during the years covered by our analysis clearly exclude an explanation that builds on persistence of the political and economic framework conditions for self-employment and new business formation. The intergenerational transmission of entrepreneurial role models among the local population might be a relevant explanation, but it is unclear to what extent such a transmission has been impaired by external shocks, such as 40 years of a socialist regime in East Germany (Wyrwich 2015). One factor that needs further analysis in this regard is mobility. Do people with an entrepreneurial mindset show a tendency to migrate to regions with a pronounced culture of entrepreneurship? Moreover, future researchers should, of course, investigate the sources of historical self-employment rates and of a regional culture of entrepreneurship. Learning about the factors that engendered the emergence of such a culture may be particularly helpful when it comes to developing policies for regions in which such a culture is absent.

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# Chapter 9
# Summary and Outlook: What Can Be Learned?

## 9.1 What We Found: Persistence of Regional Entrepreneurship and Regional Entrepreneurial Culture

The starting point of the analyses was the finding that regional levels of entrepreneurship, as represented by self-employment and new business formation, tend to be quite persistent over time. Our study region, Germany, provides a particularly interesting example for investigating regional persistence of entrepreneurship because the country experienced a considerable number of disruptive changes to the political, social, and economic framework conditions during the course of the twentieth century. These changes included two World Wars, massive destruction of the country's infrastructure and resources, occupation by Allied Forces, inflow of expellees from former German territories, the separation of one nation into two separate states, radical changes to the political system (such as the switch from an imperial regime to a democratic republic), 40 years of a Soviet-imposed socialist regime in East Germany, and the transformation of East Germany from socialism to a modern western-type democratic system after national reunification in 1990 (Sect. 3.1).

Our empirical analyses revealed pronounced long-term persistence of regional entrepreneurial activity despite such disruptive changes (see particularly Chaps. 4 and 5). Regions with high levels of self-employment in the early twentieth century tend to show high levels of new business formation today, while regions with low levels of historical self-employment have low start-up rates today. We conjecture that this persistence indicates the presence of a culture of entrepreneurship that is typically understood "as a positive collective programming of the mind" (Beugelsdijk 2007, p. 190) that leads to a social legitimacy of entrepreneurs and their activities. Put to the regional level, the degree of societal legitimacy for entrepreneurship may be higher in some regions than in others (Kibler et al. 2014). As a consequence, the more

entrepreneurship is regarded as legitimate from a societal point of view, the higher the demand for it and the more resources are dedicated to such activity.

This social acceptance of entrepreneurship within a society can be regarded as part of the informal institutions of a community, which is defined as codes of conduct as well as norms and values among the regional population (North 1994). They are the building blocks of 'culture'. Culture belongs to the level of social structure that is deeply embedded in a population and that tends to change only very slowly over long periods of time (Williamson 2000). Especially, the survival of regional pockets of entrepreneurial activity that endured the anti-entrepreneurial policies of the socialist regime of East Germany demonstrates that entrepreneurial norms and values are able to withstand even severe policies aimed at their elimination.

Investigating the relationship between entrepreneurial culture as measured by historical levels of self-employment and current growth performance, we find that regions with high levels of self-employment in the early twentieth century exhibit higher rates of employment growth more than 50 years later (Chap. 6). The more recent development of East German regions that labored under 40 years of communism also suggests that those regions that had high levels of historical self-employment and an entrepreneurial tradition were much better able to cope with the economic challenges of the transformation to a market economy after German unification in 1990 (Chap. 5).

Focusing on the role played by the regional knowledge base in innovation activity and the formation of innovative new businesses (Chap. 7), we found that there is a significantly positive relationship between a relatively well developed regional knowledge base at the beginning of the twentieth century and regional innovation activity more than 100 years later that also results in relatively high levels of start-ups in innovative industries. This relationship is particularly pronounced if high regional levels of historical knowledge go together with high levels of historical self-employment. Consistent with the knowledge spillover theory of entrepreneurship (Acs et al. 2009, 2013), these results suggest that it is not just the regional knowledge base, but the commercialization of this knowledge through start-ups that is decisive for its long-term effect.

Finally, we tested our conjecture that high levels of historical self-employment indicate the presence of a regional entrepreneurial culture using data about the personality structure of today's local population. This corresponds with the concept that an entrepreneurial culture is an "aggregate psychological trait" (Freytag and Thurik 2007, p. 123) found in the regional population that favors entrepreneurship. We capture such a conceptualization of entrepreneurship culture by calculating the population share of people with an entrepreneurship-prone personality profile at the regional level. According to Rentfrow et al. (2008), regional differences in the share of people with an entrepreneurial mindset today may be explained by social influences within the region as people respond, adapt to, or get socialized according to regional norms, attitudes, and beliefs. Moreover, variations in the degree to which an entrepreneurial culture is found in different regions may become more pronounced if people

with an entrepreneurial mindset tend to migrate to places where the local population has similar personality characteristics (see also Obschonka et al. 2013, 2015).

We find indeed a significantly positive relationship between the regional levels of historical self-employment and the share of today's population with an entrepreneurial personality profile (Chap. 8). Regions with a pronounced entrepreneurial personality profile of the local population not only exhibit higher start-up rates today, but have also higher levels of innovation activity as indicated by the share of R&D employees, or the number of patent application per workforce. Including both variables—historical levels of self-employment and the entrepreneurial personality profile of today's population—into one empirical model, shows that the historical self-employment rate has the dominant effect. Based on these results we conclude that high levels of self-employment in the past tend to shape the personality profiles of the regional population and induce a long-lasting culture of entrepreneurship that leads to high levels of new business formation and innovative activity that are conducive to economic growth.

Summarizing these findings, we can say that a region's history with regard to entrepreneurship, knowledge, and innovation can have rather significant effects on its current performance. Historical constellations may produce a long-lasting regional culture, i.e., an informal institution that is able to persist disruptive changes of the political, social, and economic framework conditions.

## 9.2   Contribution to Theory

Our analyses make several contributions to economic theory, and particularly to the study of entrepreneurship. First of all, our results reveal the key importance of integrating a dynamic perspective into the study of regional development, especially in studies about the levels and effects of entrepreneurship. We can clearly show that history matters. That is, any analysis of new business formation across space should consider those regional conditions that are deeply rooted in history, particularly historical patterns of entrepreneurial activity that continue to affect new business formation and regional development until today, and which are also likely to play a role in start-up activity and regional development in the future.

More specifically, our study confirms that historically determined informal institutions play an important role for regional entrepreneurship and development. Informal institutions such as a regional culture of entrepreneurship can considerably vary across regions. Since informal institutions tend to be relatively stable over longer periods of time, they constitute an important part of the regional framework conditions that cannot be significantly changed by policy in the short run. However, once such informal institutions are shaped in a way that facilitates entrepreneurship, it is likely that they will lead to a long-lasting increase in the level of start-up activity. Informal institutions in favor of entrepreneurship reflect an entrepreneurial culture that is a long-lasting and enduring regional resource. As a consequence, any attempt to understand

regional differences in entrepreneurship should try to assess and account for such region-specific informal institutions.

Using a broad definition of path dependency, one might consider the persistence of entrepreneurship caused by an entrepreneurship-facilitating culture to fall into this category in the sense that past output matters for current and future economic performance (Martin and Sunley 2006; Setterfield 1995). However, the persistence of entrepreneurship and the informal institution of an entrepreneurial culture present us with a rather special case. Unlike other forms of path dependency, an entrepreneurial culture cannot cause lock-in effects with negative consequences for economic performance. On the contrary, an entrepreneurial culture is a regional asset, or part of a region's social capital, that helps to avoid negative lock-in effects by facilitating the recognition and realization of entrepreneurial opportunities that fuel structural change and regional renewal. In that sense it is an informal institution that is conducive to overcoming path dependencies and lock-in constellations that are caused by certain technologies or by other factors. Hence, it may not be appropriate to speak of an entrepreneurial culture as a path-dependency phenomenon.

Our analyses show that there are considerable interactions between a historically grown culture and the regional knowledge base (Chap. 7). Thus, we also add to the knowledge spillover theory by demonstrating that a regional entrepreneurial culture may also be an important transmission mechanism that promotes knowledge spillovers. This means that the commercialization of knowledge via the formation of new businesses may not only depend on incentives, but also on the dispositions of the local population. Hence, in a region that lacks an entrepreneurial culture, the potential of new knowledge to fuel structural change and economic development may be rather limited.

Finally, we integrate theories from the fields of economics, geography and psychology. By combining these theoretical perspectives with our historical approach of studying modern day entrepreneurship and economic performance, we significantly contribute to the development of a truly holistic perspective on entrepreneurial phenomena across space.

## 9.3   Policy Implications

Our study demonstrates that regions do not only differ in their current levels of entrepreneurship, but also with regard to the role of entrepreneurship in their history. These differences in the historical experiences and the resulting cultures of entrepreneurship clearly confirm the recognition that a 'one size fits all' policy approach that could be appropriate for all regions does not exist. The results of our analyses clearly suggest that policy should account for regional histories, cultures, and the psychological dispositions of the regional population. Hence, different measures and strategies may be needed for different kinds of regions, such as areas with high and low levels of an entrepreneurial culture.

Our result that regional levels of self-employment and new business formation are rather persistent over time means that regions with high levels of entrepreneurship today are likely to have also relatively high levels of entrepreneurship in the future, while regions with currently low levels of entrepreneurship may expect correspondingly low levels in the coming decades. Hence, policies that aim at raising the level of regional entrepreneurship and stimulating an entrepreneurial culture may require rather long periods of time before significant changes can be noticed. Clearly, creating an entrepreneurship culture is a long-term strategy. However, once such a culture is created it may generate long-lasting positive effects.

In regions that already have a pronounced culture of entrepreneurship, policy might play the distinctive role of preserving this culture and opening avenues to overcome development bottlenecks. Regions where a culture of entrepreneurship is lacking may require considerably more attention and effort to build such a culture. As a first step, such a policy approach should try to identify the reasons for the relatively low levels of regional entrepreneurship. The results of such an analysis can then serve as a basis for the development of a region-specific strategy to improve the level of entrepreneurial activity.

We have demonstrated in our analyses that entrepreneurship in innovative industries—a type of entrepreneurship that can be regarded particularly important for regional growth (Fritsch 2011)—is closely related to the regional knowledge base (see Chap. 7). Hence, strengthening the regional knowledge base may be an important way of raising especially the number of innovative new businesses. This pertains to all levels of education, as well as to research.

## 9.4   Avenues for Further Research

In our analyses we found a number of long-term relationships, particularly persistence of regional levels of entrepreneurship, that we were only partly able to explain. These findings offer promising avenues for further research. In the following, we describe those research perspectives that are, in our view, most important.

One task for follow-up studies is to analyze the relationships between historical events and current developments using better, especially more comprehensive historical data. This may include developing other indicators for entrepreneurship, a more detailed assessment of the regional knowledge base, information about government policies towards entrepreneurships and the supporting infrastructure for entrepreneurs such as the local banking system, information on social practices (e.g., modes of inheritance; see Sect. 4.6), as well as information about social values and attitudes of the regional population. This type of more comprehensive data would not only lead to a better description of historical entrepreneurship and related issues, but could also allow researchers to identify those elements of the historical entrepreneurship system that are of key relevance for persistence over longer periods of time. An important direction of data mining should be to make information about

more distant time-periods available. This would allow for the investigation of regional development trajectories over even longer time spans.

More comprehensive data over longer time spans could also be very helpful in investigating those factors that contributed to the emergence of a regional culture of entrepreneurship, a key issue that we had to leave open here. What explains the pronounced differences of historical self-employment rates that we found in our analyses? What is the role of natural conditions such as location and accessibility of a place, of climate conditions, of quality of the soil and soil resources[1] in the emergence of an entrepreneurial culture? Do social practices, such as the prevailing modes of inheritance, play a role? What is the specific effect of formal institutions, such as region-specific barriers to entry, or a legal framework that allowed for a relatively high level of economic freedom?[2]

The last question about the legal framework conditions points to another broader, but no less important issue: the relationship between formal and informal institutions. Although our analyses confirm the common conjecture that informal rules tend to be much more persistent than formal ones (Williamson 2000), there is also solid empirical evidence that certain formal rules can stimulate the level of entrepreneurship and, and hence, the emergence of an entrepreneurial culture.[3] This is clearly shown in our analysis of the case of East Germany in Chap. 5. Although we found that 40 years of anti-entrepreneurial socialist regime in East Germany was not able to completely eradicate a regional culture of entrepreneurship, there is also a clear indication that the socialist era has left significant traces. It is, therefore, important to inquire more deeply into the effect formal institutions have on informal ones, such as a regional entrepreneurial culture. It would also be important to know more about effects in the opposite direction, i.e., how might an informal institution like an entrepreneurial culture impact the design and formation of formal institutions? Do high levels of entrepreneurship and a positive attitude of the regional population lead to the implementation of more entrepreneurship-friendly formal rules? Such a relationship could be a further mechanism that makes a culture of entrepreneurship persistent—at least as long as there are no radical switches of the political regime.

How a regional culture of entrepreneurship is able to be transferred across generations despite severe disruptive shocks of the social, political, and economic

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[1]A prominent example for the role of soil resources are coal deposits. Our study (Sect. 3.2.1) has confirmed the results of other analysis (Chinitz 1961; Stuetzer et al. 2016) that regions with a concentration in coal mining and in related industries are characterized by low levels self-employment, a finding that is probably a result of the large scale plants that were characteristic for such industries. Dominance of larger firms implies low shares of self-employed, and hence entrepreneurial role models in the regional population.

[2]Due to its pronounced federal tradition and the resulting differences in the regulation of economic activities, Germany would be would be well-suited for such an analysis.

[3]Clearly, administrative and legal barriers to entry are negatively related to the level of new business formation (Klapper et al. 2006). A prominent example of such a positive effect of low entry barriers to entrepreneurship is the non-enforcement of covenants not to compete in some of the US states (Sampsa and Sorenson 2011).

framework conditions is another key issue that requires further investigations. A main mechanism for the transmission of an entrepreneurial spirit over time that has been well investigated in the literature is the transfer from parents to their offspring (e.g., Chlosta et al. 2012; Dohmen et al. 2012; Laspita et al. 2012; Lindquist et al. 2015). Much less is known about the potential contribution of spatial mobility of people to the persistence of a regional entrepreneurial culture. If, for example, people with an entrepreneurial mindset are particularly attracted to regions that are already characterized by high levels of entrepreneurship, this supports the persistence of a regional culture of entrepreneurship. A third mechanism—already mentioned above—that may lead to persistence of an entrepreneurial culture is an effect of such a culture on the formal institutions; it is, however, unlikely that such an effect can survive radical regime changes. There may also be an effect of collective memory that could explain the persistence of entrepreneurship, e.g., the knowledge that entrepreneurship has been successful in former times (Fritsch et al. 2018).

A further point that deserves attention is the design of appropriate political strategies. What policies can be recommended for regions that have a pronounced culture of entrepreneurship? What measures are appropriate if such a culture is missing? How can policy support the emergence and the development of an entrepreneurial culture? Do regions with a strong entrepreneurial culture respond differently to certain policy measures than regions lacking, or with a weaker, entrepreneurial culture? Little is by now known about such questions.

An important limitation of our study is, of course, that the analysis is for just one country, Germany. Although the few available analyses for other countries and regions (Fotopoulos and Storey 2017; Fritsch et al. 2018) confirm the basic result of long-term persistence, we need much more empirical evidence specific to other regional settings in order to determine if our findings for the case of Germany can be generalized.

Many of the research questions listed above fall in the domains of several academic disciplines: economics, geography, history, sociology, psychology, and political science, to name the main disciplines here. This clearly suggests that many of the research questions mentioned above would considerably benefit from interdisciplinary cooperation.

## 9.5   Concluding Remarks

This book deals with long-term development trajectories of regions. We show that regional economic activity today is considerably influenced by the past. The main focus of our analyses is on entrepreneurship, i.e., self-employment and start-ups. We argue that high regional levels of self-employment in the past may represent a culture of entrepreneurship that tends to be long-lasting and is rather robust, even in the face of disruptive shocks to the political and economic framework conditions. A culture of entrepreneurship implies that there are significant numbers of entrepreneurial role models and a widespread social acceptance of self-employment. It is these very

characteristics of an entrepreneurial culture that are conducive to the recognition and the realization of entrepreneurial opportunities. We show that a culture of entrepreneurship is, to a significant degree, historically determined. However, having demonstrated that entrepreneurship was a key driver of economic growth in the past, even more attention must be given to the historical roots of entrepreneurial cultures in order to better understand the persistence of regional differences today, and to identify opportunities for promoting economic growth through entrepreneurship in the future.

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# Index