university of groningen / faculty of economics and business

2022006-I&O

Entrepreneurship in the Long-run: Empirical Evidence and Historical Mechanisms

August 2022

Michael Fritsch
Michael Wyrwich

SOM is the research institute of the Faculty of Economics & Business at the University of Groningen. SOM has seven programmes:

- Accounting
- Economics, Econometrics and Finance
- Global Economics & Management
- Innovation & Organization
- Marketing
- Operations Management & Operations Research
- Organizational Behaviour

Research Institute SOM
Faculty of Economics & Business
University of Groningen

Visiting address:
Nettelbosje 2
9747 AE Groningen
The Netherlands

Postal address:
P.O. Box 800
9700 AV Groningen
The Netherlands

T +31 50 363 9090/7068/3815

www.rug.nl/feb/research

Entrepreneurship in the Long-run: Empirical Evidence and Historical Mechanisms

Michael Fritsch
Friedrich Schiller University Jena and Halle Institute for Economic Research, Germany

Michael Wyrwich
University of Groningen, Faculty of Economics and Business, Department of I&O
m.wyrwich@rug.nl

Entrepreneurship in the long-run: Empirical evidence and historical mechanisms

Michael Fritsch[a]

Michael Wyrwich[b]

Forthcoming in *Foundations & Trends in Entrepreneurship*

June 2022

Abstract

We review and discuss research on the development of regional entrepreneurship over time. A particular focus is on the long-term persistence of regional levels of entrepreneurship, its explanation, and its meaning for economic development. What is the state of empirical research in this field, and what can explain the empirical findings? How are long-term trends of entrepreneurial activity linked to regional performance in terms of employment, gross domestic product (GDP), and innovative activity? Based on our assessments we derive conclusions for theory, policy implications, and avenues for further research.

Keywords: Entrepreneurship, self-employment, regional growth, entrepreneurial culture, historical analysis

JEL-classification: L26, M13, O1, O33, R11

a) Friedrich Schiller University Jena and Halle Institute for Economic Research (IWH), Germany. ORCID 0000-0003-0337-4182. m.fritsch@uni-jena.de

b) University of Groningen, The Netherlands and Friedrich Schiller University Jena, Germany. ORCID 0000-0001-7746-694X. m.wyrwich@rug.nl

1. Historical roots of entrepreneurship and economic performance[1]

Entrepreneurship research was for a long time rather ahistorical.[2] Recent studies did, however, show that entrepreneurship can have pronounced historical roots that may have significant long-term effects. There are several examples of countries and regions that show stunning persistence of entrepreneurship levels over long time periods. This persistence can be observed despite disruptive shocks, such as devastating wars, high levels of in- and out-migration, or a radical change in the framework of formal institutions, political regimes, and the general economic situation(see Section 3). Moreover, it is positively related to economic performance (Glaeser et al., 2015; Fritsch and Wyrwich, 2017, 2019).

This article reviews the available evidence on the historical roots of entrepreneurship and its relationship with economic performance across regions, which we define as subnational geographic entities. Given the tremendous differences in the level and the type of entrepreneurship between regions, we focus on the regional level. We demonstrate how historical factors can determine entrepreneurial activity in a region and may, to a certain extent, predetermine future development paths. In addition, we look at the ability of a regional economy to cope with external challenges. Our main explanation for such long-term effects and, particularly, for the persistence of the level of regional entrepreneurship over long periods are historically rooted regional cultures that change only very slowly. Generally, historical roots provide a key explanation for the development of regions along long-term trajectories that are characterized by a co-evolution of entrepreneurship, knowledge, and informal institutions[3]. This means that regions can have persistently low or persistently high

[1] We are indebted to Marcus Dejardin, Johannes Kleinhempel, Korneliusz Pylak, Michael Stuetzer, Fabian Wahl, and an anonymous reviewer for helpful comments on earlier versions of this paper.

[2] This is surprising given that Joseph Schumpeter (1934, 1939), a key ‘founding father’ of the discipline, based his argument mainly on historical examples.

[3] According to North (1994), institutions are understood as the ‘rules of the game’. While the formal institutions comprise those rules that are the codified, the informal institutions are the unwritten rules, such as codes of conduct as well as social norms and values, which are the very building blocks of ‘culture’.

levels of entrepreneurship depending on whether historical factors shaped entrepreneurship positively or negatively.

This contribution is a further call to incorporate history into entrepreneurship research (Wadhwani et al., 2020). Starting with a brief overview of data availability and measurement (Section 2), we summarize the available empirical evidence on long-term trends in regional entrepreneurship in Section 3. Section 4 discusses potential explanations for these findings. Section 5 is then devoted to the effects of persistent regional entrepreneurship on economic development. Based on these findings we discuss conclusions for theory development in Section 6 and derive policy implications in Section 7. Section 8 discusses empirical challenges and describes main avenues for further research. The final section (Section 9) concludes.

2. Measuring long-term trends of regional entrepreneurship

2.1 Measures of entrepreneurial activity

At its core, entrepreneurship is an attitude that results in certain behaviors, such as identifying opportunities, taking initiative, assuming responsibility, taking risks, doing something new, and starting and running an own business. While an important strand of empirical research tries to assess such attitudes and behaviors at the level of individuals, research on individuals at a regional or national level is very much restricted by the availability of suitable data.

A commonly used indicator of the regional or the national level of entrepreneurship is based on the number of new businesses that are set up during a certain period of time. For reasons of comparability, the level of regional new business formation is commonly expressed as a rate, dividing the number of start-ups

by the number of workforce or population at working age.[4] The start-up rate represents an important dynamic element of a regional or national economy. It may be calculated for all industries or for selected industries and economic sectors. A start-up may represent a new firm (= new legal entity) or a new establishment that is a branch plant of a firm with its headquarter in another region. Data that do not include new branches, often assign economic activity, such as value-added or employment, to the region of the firm's headquarter.[5]

An important restriction for the analysis of long-term trends in new business formation is the limited length of consistent time series. This kind of data is hardly available for years earlier than the late 1970s.[6] An alternative measure of entrepreneurial activity that is available in many countries for longer time periods is self-employment. In most cases, such data is based on censuses that are only conducted in selective years.[7] Another source of historical self-employment data may be tax statistics or (sector-specific) trade registers. In several countries such data currently reach back until the early 20th century or even the late 19th century. In addition, it can be expected that data on self-employment for even earlier years will

[4] Audretsch and Fritsch (1994) termed this way of calculating a start-up rate the 'labor market approach'. An alternative way of calculating a start-up rate, the 'ecological approach', would be dividing the number of starts-ups by the number of incumbent businesses. Both measures may lead to rather different results. The reason for such differences is that in the ecological approach very large and very small businesses have the same weight although large firms comprise more employees that may start their own venture. For this reason, the labor market approach may be better suited as a measure of regional entrepreneurship. It represents the propensity of someone in the labor force to start an own business.

[5] Quite frequently, information on start-ups does not include much information on characteristics of the founder such as qualification level, age, or previous career. Moreover, it often does not allow following the development of the respective firms or establishments over time.

[6] In West Germany the longest time series of new business formation based on employment statistics begins in the year 1976. In the US information on regional new business formation is available from 1978 onward. Kobayashi (2020) reports start-up rates for Prefectures in Japan from 1972 onward. In some countries, there is information available on new firms or establishments only in certain sectors or size classes, which represents only a small share of start-up activity and is, therefore, hardly meaningful for an analysis of regional entrepreneurship.

[7] The earliest available data on self-employment in the UK is for 1851 (see Bennet et al., 2020) and for the US it is based on a census conducted in 1910.

become available in the future.[8] An advantage of historical self-employment data can be that it comprises information on firm size (number of employees and turnover) and employment structure. A disadvantage is, of course, that self-employment data also comprises older firms and, hence, does not represent the dynamic aspect of entrepreneurship in the same way as data on new business formation.

A typical problem of data on start-ups or self-employment is incomplete coverage. A statistic may not capture all types of start-ups or self-employment. Quite frequently, minor forms of self-employment, such as sideline businesses or start-ups and self-employed without further employees, are not included. Changes in regulations and in the statistical reporting system may lead to considerable differences in coverage of the recorded data, which may impair the comparability of data for different periods.

In order to gain a more relevant measure of entrepreneurship based on self-employment, some researchers limit the analysis to certain types of firms, such as small and micro-firms (Fritsch et al., 2019a). Another possibility is to focus on self-employment in certain sectors regarded as particularly important for economic development, like high-tech or knowledge-intensive industries (Fritsch, 2011). The idea behind a focus on micro-firms is that it is rather likely that these businesses are owner-managed. Self-employment in high-tech or knowledge-intensive industries may be regarded as a proxy for high-quality entrepreneurship in terms of abilities and economic impact. This might have a positive long-run effect on the performance of the respective region. Moreover, start-ups in high-tech industries can be assumed to generate a pronounced positive impact on regional development. Often, they are

[8] Quite often, the earliest available data do not cover an entire country in its contemporary definition but only certain regions.

economically or technologically more successful than other firms and create larger numbers of promising entrepreneurial opportunities.[9]

It is quite common practice in empirical analyses of regional entrepreneurship to exclude start-ups and self-employment in agriculture because it constitutes a rather special case hardly comparable to other industries. In particular, entrepreneurship in agriculture requires qualifications and abilities that differ considerably from other sectors. One special feature of self-employment in agriculture is the relatively high share of family businesses that are passed on by customs of inheritance. Hence, many farm owners did not experience the risky process of founding and establishing their businesses. Moreover, since the growth of farms is limited by available acreage, the business strategies of farmers tend to be dominated by attempts to preserve their farms; expansion plays only a minor role, if any.

A proxy for the level of regional entrepreneurship that has been used in some empirical studies (e.g., Glaeser et al., 2015) is the regional activity in large-scale industries, such as steel production and coal mining. The idea behind this measure is that large-scale industries require large firm sizes, which reflect high entry barriers for newcomers. As a result, regions that are dominated by such industries typically have relatively few self-employed and low levels of new business formation (Stuetzer et al., 2016).

2.2 Metrics of change

A simple approach to analyzing long-term trends in regional levels of entrepreneurship is to compare start-up or self-employment rates at different points in time. Correlations between these rates then indicate the levels of persistence of

[9] The definition of high-tech industries is commonly based on their share of research and development. While this classification is limited to manufacturing industries, certain service sector industries (mostly technology-intensive services and non-technical consulting) are classified as being ‘knowledge-intensive’ (for details, see Fritsch, 2011). A problem of such a classification is that industry affiliation is a fuzzy criterion because there may be innovative and not so innovative firms in all industries. However, given the limited availability of data on the innovativeness of individual businesses, this is often the only feasible way to identify new businesses as being innovative (for details, see Fritsch, 2011). New businesses in high-tech manufacturing industries make up only a rather small fraction of all start-ups, typically far less than 1%.

regional entrepreneurship. However, comparisons over long periods may be considerably impaired by national trends (such as demographic change and technological developments), or by changes in the statistical reporting system that do not affect all regions in the same way. In such cases, it may help to transform the distributions of entrepreneurship rates to a common mean value and standard deviation (z-transformation).

Another way to account for such changes is to compare the regional position with regard to a certain entrepreneurship indicator in a national ranking ("National Entrepreneurship League Table"). A key advantage of such an approach is that some potentially important national-level influences on entrepreneurship are held constant. These influences include macro-economic policies and changes in the business regulatory framework or in the statistical reporting system that affect all regions in about the same way. In contrast, analyzing the development of regional start-up or self-employment rates would also reflect changes at the national level—such as interest rates—that vary only marginally between regions in a country. Another advantage is that due to their ordinal character, rankings are robust to extreme cases ('outliers') that could bias the results if continuous metrics are used. Moreover, rank positions indicate the attractiveness of regions for entrepreneurial talent, investments, and relocation of firms in comparison to other regions (see Fotopoulos and Storey, 2017; Fritsch and Kublina, 2019). For this reason, rank positions may have particular appeal to policymakers.

3. The phenomenon of persistence in regional entrepreneurship—an overview

It is a standard result of empirical studies analyzing regional new business formation over time that start-up rates are highly correlated over successive years or even periods of two or three decades.[10] Correlation coefficients for regional start-up rates in successive years often assume values considerable above 0.9. As a result, regions

[10] See Andersson and Koster (2011) for Sweden, Fritsch and Mueller (2007) and Fritsch and Kublina (2019) for Germany, Mueller et al. (2008) and Fotopoulos (2014) for the UK, van Stel and Suddle (2008) and Koster and Hans (2017) for the Netherlands, Baptista et al. (2008) for Portugal, Acs and Mueller (2008) and Qian (2022) for the US, and Kobayashi (2020) for Japan.

that have relatively high (low) levels of new business formation today are likely to also show relatively high (low) levels in later years. The correlation coefficients do, however, tend to decrease with the growing time span between the years that are compared (e.g., Andersson and Koster, 2011; Fritsch and Mueller, 2017). For Sweden, Andersson and Koster (2011) find that the persistence of new business formation is more pronounced in regions where the level of start-ups exceeds a certain threshold level. Fotopoulos (2014) shows for the UK that not only start-up rates but also the main regional determinants of new business formation tend to be rather persistent over the observation period of 13 years. Fritsch and Kublina (2019) confirm such persistence of the main regional determinants of new business formation in the regions of West Germany over a period of 30 years. West German regions that experienced an increase in their levels of new business formation are characterized by a high share of the manufacturing sector, high levels of R&D activity, and an entrepreneurial climate, i.e., a high employment share in small and young firms (Fritsch and Mueller, 2007; Fritsch and Kublina, 2019).

While data on new business formation is currently only available since the 1970s (see Section 2.1), information on entrepreneurial activity in terms of self-employment may cover much longer periods of more than a century. A growing number of empirical analyses for a variety of countries and over time periods of different lengths demonstrated some persistence of regional self-employment; for an overview, see Table 1. So far, the most detailed analyses were conducted for Germany (e.g., Fritsch and Wyrwich, 2014, 2018, 2019; Fritsch et al. 2019b), and Great Britain (e.g., Stuetzer et al., 2016; Fotopoulos and Storey, 2017). Further studies were mainly carried out for European countries, such as Czechia (Novosák et al., 2020), Italy (Cosci et al., 2021), the area of Kaliningrad (Fritsch et al. 2019a), Poland (Fritsch et al., 2021a), and Russia (Belitski et al., 2022). For other parts of the world, there is only sparse empirical evidence with studies for the US (e.g., Glaeser et al., 2015; Qian, 2022; Stuetzer et al., 2021), China (Opper and Andersson, 2019), and Japan (Kobayashi, 2020).

Table 1: Overview of empirical studies of persistent entrepreneurship over longer time periods

Authors	*Region and time period*	*Metrics for entrepreneurship* *- historical* *- current*	*Main findings*
Andersson & Koster (2011)	Sweden, 1994 - 2004	- start-ups - start-ups	High correlation of regional start-up rates over time. Persistence more pronounced in regions where the level of start-ups exceeds a certain threshold level.
Belitski, Tsareva & Zemtsov (2022)	Russia, 1926 - 2018	- retail trade establishments; cooperatives - micro and small businesses	There is a significantly positive relationship between the historical numbers of establishments in retail trade (1926, 1949, 1950), the number of cooperatives in 1989 per regional population, and small business density in the 1998-2018 period. The effect of historical entrepreneurship seems to become weaker over this period.
Cosci, Meliciani & Pini (2021)	Italy, 1927 - 2017	- self- employment - start-ups	Historical self-employment in overall manufacturing is positively related to new business formation in manufacturing today. Such correspondence is also found for historical levels of self-employment and new business formation today in the service sector. Historical self-employed manufacturing firms that applied motive power are positively related to new business formation in all parts of the manufacturing sector, but especially, high- and medium-tech industries.
Fotopoulos (2014)	UK, 1994 - 2007	- start-ups - start-ups	High persistence of regional start-up rates over the period of analysis. The main determinants of regional new business formation remain also rather unchanged over time.
Fotopoulos & Storey (2017)	England and Wales, 1921 - 2011	- self-employment - self-employment	Pronounced persistence of self-employment rates. Strong increase of self-employment in London and declining self-employment in coastal areas.
Fritsch & Mueller (2007)	West Germany, 1983 - 2002	- start-ups - start-ups	High correlation of regional start-up rates between different years. Main factors determining the level of regional start-ups are innovation and an entrepreneurial climate.
Fritsch & Wyrwich (2014, 2017, 2018, 2019, 2022); Fritsch, Obschonka & Wyrwich (2019)	Germany, 1907-today	- self-employment - start-ups	Historical self-employment is positively related to new business formation today. East German regions with high levels of historical self-employment have also high levels of remaining self-employment at the end of the socialist era and have high start-up rates afterwards.
Fritsch & Kublina (2019)	West Germany, 1976 - 2007	- start-ups - start-ups	High correspondence of regional rank positions of start-up rates. Regions that experienced an increase of their levels of new business formation are characterized by a high share of the manufacturing sector, high levels of R&D activity, and high shares of small business employment.
Fritsch, Greve & Wyrwich (2022a)	Germany, 1925 - 2015	- self-employment - self-employment	Forty years of socialism in East Germany had a strong negative effect on self-employment. Several decades after German reunification self-employment in East Germany is considerably higher than in the West.
Fritsch, Sorgner, Wyrwich & Zazdravnykh (2019a)	Russia (Kaliningrad), 1925 - 2010	- self-employment - micro and small businesses	There is a significant correspondence of industry-specific self-employment rates across regions. This correspondence is particularly high if historic firms applied electric power.
Fritsch, Obschonka, Wahl & Wyrwich (2021b)	Germany, about 170 AD – today	- occupation by the Romans - start-ups	The number of start-ups over workforce (in all industries and in innovative manufacturing) is significantly higher in German regions that were occupied by the Romans about

			1700 years ago. An important mechanism for persistence could be Roman roads.
Fritsch, Pylak & Wyrwich (2021)	Poland, mid 1920s - 2019	- self-employment - start-ups	Historical self-employment in knowledge-intensive industries is positively related to new business formation in all industries today. No positive relationship for historical self-employment in non-knowledge-intensive industries.
Glaeser, Kerr & Kerr (2015)	USA, 1900 - 1982	- distance to historical mines (coal and iron) in the year 1900 - share of small businesses; employment share in start-ups 1982	Proximity to historical mines for coal and iron in the year 1900 predicts low shares of small firms and of employment in start-ups in 1982.
Novosák, Severová, Novosáková, Šrédl, Hájek & Spiesová (2020)	Czechia, 1930 - 2011	- self-employment - self-employment	Historical self-employment is positively related to regional self-employment after 1990. The effect is relatively strong for manufacturing, less pronounced for services, and ~~but~~ insignificant for agriculture.
Opper & Andersson (2019)	China, 1644 - 2012	- number of merchant guilds - private firms	Positive relationship between the historical number of merchant guilds and the number of private firms per population in 2012
Qian (2022)	USA, 1920 - 2019	- self-employment - self-employment	Significant correlation between regional self-employment rates in different years of the period of analysis.
Stuetzer, Obschonka, Audretsch, Wyrwich, Rentfrow, Combes, Shaw-Taylor & Satchell (2016)	UK, 1891- 2011	- distance to the nearest coalfield - start-ups; self-employment	Proximity to historical coalfields predicts low shares of small firms and a low level of new business formation in 1982.
Stuetzer, Obschonka, Brodeur, Audretsch, Rentfrow, Potter & Gosling (2021)	USA	- Gold rush in the 19th century - Self-employment 1910 - 2010	Counties that experienced a gold rush in the 19th century have higher self-employment rates from 1910 to 2010. The gold rush may have attracted individuals with an entrepreneurial personality structure and the formation of an entrepreneurial culture.

Fotopoulos and Storey (2017) compare the ranking of regions in England and Wales according to the self-employment rate (League Table approach, see Section 2.2) in the years 1921 and 2011 and find that this ranking remains rather constant. An outlier with a relatively pronounced increase in the rank position is the city of London. The analysis shows that the changes in rank positions relate to respective structural changes in human capital, age structures of the regional population, and migration. Cosci et al. (2021) show a significantly positive relationship between regional self-employment in the year 1927 and levels of new business formation in the 2000-2017 period for the regions of Italy. Qian (2022) analyzed self-employment rates in US Commuting Zones and Metropolitan Statistical Areas (MSAs) between

1920 and 2019. The findings show a significant correlation between self-employment rates in different years of the period of analysis.

Fritsch and Wyrwich (2014, 2018, 2019)[11] showed for Germany that historical regional levels of self-employment are significantly and positively related to self-employment and new business formation over a period of more than a century. This is rather noteworthy given that Germany experienced a number of disruptive shocks in the course of the 20th century. These include the First World War (WWI), the Great Recession of the late 1920s, the Nazi regime and the devastating Second World War (WWII), occupation by the Allied Powers, and massive in-migration from lost territories after WWII. After the war, the country was split into two separate states for forty years—a western-type market economy (West Germany, the FRG) and a communist regime (East Germany, the GDR) with a Soviet-style planned economy. During the years of the socialist regime, collectivist values were strongly favored and entrepreneurship was perceived as a bourgeois anachronism. The communist regime implemented a significant number of policies intended to eradicate entrepreneurship. This included massive socialization of private enterprises and the suppression of any remaining private-sector activity (for details, see Pickel 1992). These anti-entrepreneurial policies left their traces. At the end of the communist regime, East Germany had much lower levels of self-employment than West Germany (Fritsch and Wyrwich 2014, 2019).

Over the four decades of separation, the West German market economy clearly outperformed the East German system. At the time of the reunification of the two states in 1990, the economically much less advanced East German society was subject to a shock transformation with a radical reorganization of its economy that caused high levels of unemployment. Quite remarkably, Fritsch and Wyrwich (2014, 2018, 2019) found significant correspondence between the regional structure of self-employment before WWII and the regional structure of the remaining self-employment in East Germany at the end of the communist period. Moreover, those East German regions that had relatively high levels of remaining self-employment

[11] See also Fritsch, Obschonka and Wyrwich (2019) and Fritsch, Greve, and Wyrwich (2022).

showed high levels of new business formation after reunification (Fritsch et al., 2021c).

Fritsch et al. (2019) document another striking example of persistent entrepreneurship that experienced even stronger disruptions than East Germany. The example is the area of Kaliningrad that was German until the end of WWII and then became part of Russia. One of these disruptions was the displacement of the original German population soon after the war with the new population coming from diverse areas of Russia. The region then endured four decades of socialism during which self-employment was almost illegal. This was followed by another disruptive transition toward a market economy in the early 1990s that was accompanied by massive economic dislocation and decline.

Another example of persistent regional entrepreneurship despite an exchange of large parts of the local population is the case of Silesia and Pomerania in Poland. Like Kaliningrad, these regions were German until WWII and became part of Poland afterward. In the last months of the war, the German population of this area fled from the approaching Russian Army or was expelled after the war. The incoming population originated from other areas of Poland—particularly, from those regions that became part of the Soviet Union after WWII. Then, Poland was subject to a communist regime and transformed into a market economy after 1989. In contrast to the case of Kaliningrad, Fritsch et al. (2021a) did not find persistence of the general level of historical self-employment in the mid-1920s but that current levels of new business formation are related to historical self-employment in knowledge-intensive industries.

Czechia, like Kaliningrad and Poland, was for forty years subject to a communist regime after WWII. Novosák et al. (2020) found a significant correlation between regional self-employment rates in Czech regions in the year 1930 with self-employment after 1990 when the communist regime was abolished. This relationship is strongest for self-employment in the manufacturing sector, less pronounced but still significant within services, but insignificant for agriculture. Such persistence can also

be found in those areas of Czechia that were dominated by German population before the Second World War (i.e., the *Sudentenland*).

There are also studies for a number of countries using historical events and constellations that represent the regional level of self-employment in an only indirect way. Glaeser, Kerr and Kerr (2015) and Stuetzer et al. (2016) base their analysis on the presence of historical coal and iron ore mines. They take them as an indicator of the presence of large-scale industries in a region and, hence, low levels of self-employment among the regional population. For the US, Glaeser, Kerr and Kerr (2015) show that geographic proximity to historical mines for coal and iron ore that existed in the year 1900 is related to a low share of small firms today. Stuetzer et al. (2016) confirm such a relationship for the UK.

Opper and Andersson (2019) in their study of China use the regional number of merchant guilds per population during the Qing Dynasty (1644-1912) as a proxy for regional entrepreneurship and find a significant positive correlation with the regional number of private firms per capita in the year 2012. For those German regions occupied by the Romans about 1700 years ago, Fritsch et al. (2021b) find higher levels of start-ups and innovation activities today.

Altogether, the phenomenon of persistence over long periods of time can be found in many different institutional and geographic contexts. At the same time, there is also evidence that such a pattern does not hold for all types of entrepreneurship. These findings lead to the question about the historical roots of regional differences in entrepreneurship and how persistence of entrepreneurship despite disruptive shocks can be explained. We address this important question in the following section.

4. The historical roots of regional entrepreneurship and its persistence

The persistence of regional entrepreneurship over time can be explained in a number of different ways. We begin our discussion of possible reasons for persistence with the stability or “stickiness” of regional conditions for entrepreneurship (Section 4.1). Section 4.2 then focuses on historical industry specialization that may have long-term consequences for regional entrepreneurship. A further relevant factor that is closely

related to industry structure is the regional knowledge base (Section 4.3). The following two section discuss the role of informal institutions—a regional culture of entrepreneurship (Section 4.4) and a collective memory of the local population (Section 4.5). The role of population density and agglomeration is subject to Section 4.6, and Section 4.7 deals with the question why certain historical episodes and 'accidents' leave a persistent imprint, while others do not. Finally, we discuss factors that may shape the strength of persistence (Section 4.8).

4.1 Stable regional conditions for entrepreneurship

One simple explanation for the persistence of new business formation and self-employment could be that the relevant regional conditions for entrepreneurship remain constant. The empirical analyses that trace back the persistence of entrepreneurship to unchanged regional conditions focus on factors such as the legal framework, industry- and firm-size structure, population density, regional human capital, unemployment, and conditions in the regional labor market (see Andersson and Koster, 2011; Fotopoulos, 2014; Fritsch and Mueller, 2007; Fritsch and Kublina, 2019). While such factors are likely to remain relatively constant in the short run, once we consider time periods that span several decades, they may be subject to fundamental changes. Hence, regional conditions can hardly explain the persistence of entrepreneurship over longer periods as these conditions are likely to show great changes in the long run. The significant persistence of regional entrepreneurship that was found in contexts with several disruptive changes in the social, political, and institutional environment (see Section 3.2) clearly indicates the relevance of other factors.

One factor that does remain rather constant over long periods of time is the natural geographical circumstances, the 'first nature' of a location. This comprises numerous physical geography factors, such as distance and access to navigable waters, climate, suitability for agricultural use, and the existence of natural resources, like coal and ore. Natural geographic circumstances can have an effect by providing favorable conditions for certain types of activities. A commonly observed pattern is that poor quality of the soil for agricultural purposes determines a regional

specialization in manufacturing as the opportunity costs of agricultural specialization are low (Hall, 1998; Runst and Wyrwich, 2022). Another example is the presence of natural resources, such as ore and coal. Stuetzer et al. (2016) show that regional specialization in large-scale, energy-intensive industries, after the take-off of industrialization in Great Britain, is driven by proximity to coal deposits. The reason behind this link is that it was beneficial for large-scale and energy-intensive industries, such as steel processing and textiles, to locate close to coal deposits in order to save on transport costs for this important input.

A different effect of a natural resource on entrepreneurship is observed by Stuetzer et al. (2021). The authors show that those counties in the western part of the US that experienced a gold rush in the second half of the 19th century have higher levels of self-employment and new business formation in the 20th century. The link between gold discoveries and continued entrepreneurship is argued to be due to the influx of settlers with entrepreneurial personality traits, the formation of an entrepreneurial culture fostering risk-taking, and the establishment of entrepreneurship-friendly formal institutions. This pattern shows how natural conditions can determine not only the location of industries during the industrialization period but also the long-run impact on entrepreneurship in the region via this industry specialization and the migration pattern of entrepreneurial people.

4.2 Historical industry specialization

Typical industry characteristics that affect the entry rate are the capital intensity and the minimum efficient scale that is required for being able to compete successfully in the respective industry (for an overview, see Geroski 1995). Entering an industry that is characterized by high capital intensity and large minimum efficient size requires a relatively great amount of resources. Therefore, the rates of new business formation in such an industry are correspondingly low (Fritsch and Falck, 2007). Conversely, entrepreneurship levels tend to be relatively high in industries where successful entry requires only a few resources (e.g., many types of personal services). Thus, industry characteristics are an important determinant of entry. In particular, the larger the minimum efficient size of an industry, the lower the number of firms and, hence,

entrepreneurs. Thus, large-scale industries with high average firm sizes, such as coal-mining and steel production, are marked by low levels of start-ups and low shares of self-employed in the population.

Stuetzer et al. (2016) utilize this argument and apply it to the regional level. They show for Great Britain that a historical specialization in coal-mining and steel production in the late 19th century is related to persistently low start-up rates despite the fact that these regions have no significant share of such industries today. Hence, the persistence of industry structures cannot explain the observed patterns. Glaeser et al. (2015) report comparable evidence for the US.

An alternative explanation for the remaining low levels of entrepreneurship in regions with a historical specialization in large-scale industries could be that these regions had relatively low numbers of entrepreneurial role models. This line of argument is commonly based on the observation that employees in small firms typically have a higher propensity to start their own business than employees in larger firms (e.g., Parker, 2009; Elfenbein et al., 2010). Accordingly, small firms are commonly regarded as breeding grounds—or 'seedbeds' (Beesley and Hamilton, 1984)—for start-up activities. As the historical self-employment rate relates the number of entrepreneurs to all employees, it is by definition also a proxy for the average firm size in a region. Hence, the historical self-employment rate can be regarded as a measure of the historical 'seedbed function' that may explain a persistent impact of historical self-employment on current entrepreneurship.

This small firm effect can have several sources. First, since small firms tend to offer lower wages and job security, the opportunity costs for a person deciding to set up an own firm are lower when working in a small firm (Parker, 2009). Second, small firms are characterized by lower levels of specialization and division of labor. Hence, employees are exposed to a higher diversity of different tasks which, in accordance with the jack-of-all-trades theory (Lazear, 2004, 2005), is beneficial for the ability to successfully start an own business. Third, small firms typically have flat hierarchies providing an arena for frequent social interaction between the owner and his employees. Entrepreneurs are social role models that induce demonstration effects

regarding entrepreneurial skills. Hence, frequent interaction with an entrepreneur may induce peer effects that positively shape a person's perception and thinking about self-employment (Minniti, 2005; Nanda and Sorenson, 2010). For these reasons, small firms can be regarded as nurseries for the emergence of new businesses due to entrepreneurial role model effects at the firm level, which can explain persistence of (regional differences) in entrepreneurship.

An explanation of persistent entrepreneurship based on the regional industry structure is, however, questionable because industries are subject to permanent change. A common explanation of the immanent dynamics of industries is the life-cycle approach (Klepper, 1997; Winter 1984). According to this type of theory, the development of many industries shows a typical pattern from an 'entrepreneurial' stage, where most innovations come from small and new firms, to a 'routinized' stage, where the product is largely standardized and the market is dominated by a few large-scale incumbents. The life-cycle approach suggests that entrepreneurial regions may not remain entrepreneurial but develop into routinized ones. Although there are industries that do not closely follow a life cycle or where the model does not apply at all (e.g., some consumer-oriented services), there are many industries where such a pattern of development can be well observed.

An explanation why some regions remain entrepreneurial over time is the emergence of new industries that begin to follow a new life cycle. Hence, if regions adopt or generate innovations that create new markets with new life cycles, they may remain entrepreneurial. If not, they are endangered to be dominated by 'routinized' industries that are sooner or later likely to decline (Audretsch and Fritsch, 2002). These considerations clearly suggest an important role of innovation activity and the regional knowledge base in the persistence of regional entrepreneurship. Knowledge is a pivotal source of entrepreneurial opportunities in general (e.g., Shane, 2000; Acs et al., 2009) and a key individual success factor for entrepreneurship (e.g., Unger et al., 2011). Hence, workers in industries with low knowledge intensity may also have a lower entrepreneurial propensity, and entrepreneurship among low-skilled workers may be less successful.

Based on the above considerations, regions that historically specialized in industries of either low knowledge intensity or where path-dependent knowledge created entry barriers may have spawned fewer small and new firms as a source of persisting entrepreneurial role-model effects. Large-scale production in the 19th century, especially industries that are related to the extraction of raw materials (i.e., mining), often relied on low-skilled work. In this respect, Stuetzer et al. (2016) show that a considerable proportion of the negative impact of historical large-scale industries on today's regional entrepreneurship levels is mediated through human capital, as captured by data on school attendance in the mid-19th century. In other words, low human capital due to historical industry specialization is an important channel explaining low entrepreneurship levels today. Empirical evidence for Germany, Italy, and Poland suggests that self-employment in knowledge-intensive manufacturing industries in the early 20th century has a positive long-run effect on the general level of regional entrepreneurship today. At the same time, the effect of historical self-employment in non-knowledge-intensive industries on contemporaneous start-up activity is substantially smaller (Fritsch and Wyrwich, 2018; Cosci, Meliciani and Pini, 2021) or, in the case of Poland, even absent (Fritsch et al., 2021a).

There are several reasons to assume that self-employment in knowledge-intensive industries represents entrepreneurship of a relatively high quality that may generate particularly pronounced role-model effects and induce further self-employment. First, setting up and running a knowledge-intensive firm requires specific qualifications. Since knowledge-intensive start-ups are likely to introduce risky innovations, certain entrepreneurial attitudes and abilities are needed. Second, successful self-employment in knowledge-intensive industries is more likely to generate a significant positive impact on regional development than self-employment in other industries. Although failure rates in knowledge-intensive industries may be in about the same range or even higher than in other sectors, the surviving firms are economically and technologically successful and create considerable numbers of promising entrepreneurial opportunities.

Altogether, historical industry specialization can play a very important role in the persistence of entrepreneurship. This pattern depends on certain industry characteristics—particularly, size structure (minimum efficient size) and qualification of the workforce. While the short-term effect on entrepreneurship can be directly attributed to these characteristics, the long-term effect is unlikely to be explained by the persistence of these industries. Rather the initial presence of such industries could facilitate a role-modeling process that is either inhibiting or promoting entrepreneurship (see Section 4.4 and Section 8.5, for further details on the role-modeling process).

4.3 Regional knowledge base

A further possible source of persistent entrepreneurship could be the presence of a regional knowledge base and its more or less continuous development. Two main components of the regional knowledge base may be distinguished. First, education and skills of the regional workforce, and second, R&D activities. While research creates entrepreneurial opportunities, education and knowledge of the regional workforce are important for recognizing the available opportunities and for the ability to successfully run an own business. The regional knowledge base may be regarded as particularly important for innovative entrepreneurship (Acs et al., 2009). Accordingly, regional differences in the magnitude and quality of the knowledge base are important determinants of regional differences in entrepreneurship, especially, in innovative businesses (Fritsch and Aamoucke, 2013, 2017).

The spread of new knowledge and spillovers is geographically limited (e.g., Jaffe et al. 1993; Boschma, 2005; Breschi and Lissoni, 2009; Liu, 2015) for which there are several reasons. First, knowledge contains often a tacit component (van Hippel, 1994) that is bound to specific people and, therefore, remains in the place where these people are based. Second, people that possess this tacit knowledge typically start their ventures close to where they reside. One reason to do so is the integration into supporting social networks, which can be regarded as a critical success factor for new firms (Michelacci and Silva, 2007; Dahl and Sorenson, 2009). This also implies that (knowledge-intensive) industries tend to be concentrated in a

small number of places (Sorenson, 2018) perpetuating regional differences in entrepreneurship.

The effect of regional knowledge spillover on entrepreneurship is also marked by a distance decay between the source of knowledge production and the receiving end. First, geographic proximity of actors tends to increase the frequency of (face-to-face) interaction that provides the basis for sharing of (tacit) knowledge and effective learning. Second, spatial proximity reduces communication costs (e.g., Boschma, 2005; Jacobs, 1969; Helsley and Strange, 1991; Storper and Venables, 2004; Agrawal and Goldfarb, 2008). Hence, proximity to centers of knowledge production may increase the likelihood of knowledge spillovers.

A regional knowledge base may have two types of foundations. One source could be continuous problem solving or an important invention that generates a growing stock of more and more sophisticated knowledge allowing for better solutions. The emerging knowledge stock will then create new entrepreneurial opportunities that may lead to new firms and knowledge-intensive industries.[12] Such a development may then be supported and solidified by the formation of a university or a comparable institution (e.g., an academy of sciences). These help to absorb and accumulate the existing knowledge, generate new knowledge, and make this knowledge available to the general public.

> An example of such a development is the German region of South Saxony (for details, see Fritsch et al., 2022b). The essential starting point of the development was the discovery of silver and other ores in the 12th century. While the ores were initially extracted in easily accessible places in open-cast mining, it was soon necessary to dig deeper. This was associated with steadily increasing technical requirements. The development of ore mining, as well as the smelting

[12] A prominent example is the success of the shipbuilding industry in 19th-century Glasgow. Glasgow had some advantages over other UK regions. Beside its shorter distance from the US, nearby coal and iron deposits, the city also had an engineering tradition that can be linked to James Watt. Engineers teamed up with shipbuilders to construct early steam ships around 1810. From this time on a chain of continuous innovations in steam engine technology and ship building was set in motion in Glasgow leading to the construction of wooden hull steam ships able to navigate the nearby seas by 1830 and conquering the Atlantic in the 1840s. Iron hull ships were produced as early as 1832. Again, here continuous innovations greatly increased fuel efficiencies leading to dramatic increases in the tonnage of ships. It should be no surprise that Glasgow also was among the first movers in steel ships in the 1890s (Hall, 1999, Chapter 11).

> and further processing of the extracted ores, stimulated the development of crafts and were a strong impetus for numerous inventions and technological developments that increased yields. These technological developments, as well as the increasing understanding of scientific relationships, led to an extensive, valuable and rapidly growing knowledge base over the years. The desire to secure this knowledge, develop it further, and make it available for economic use induced the foundation of a university of mining (the *Bergakademie Freiberg*).

The development may, however, also begin with the foundation of a university that constitutes the nucleus of a regional knowledge base that induces the formation of new businesses (e.g., O'Shea et al., 2005; Colombelli, 2016; Prokop, 2021). Universities and non-university public research institutes are key centers of regional knowledge production. They contribute to a continuous update of the regional knowledge base and are crucial for the absorption, storage, and diffusion of knowledge. Moreover, they support the local economy by providing innovation-related inputs and contributing to the regional stock of human capital (Schubert and Kroll, 2016). Universities are also key actors in local innovation systems because they often assume multiple broker and gatekeeper functions (e.g., Graf, 2011; Kauffeld-Monz and Fritsch, 2013). Local businesses also are an important source of regional knowledge—particularly, large firms often assume the roles of a broker and a gatekeeper (Graf, 2011; Kauffeld-Monz and Fritsch, 2013). However, universities and other research organizations can be assumed to be vital for the persistence of a regional knowledge base because, once established, they tend to exist for long periods, often decades or centuries. In Europe, most of the universities founded in pre-industrial times still exist today (Goethner and Wyrwich, 2020). Hence, if universities are long-lasting centers of knowledge production that stimulate local entrepreneurship, then the long-run presence of historical universities should leave a persistent impact. This is confirmed by Fritsch and Wyrwich (2018) who show that those German regions that host a technical university founded at the end of the 19th century have higher rates of technology-intensive start-ups today.

In the same vein, Del Monte and Pennacchio (2020) can show in the case of Italy that the presence of public universities is strongly linked to the current level of innovative start-up activity. Interestingly, the authors also find that the historical presence of scientists and inventors is positively linked to the current rate of new firm formation. According to the empirical analysis, this group of actors is most crucial for the generation of a historical knowledge base. The observed link to current entrepreneurship may reflect the involvement of this group in new firm formation.[13]

In general, it is difficult to disentangle the mechanisms behind the long-term link between historical centers of knowledge production and entrepreneurship today. There are several potential mechanisms beyond the direct effect of universities through knowledge spillovers and academic entrepreneurship. Once start-ups emerged as spin-offs from universities or due to university's knowledge spillovers, these young and small entrepreneurial firms themselves become a 'seedbed' for new businesses because of the small firm effect mentioned in Section 4.2. This pattern may lead to a regional specialization in knowledge-intensive industries that is conducive to entrepreneurship over time. Entrepreneurial firms started by university employees may also grow into large established companies that provide an arena for employee spin-offs as described above. Studies on universities, like Stanford and MIT, show (Hsu et al., 2007; Eesley and Miller, 2018) that the impact of universities on entrepreneurship can be quite substantial. There is also evidence that university specialization impacts the sectoral structure of new firm creation (Bonaccorsi et al. 2013).[14] Altogether, the regional knowledge base is an important historical root of regional entrepreneurship.

---

[13] Another interpretation that the authors follow is the impact of past creativity in the region. Creativity is an important conduit of entrepreneurial ideas (e.g., Lee et al., 2004) although it is difficult to disentangle creativity from human capital effects.

[14] Spin-off entrepreneurship may be also promoted via education of graduates, as human capital is a highly important factor for identifying entrepreneurial opportunities and for running a firm successfully (Davidsson and Honig, 2003; Unger et al., 2011). In this respect, the identification of high-quality opportunities may be promoted by cross-faculty information spillover and by shaping founding teams to the extent that students and co-workers with different specialization team up, which helps identifying opportunities (Goethner and Wyrwich, 2020; Barbini et al., 2021).

4.4 Entrepreneurial culture

Places that are regarded as exceptional breeding grounds for entrepreneurship are often characterized by the prevalence of a regional entrepreneurial culture. Well-documented examples of such a claim are the Silicon Valley in the US (Saxenian, 1994), the Cambridge area in the UK (Garnsey and Heffernan, 2005), Munich in Germany (Sternberg and Tamasy, 1999), or the Gnosjö region in Sweden (Karlsson and Larsson, 1993; Wigren, 2003). An entrepreneurial culture is typically defined as an "aggregate psychological trait" (Freytag and Thurik; 2007, p. 123) or "collective programming of the mind" in favor of entrepreneurship (Beugelsdijk 2007, p. 190). It can be also described as an informal institution that changes only rather slowly over long periods of time. In contrast, the regulatory framework of formal rules may change rather quickly and frequently. Culture can also be understood as heuristics or rules of thumb that aid people in decision-making (Nunn, 2009).

Research has shown that such informal institutions tend to maintain a high degree of independence from changes in the social, economic, and political context—particularly, changes in formal rules (North, 1994; Williamson, 2000). Such pronounced robustness of a well-developed entrepreneurial culture may be a key explanation for the persistence of entrepreneurship over long periods of time and in disruptive environments. This might also be the case because culture, in general, was shown to be important for economic outcomes, such as setting up an own business (e.g., Guiso et al., 2006).[15]

[15] Another approach to define an entrepreneurial culture is based on the legitimacy of entrepreneurship in a society, e.g., "the social status of entrepreneurs, the attention paid to entrepreneurship in the educational system, and the tax incentives for entrepreneurship" (Beugelsdijk and Maseland, 2011, 158f.). Such aspects of legitimacy of entrepreneurship is to a considerable degree based on the governing formal rules that may be subject to quick changes. Therefore, this definition of entrepreneurial culture does not sufficiently cover long-term phenomena such as persistence of entrepreneurship across rather different types of political regimes, as was found in the German example (see Section 3). This argument also holds for a further approach to entrepreneurial culture that is based on dissatisfaction with the current society, which may provide an incentive to start an own business; see Beugelsdijk and Maseland (2011) and Thurik and Dejardin (2012).

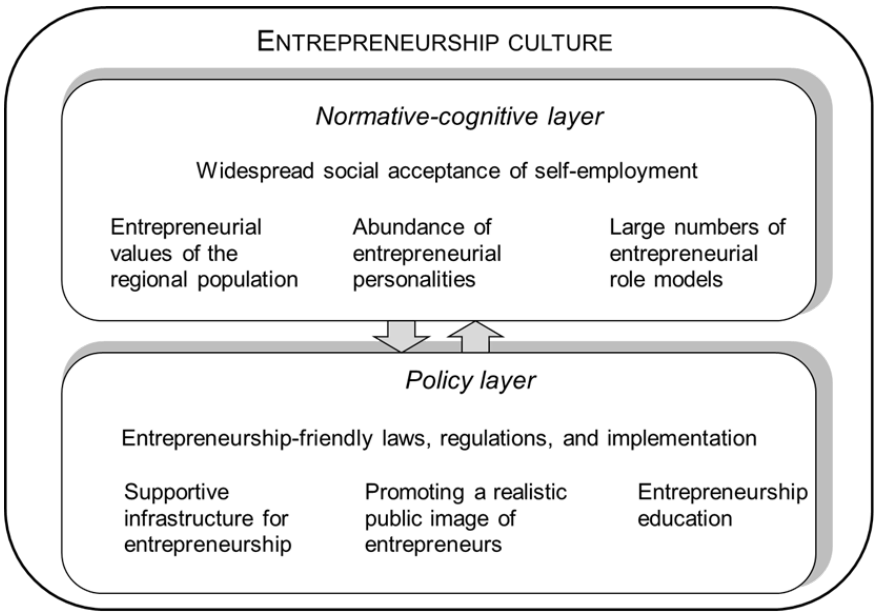

Figure 1: Elements of an entrepreneurship culture

There are several components that contribute to an entrepreneurial culture. One can distinguish between a normative-cognitive and a policy layer (Figure 1; for details, see Fritsch and Wyrwich, 2019 and Section 8.4). The *policy layer* of a regional entrepreneurship culture comprises entrepreneurship-friendly laws and regulations that lead to a supportive infrastructure for start-ups. Further elements of such an infrastructure can be entrepreneurial networks (e.g., mentorship, shared facilities), the availability of venture capital (see e.g., Kenney and Patton, 2005; Samila and Sorenson, 2011; Spigel, 2017), and the presence of key public actors in the local innovation system, such as 'entrepreneurial' universities, that actively promote academic entrepreneurship (e.g., Etzkowitz, 2000; Shane, 2004). The *normative cognitive layer* reflects the social acceptance or legitimacy of entrepreneurship in a region (Kibler et al., 2014). This alludes to a high share of entrepreneurial role models and people with entrepreneurial values as well as a high share of the population with an entrepreneurship-prone personality profile.

Several studies use indicators of the values of the population, such as individualism, masculinity, and autonomy-seeking, as measures for the normative-cognitive dimension of an entrepreneurship culture (e.g., Hofstede and McCrea,

2004; Mueller and Thomas, 2001; Beugelsdijk, 2007; Noseleit, 2010; van Gelderen, 2016; Stephan and Pathak, 2016). A further frequently used proxy in empirical studies is the share of people with an entrepreneurship-prone personality profile (Rentfrow et al., 2008; Obschonka et al., 2013; 2015; 2021). For example, people with such a profile score high on extraversion, conscientiousness, and openness, and low on agreeableness and neuroticism (Obschonka et al., 2013, 2015, 2021).

Regional differences in the share of people with an entrepreneurial mindset today can be explained by social influence within the region as people respond, adapt to, or get socialized according to regional norms, attitudes, and beliefs. Furthermore, people may migrate to places where the local population has similar personality characteristics. This is the prediction of an elaborate theory on the emergence, persistence, and manifestation of regional personality differences developed by Rentfrow et al. (2008), which was recently adapted to the entrepreneurship context (Obschonka et al., 2013, 2015, 2021). The theory draws on seminal psychological and sociological concepts as well as empirical studies. It is embedded in a burgeoning strand of literature in socio-ecological and cross-cultural psychology research, and it suggests that personality traits are not randomly distributed across regions and countries but are regionally clustered (McCrae et al., 2005; Schmitt et al., 2007; Park and Peterson, 2010; Rentfrow, 2010).

Further elements of the normative-cognitive layer could be a high level of entrepreneurship-promoting social capital (Westlund and Bolton, 2003; Westlund et al., 2014; Kleinhempel et al., 2020a), a realistic public image of entrepreneurs (Cardon et al., 2011), and a collective memory of successful historical entrepreneurship (Fritsch et al., 2019a). Furthermore, Huggins and Thompson (2016) find that several dimensions representing socio-spatial community culture—as reflected by social cohesion, collective action, and social rules—are significantly associated with local entrepreneurial activity. An example of deep historical roots of social capital is provided by De Blasio and Nuzzo (2009). The authors show for Italian provinces that the social capital that is positively related to entrepreneurship today can be traced back to local systems of government in the Middle Ages and civic involvement in the late 19th century (see also Putnam, 1993).

A key explanation for a positive effect of an entrepreneurial culture on the level of entrepreneurship is the presence of role models that provide demonstration and peer effects (e.g., Minniti, 2005; Bosma et al., 2012). As mentioned in Section 4.2 such positive peer effects are not restricted to the firm level but they also occur at the regional level (Lafuente et al., 2007), the neighborhood level (Giannetti and Simonov, 2009; Andersson and Larsson, 2016), at the level of universities (Lerner and Malmendier, 2013), and, most important, at the family level (Laspita et al., 2012; Chlosta et al., 2012 Dohmen et al., 2012; Lindquist et al., 2015; Vladasel et al., 2020). For example, Nanda and Sorenson (2010) estimate that the family peer effects on a person's propensity to start up a business are about 10 times higher than workplace peer effects. It is important to note that the effects of role models are mainly driven by social interaction and direct personal contact at the local level rather than by classroom examples or entrepreneurial icons touted by the media (Bosma et al., 2012). Since people typically start their firm close to where they reside, such role model effects are likely to be concentrated in the respective region and might not spill over to other areas. Thus, the presence of entrepreneurial role models in a region can be regarded as a region-specific trigger of entrepreneurship.

Peer effects can also be regarded as an important source of persistence of entrepreneurship via intergenerational transmission of family businesses or of entrepreneurial values and entrepreneurial orientation from parents to their offspring. In this respect, Laspita et al. (2012) find that even grandparents can exert a positive influence on a person's entrepreneurial choice. Another way of intergenerational transmission could be the genetic inheritance of entrepreneurial personality traits (Abdellaoui et al., 2019).[16] High levels of entrepreneurship in a region might also foster the general social acceptance and legitimacy of entrepreneurship that constitute

[16] A further explanation for persistence of a regional entrepreneurship culture could be the small firm effect. As already mentioned (see Section 4.2), the entrepreneurial peer effects tend to be particularly pronounced in small and young firms and this may be a reason for the high propensity of small firm employees to start their own business (Parker, 2009). Because most start-ups remain small, regions with high levels of new business formation not only have many entrepreneurs but also high employment shares in small businesses and, hence, high levels of peer effects. This structural characteristic of entrepreneurial regions may contribute to the persistence of high regional levels of self-employment and new business formation. This line of argument does, however, not hold if regional firms become economically successful and grow to larger size.

a critical ingredient of an entrepreneurial culture. This may induce more people to perceive entrepreneurship as a viable career option and to start their own businesses (Etzioni, 1987; Kibler et al., 2014). Taken together, role models, peer effects, and social acceptance of entrepreneurship may feedback and support a virtuous circle that can make a regional entrepreneurship culture, once established, self-perpetuating (Figure 2).

There are at least two further factors that can reinforce a regional culture of entrepreneurship and explain its persistence. One of these factors is the policy layer (see Figure 1), which includes an infrastructure of supporting services—in particular, the availability of competent consulting, entrepreneurial finance, and political support. The emergence of such an infrastructure is often a reaction to a high regional level of new business formation and may reinforce high levels of entrepreneurship over time. Another mechanism reinforcing a given entrepreneurship culture could be the attraction of people with an entrepreneurial mindset into the region. Since such a self-sorting of entrepreneurial people into regions with an entrepreneurship culture weakens the entrepreneurial basis for their home regions, it could reinforce regional disparities in regard to such a culture. Because the main elements of a regional entrepreneurship culture change only gradually over time and because of the self-perpetuating effects mentioned above, regional cultures of entrepreneurship have a pronounced tendency to be long-lasting and, thus, can be viewed as a type of 'informal capital'.[17]

[17] Andersson and Koster (2011) and Fritsch and Wyrwich (2014) find empirical evidence that a historical level of entrepreneurship only persists if it exceeds a certain threshold level. This can be regarded as an indication that a certain intensity of entrepreneurial activity is required for the reinforcing and self-perpetuating effects of an entrepreneurial culture.

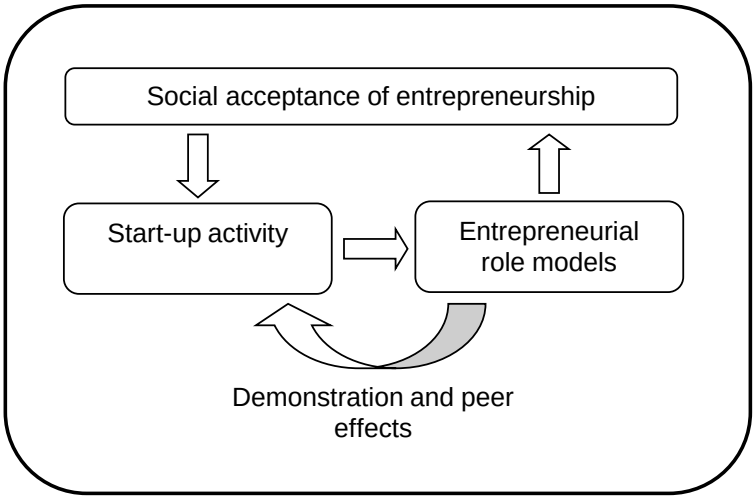

Figure 2: The self-perpetuation of entrepreneurship through demonstration and peer effects

Although it is difficult to capture such a self-perpetuation process over periods spanning several decades or even centuries, the available empirical evidence on the impact of historical factors on components of a regional culture of entrepreneurship is quite encouraging. Stuetzer et al. (2016), for example, find that the population in regions that were specialized in large-scale industries in the 19th century has, on average, a less entrepreneurship-prone personality profile today despite drastic industrial restructuring and the departure of most of these large-scale industries. Hence, the historical industrial specialization has a long-term effect on an important component of local entrepreneurial culture. In a similar vein, Fritsch et al. (2019b) find that today the average regional personality profile is more entrepreneurial in areas with high levels of self-employment in the early 20th century. At the same time, the share of people with an entrepreneurship-prone personality profile, due to the historical tradition of entrepreneurship, is positively linked to the level of regional start-up activity. Gherhes et al. (2018, 2020) show by means of in-depth qualitative interviews that history still negatively shapes the local culture of post-industrial places. This is reflected by low aspirations, generational unemployment, loss of identity, and negative perceptions of place and opportunity, which all constrain these places with respect to entrepreneurial ambition.

4.5 A collective memory of places?

While cultural factors may explain persistent entrepreneurship despite many kinds of changes, such an explanation seems implausible in regions where the largest parts of the local population were exchanged, which means peer effects and intergenerational transmission of values can be excluded. Examples of such cases are the area of Kaliningrad in Russia (Fritsch et al., 2019a), the western part of Poland (Fritsch et al., 2021a), and a number of regions in Czechia (Novosák et al., (2020). Fritsch et al. (2019a; 2021a) argue, that there are good reasons to believe in the existence of an awareness or collective memory of historical entrepreneurship. This could explain the persistence of an entrepreneurial culture in places despite a population exchange. Hence, in these regions historical entrepreneurship culture may be revitalized through collective memory.

A collective memory of entrepreneurship is understood as an awareness of the entrepreneurial history of a region, particularly of successful historical entrepreneurship (for details of the concept of collective memory as such, see Olick et al., 2011). In both stable and disruptively changing contexts, the remembrance of time-distant role models might be prevalent.[18] Collective memory can build on physical remains, narratives, archival documents, and the image of a place. Immigration of people with an entrepreneurial mindset into entrepreneurial regions may accelerate such a process (for detailed arguments, see Fritsch et al. 2019a; 2021a).

An interesting pattern in Czechia, Poland, and the Kaliningrad area is that private sector self-employment was hardly possible in the decades following the population exchange as these regions were subject to an anti-entrepreneurial communist regime. In this respect, the dissolution of communism and the

[18] Places typically have their own meaning, a social construct that reflects collective histories, memories, and identities (Gieryn, 2000; Zukin, 2011). In this respect, a place is also the interplay of location, meaning, and material form (Gieryn, 2000). The establishment of new firms can be affected by a place-based collective memory, since place-bound features of local communities, such as: market structures, types of public policies, relational systems and networks, history, tradition, and even features of physical geography, can exert a significant influence on organizational behavior (Marquis and Battilana, 2009). A place-based collective memory of earlier entrepreneurship in the new population may be based on remaining buildings, documents, and narratives.

significantly improved conditions for entrepreneurship may have re-activated the collective memory of historically successful entrepreneurship and triggered new firm formation. Empirical studies have shown how historical experiences can be reactivated by certain political campaigns (Ochsner and Roesel, 2017) and it is, thus, not unlikely that disruptive political changes may play a role in reactivating a collective memory of the regional past.

4.6 Further factors: Agglomeration and related effects

There are several factors beyond industry structure, knowledge, and entrepreneurial culture that could play a role in the persistence of regional entrepreneurship. Another key aspect is the geographic agglomeration of economic activity.

The degree of geographic agglomeration is often highly correlated with entrepreneurship-facilitating factors, such as diversity and availability of knowledge, specialized inputs, and larger markets (e.g., Armington and Acs, 2002; Bosma and Sternberg, 2014; Glaeser, 2007; Qian, 2017). Furthermore, larger cities can be particularly attractive for people with a creative mindset who may spur entrepreneurial activity (Florida, 2004; Lee et al., 2004; Tavassoli et al., 2021). However, cities are often characterized by intensive competition for scarce resources that may deter entry (Arauzo-Carod and Teruel-Carrizosa, 2005).

The empirical evidence on the role of agglomeration in start-up activity is somewhat ambiguous. While some studies find a positive effect of population density on new business formation (e.g., Reynolds et al., 1994; Armington and Acs, 2002; Fritsch and Falck, 2007) others suggest a negative link (e.g., Wyrwich, 2014). Some recent studies suggest that innovative start-ups tend to cluster in larger cities (Paunov et al., 2019; Fritsch and Wyrwich, 2021), but cities do considerably differ in this respect (Boschma and Sternberg, 2014). These differences may be partly due to industry specialization and the regional knowledge base. However, Tavassoli et al. (2021) find a significant role of certain personality traits of the local population that may reflect cultural factors, which attract start-ups of high quality. According to this study, cities with a high share of open-minded people have high levels of quality start-ups in terms of their growth potential (see also Guzman and Stern, 2020).

Empirical evidence on the impact of historical population density on the persistence of entrepreneurship indicates that agglomeration plays a rather unimportant role. Fritsch et al. (2019b) detect that there is no significant link between population density in the early 20th century and start-up activity across German regions more than 90 years later. This pattern can be confirmed for the case of Poland (Fritsch et al., 2021a). There is also no link between historical population density and start-up activity in technology-intensive industries later on (Fritsch and Wyrwich, 2018). One can, however, not completely exclude a 'masked' effect of agglomeration that works through the historical industry specialization or proximity to knowledge centers (Voth, 2021). But it is difficult to disentangle these mechanisms, also because many of the potentially relevant factors tend to be—as previously mentioned—strongly correlated with population density. Especially when it comes to the role of migration and population dynamics, there is also a selection problem in the sense that entrepreneurial places (cities) may particularly attract people with an entrepreneurial personality profile (Florida, 2004; Florida and Mellander, 2015).

4.7 Historical events—which are important for today's entrepreneurship?

Apart from typical structural determinants of entrepreneurship, it is also worthwhile to examine the role of specific historical episodes and 'accidents'. This alludes to unforeseen (non-path-dependent) institutional and political events but also to specific historical episodes that leave an imprint on the development of entrepreneurship in the long run.

Fritsch et al. (2021b) document an intriguing example of an ancient historical episode—occupation by the Roman Empire about 2,000 years ago—that left a deep cultural imprint on entrepreneurship and innovative activity. The authors find that those German regions that were part of the Roman Empire reveal a higher level of entrepreneurship and innovation today. There are several explanations for this pattern. Generally, it is plausible to assume a significant degree of cultural transmission and knowledge transfer from the much more advanced Romans to the local Germanic tribes. A further explanation could be that belonging to the large Roman Empire could have affected attitudes of the population that are important for

innovation and entrepreneurial activity, such as tolerance toward strangers, openness for change and new ideas as well as a certain willingness and ability to bear risk (Obschonka et al., 2021).

The empirical assessment suggests that higher entrepreneurship rates in regions that once belonged to the Roman Empire may be particularly driven by the long-run impact of the infrastructure, i.e. the system of roads that considerably shaped the geographic pattern of today's main roads in the formerly Roman territory (Fritsch et al., 2021b). The evidence is in line with previous research finding a long-run effect of the Roman occupation on economic development (Wahl, 2017; Flueckiger et al., 2022).

An interesting pattern observed by Fritsch et al. (2021b) is that the Roman impact is robust even when considering more recent historical episodes that may have left an imprint on entrepreneurship. One example is the occupation of parts of Germany by Napoleon, which is found to have a significant long-term impact on trust and cooperation behavior (Buggle, 2016) important for entrepreneurship (for a review, see Welter, 2012). Quite interestingly, Obschonka et al. (2022) find significant differences in the personality traits of today's population in the formerly Roman regions and the unoccupied part of Germany. In particular, the population in the formerly Roman part of the country has a more entrepreneurial personality profile.

Some studies reveal an interplay between historical events and location fundamentals. The role of location fundamentals in the emergence of entrepreneurship and an entrepreneurial culture was already demonstrated by Glaeser et al. (2015) and Stuetzer et al. (2016) (see Section 4.2). In this respect, the take-off of industrialization can be seen as a historical episode that interacted with the availability of natural resources. Wang et al. (2021) document another interesting case. They show that the opening of seaports in China in the early 19th century had a long-lasting effect on the regional level of entrepreneurship. Ports require proximity to a coastline, which is a location fundamental while the decision to open ports was a specific historical event. The authors also find some indication that the long-term

effects of historical ports on current entrepreneurship work, among other things, through the persistence of entrepreneurial culture and human capital. The available evidence suggests that certain enabling conditions or events, such as industrialization or political decisions (i.e. opening ports), are necessary for natural conditions to take effect. The underlying mechanisms are not well explored (see also Section 8.3).

While some historical events leave a persistent impact on regional entrepreneurial activity, other historical episodes do not seem to have such a long-run effect. A fascinating example in this regard is the case of communist regimes in Eastern Europe. The Soviet-style centrally planned economies in the countries of Central and Eastern Europe in the 20th century can be regarded as the most anti-entrepreneurial institutional regimes in human history (Earle and Sakova, 2000). Entrepreneurship in socialist societies was seen as a bourgeois anachronism and self-employment was only allowed in a few heavily regulated sectors (Aslund 1985; Pickel, 1992). Nevertheless, the empirical evidence for post-communist East Germany (Fritsch and Wyrwich, 2014, 2019), Poland (Fritsch et al., 2021a), the Russian region of Kaliningrad (Fritsch et al., 2019a), and the Czech Republic (Novosak et al., 2020) reveal that pre-socialist entrepreneurship levels still have a significant impact on current entrepreneurship across regions despite several decades of exposure to the communist regime. Opper and Andersson (2019) provide some fascinating insights for China in this respect. The authors document that the regional distribution of entrepreneurship during the Ming Dynasty (1368–1644) and the Qing Dynasty (1644–1912) still impacts entrepreneurship today despite the fact that China also saw several decades of a communist planned economy and the Cultural Revolution in the 1960s. This relatively small and short-term impact of communist regimes on the persistence of regional levels of entrepreneurship raises the general question of why some historical constellations, such as the presence of entrepreneurial traditions and cultures, leave a rather deep and long-lasting imprint, while the impact of other events and historical episodes is comparatively small. .

In summary, there are several further historical factors beyond historical industry specialization, historical knowledge bases, and the historically-driven long-term evolution of an entrepreneurial culture that can leave an imprint on the

persistence of regional differences in entrepreneurship. At the same time, it should be noted that these historical factors also link to the formation of an entrepreneurial culture and particular industry and knowledge structures over time. Notwithstanding, the existing evidence suggests that there are manifold historical factors that can shape the evolution of spatial differences in entrepreneurship in the long run.[19]

4.8 Factors influencing the level and robustness of persistence

The strength of persistence effects of entrepreneurial activity and their robustness is reflected by the fact that they can 'survive' long periods of time, including disruptive events (for details, see Section 4.4). Hence, if historical shocks, such as the introduction of an anti-entrepreneurial regime, devastating wars, drastic structural change, and even the full exchange of the local population, cannot eradicate the persistence of entrepreneurship then it is deeply embedded in the region. This leads to the question of why certain events and historical conditions have a long-term impact while others do not?

The level and strength of persistence of entrepreneurship may also depend on a combination of certain historical factors. The results by Fritsch and Wyrwich (2018), for example, reveal that the effect of historical self-employment on technology-intensive entrepreneurship today is positively shaped by geographic proximity to a historical center of knowledge production, as indicated by the presence of a university in the year 1900. Interestingly, a positive effect of historical self-employment in non-science-based industries can only be found in regions that hosted a technical university. The results reveal that historical knowledge (= presence of a university) in combination with a tradition in entrepreneurship (= historical share of (science-based) self-employed individuals in the local population) determines the persistence of entrepreneurship. In a similar vein, Del Monte and Pennacchio (2020) find that Italian provinces with both a stronger historical knowledge base and a historically higher prevalence of scientists have currently more innovative start-ups.

[19] For a classification of such events and their effect on entrepreneurship, see Rauch and Hulsink (2021).

Another insight from Fritsch and Wyrwich (2018) is that the type of entrepreneurship, for example, science-based vs. non-science-based, might play a role. The empirical evidence also suggests that specific forms of historical self-employment do not have any effect on current start-up activity. This applies, particularly, to self-employment in agriculture and homeworking. Homeworking from a historical perspective can be regarded as a rather marginal form of self-employment (see Section 2.1). Homeworkers are often characterized by strong economic dependence on a single customer. Fritsch et al. (2019b) find that historical self-employment rates that include farmers and homeworkers are not significantly related to start-up activity today.

For Italy, Cosci et al. (2021) find that the driver of persistence of entrepreneurship in high-technology sectors is the share of entrepreneurs that use motive power in 1927. On the other hand, the share of industrial entrepreneurs in this year is an important driver of persistence in low-technology manufacturing and service sectors. Motive power reflects the diffusion of advanced production technologies and can also be regarded as an indicator for the historical success of entrepreneurship. Thus, the historical success of entrepreneurship might also determine the strength of persistence.

From a conceptual point of view, it is more likely that historically successful entrepreneurship induces the self-perpetuation process of entrepreneurship described in Section 4.3 and an entrepreneurship-facilitating collective memory. This may partly explain why farming and homeworking do not matter. Apart from that, Fritsch et al. (2019a) find for the Russian region of Kaliningrad that the persistence of entrepreneurship is stronger if historical self-employment was in industries that applied advanced technologies back then. In Poland, it is only the level of historical self-employment in knowledge-intensive manufacturing industries that exerts a positive impact on contemporaneous entrepreneurship (Fritsch et al., 2021a).

Poland is also an interesting case because there is no persistence of non-agricultural private sector self-employment in general as compared to other settings like the UK, Germany, or the Czech Republic. Thus, historical levels of

entrepreneurship do not always and everywhere persist. This insight suggests that certain regional conditions determine the size of the effect of historical self-employment on entrepreneurship today. In the case of Poland, historical self-employment only seems to exert a positive impact on entrepreneurship today in regions with a certain level of industrialization in the early 20th century. At a more general level, there is also evidence that the persistence of entrepreneurship is stronger in regions with high levels of entrepreneurship. This pattern is revealed by quantile regressions (Andersson and Koster, 2011; Fritsch and Wyrwich, 2014). An explanation for this pattern is that regions with low entrepreneurship have hardly any role models to promote a process of self-perpetuation of entrepreneurship over time.

As this section showed, there can be several factors and historical processes that determine the persistence of entrepreneurship. When determining the strength of this persistence, several types of regional conditions should also be taken into account. The problem here is that these structural conditions and certain historical processes may be an outcome of a historical tradition of entrepreneurship. Hence, including contemporaneous controls may imply endogeneity problems. A solution to this pattern is to only include historical controls for structural conditions preceding certain events and the year of measurement for historical entrepreneurship levels. A caveat of this approach is that competing explanations from more recent periods, which are unrelated to historical entrepreneurship, are omitted.[20]

Altogether, there is a lot of variation across regional contexts and types of entrepreneurship when assessing the historical roots and persistence of entrepreneurship. There is not always persistence and the strength of persistence depends on the interplay of many different factors (Sorenson, 2017). Based on the evidence, it can be concluded that a regional entrepreneurial culture has its roots in historical industry specialization, also due to natural conditions like proximity to coal deposits.

---

[20] From a pragmatic point of view, it should be noted that Fritsch and Wyrwich (2014) also find a robust impact of historical self-employment on current entrepreneurship when including contemporaneous *and* historical controls for regional conditions into the same model.

5. The effects of persistent entrepreneurship on regional development

In this section, we focus on the role of persistent entrepreneurship in economic development. Against this background, we first discuss the relationship between persistent entrepreneurship and economic growth in terms of employment and GDP (Section 5.1). Section 5.2 then reviews the role of persistent entrepreneurship in the recovery from periods with unfavorable framework conditions, disruptive shocks, and deep economic crises. In Section 5.3 we focus on the impact of entrepreneurial culture on innovation activity. Section 5.4 is devoted to a discussion on how entrepreneurship and historical context may interact in determining economic development.

5.1 Growth

There is a huge literature focusing on the effect of entrepreneurship on economic growth arguing that new firms are pivotal for shaping innovation, structural change, and ultimately economic development (e.g., Schumpeter, 1934; Wennekers and Thurik, 1999; Baumol et al., 2007). The empirical evidence largely confirms the positive effect of entrepreneurship on economic growth (for a review, see Fritsch, 2013). There are two subsequent questions emerging from this literature. First, what determines the (regional) level of entrepreneurship, and how does the persistence of entrepreneurship come into play? Second, is the effect of entrepreneurship on economic growth mirroring a 'hen-egg problem'? In other words, could it be that past economic growth creates entrepreneurial opportunities and, thus, induces a higher level of entrepreneurship?

Assessing the historical roots of entrepreneurship helps to address both types of questions. This can be illustrated by recent studies on the persistence of entrepreneurship and the applied methodology. As previously mentioned, Glaeser et al. (2015) argue that distance to historical coal mines determines the level of entrepreneurship due to certain patterns of industrial specialization that affect the local entrepreneurial culture in the long run (Section 4.2). The authors exploit this pattern to estimate the effect of today's entrepreneurship that is due to the geographic

distance to historical coal mines on economic growth. Hence, they follow an instrumental variables regression approach with the underlying assumption that distance to historical coal mines does not affect contemporaneous economic growth other than via the level of entrepreneurship. Thus, the approach largely rules out the hen-egg problem as it only measures the effect of entrepreneurship that can be attributed to historical industry specialization and natural conditions (i.e., proximity to coal deposits).

Fritsch and Wyrwich (2017) follow a different approach to identifying the effect of entrepreneurship on economic growth in Germany. They use the level of self-employment in the early 20th century to predict the level of start-up activity several decades later. The disruptive shocks that occurred during the 20th century in Germany rule out that the positive link between the two periods can be explained by persistent structural conditions of entrepreneurship. Hence, the link found is rather an indication of the prevalence of a deeply embedded regional entrepreneurial culture that emerged from the self-perpetuation process described above (Section 4.4).

In a second step, Fritsch and Wyrwich (2017) show that the level of start-up activity in the late 20th century, which is due to a historical tradition of entrepreneurship, has a positive impact on regional employment and GDP growth. Hence, the causal link between entrepreneurship and growth, which Glaeser et al. (2015) found for the US, can be confirmed for the case of Germany using a more direct measure for historical entrepreneurship. An interesting pattern that can be observed in the case of Germany is that the coefficient estimate for the start-up rate in the instrumental variable regression is almost twice as large as in a naïve OLS regression. This result suggests that the effect of entrepreneurship attributed to an entrepreneurial culture is particularly important for economic growth.

Another interesting study that looks into the interplay of entrepreneurial culture and regional growth is Stuetzer et al. (2018). The authors find a direct link between the local share of people with an entrepreneurship-prone personality profile (for details, see Section 4.4) and employment growth across US regions. Interestingly, the authors can also confirm that distance to coal mines is positively

linked to the share of people with an entrepreneurial personality profile. Hence, they provide direct evidence for the link between natural conditions (i.e., proximity to coal deposits) and a proxy for entrepreneurship culture. This confirms earlier findings for Great Britain (Stuetzer et al., 2016).

5.2 Recovery from periods of unfavorable framework conditions and disruptive shocks

A further performance characteristic that is closely related to growth is the recovery from periods of unfavorable framework conditions, such as an anti-entrepreneurial communist regime, and disruptive shocks, like wars or global economic crises.

A well-investigated case of entrepreneurship and growth after a period of communist regime is East Germany (see Section 3). Fritsch and Wyrwich (2022) show in the case of East Germany that there is a highly significant positive relationship between the regional share of remaining self-employment at the end of the communist regime and economic recovery. This finding is of interest as the share of self-employment after four decades of socialism can be regarded as a remnant of an entrepreneurial culture that is pre-communist in origin (Wyrwich, 2012). The authors find that those regions with high remnants of an entrepreneurial culture were relatively resilient during this major economic crisis. Therefore, the findings suggest that historically-grown entrepreneurial culture is a crucial source of economic growth not only under stable institutional framework conditions but also during a major historical and institutional upheaval that is accompanied by massive economic turbulence.

Altogether, the previous empirical evidence suggests that persistent entrepreneurship can have a strong impact on regional growth trajectories. Most importantly, there seems to be a positive link between a historically-grown entrepreneurial culture and economic development. These results match recent advances in psychological research that acknowledge the differences of regions with regard to the personality traits of the local population, which has important implications for ‘hard’ regional outcomes. This led to a new focus in regional

research on a variety of outcomes beyond GDP (Huggins and Thompson, 2016) like, for example, innovation activity.

5.3 Innovation activity

Entrepreneurship at its very core includes behaviors such as opportunity recognition, creativity, taking initiative, and readiness to assume risk. This then results in the introduction of new ideas, products, and services to the market. Such behaviors are not only conducive to setting up one's own business but may also reflect innovation.[21] Moreover, market-entries may force incumbent firms to innovate as a competitive response. Hence, new firms can indirectly induce innovation efforts that contribute to regional development (see Fritsch, 2013, for a discussion).

In an analysis of Germany, Fritsch et al. (2019b) indeed show that the local share of people with an entrepreneurship-prone personality profile is positively linked to measures of innovative activity, such as the share of R&D employees, the number of patents over the regional population, and the set-up of new businesses in innovative industries. This indicates that regional entrepreneurial culture promotes innovation activity in the respective region. Furthermore, the authors show that the average entrepreneurial personality profile of the local population can be traced back to historical traditions of entrepreneurship reflected by historical self-employment rates. Interestingly, Fritsch et al. (2019b) find that a relationship between historical entrepreneurship and current innovation is limited to historical self-employment in science-based industries, while the effect of general self-employment on innovation activities remains statistically insignificant. This implies that a tradition of entrepreneurship in science-based industries can be decisive for innovative activity in later years. Hence, successful entrepreneurial role models from science-based industries may have created a regional culture of innovation. This further shaped the entrepreneurial mindset of the local population and could also have attracted creative and entrepreneurial personalities to the region. Consistent with this interpretation,

[21] In line with the famous definition given by Joseph Schumpeter (1934) we use the term in a wide sense including not only new processes and products but also the access of new markets for inputs and for outputs.

Fritsch and Wyrwich (2018) show that the historical knowledge base is positively related to today's regional level of start-ups in innovative industries.[22]

There is also evidence of the influence of historical episodes of rather distant times. Fritsch et al. (2021b) and Obschonka et al. (2022) show a significantly positive relationship between the Roman occupation of parts of Germany about 1,700 years ago and today's regional levels of new business formation, innovation, and entrepreneurial personality traits of the regional population. This pattern is particularly pronounced for high-quality patents. Historical evidence clearly shows that the Romans were much more knowledgeable and entrepreneurial than the German tribes of that time, but the causal link between Roman occupation and today's performance is unclear and a question for further exploration (see Sections 8.3.5 and 8.5).

In sum, there is some (scarce) evidence that entrepreneurial culture and its historical roots play an important role in regional innovation activity. The underlying mechanisms of this relationship are not completely clear. Nevertheless, the conclusion can be drawn that a historically-rooted entrepreneurial culture amplifies innovation, which in turn is a channel for promoting structural change.

5.4 The interplay of historical determinants of persistent entrepreneurship and economic development

The previous sections revealed that historically-grounded persistent entrepreneurship and entrepreneurial culture can leave a significant imprint on economic development outcomes. The degree to which such an imprint takes place and becomes effective later on may depend on the context.

Del Monte et al. (2020) observe an interesting link in the case of Italy. They show that historical scientific knowledge as measured by the presence of universities, scientists, and inventors is positively related to long-term levels of regional entrepreneurship and innovation. At the same time, regions with higher rates of

[22] It should be noted that low-tech innovations can be science-based (for a discussion, see Christensen 2015). Hence, science-based and high-tech industries are not necessarily the same.

entrepreneurship and innovation that can be attributed to historical knowledge grow faster than other regions. The authors also find that entrepreneurship strengthens the positive impact of innovation on growth.

The analysis by Fritsch and Wyrwich (2022) for Germany suggests that the context can determine the impact of regional knowledge and local entrepreneurial culture on growth. The authors show that both factors play a significantly more important role in the growth of employment and GDP in the turbulent transition environment of East Germany after reunification in 1990 than in the rather stable condition in West Germany during the same period. This pattern suggests that entrepreneurial culture and knowledge are particularly important in environments that are marked by severe institutional and structural change.

Altogether, the available empirical evidence clearly suggests a positive role of historical entrepreneurship in regional development. There are several avenues for future research that we will address later in this review (Section 8.5). Nonetheless, the available evidence allows drawing some (first) conclusions for theory development, which we will focus on in the following chapter.

6. Conclusions for theory

Our survey of research on regional entrepreneurship in the long run clearly showed that historical developments can considerably shape current levels and structures of self-employment and new business formation. In particular, there is strong empirical evidence that historical developments and events can stimulate the formation of ‘cultures’. These cultures include values, beliefs, and identities, which in turn influence individual behaviors, local policies, and respective outcomes. Research also clearly shows marked geographical variation of such cultures. This indicates that they are to a large degree region-specific and can be only insufficiently explained with developments at the national level. Altogether, the empirical evidence clearly suggests that informal institutions, which can be regarded as something “in the air” (Marshall, 1920), are important for regional performance and constitute important elements of a region’s entrepreneurial ecosystem (Stam and van de Ven, 2021).

The research surveyed above clearly indicates that a regional culture of entrepreneurship, once established, has a pronounced tendency of being self-perpetuating. However, another important finding is that such a culture can ‘survive’ even in constellations where such self-perpetuating forces are not allowed. This might be the case in anti-entrepreneurial communist regimes or if a direct intergenerational transfer of values and attitudes in a region is disrupted by an exchange of the population. The main conclusion is that regional cultures of entrepreneurship are part of a region’s informal capital stock and, therefore, can significantly shape economic performance.

Given the longevity and the tendencies of self-perpetuation of regional entrepreneurial culture, one might think of classifying it as a phenomenon of path-dependence (Martin and Sunley, 2006). However, we believe that such a categorization would not be very helpful given the vagueness and indetermination of this concept, which argues that the past determines the future (Mahoney, 2000). In our understanding, a key role of entrepreneurship is to recognize and realize entrepreneurial opportunities that fuel structural change and regional renewal (Noseleit, 2013, 2015). Hence, the prevalence of a strong entrepreneurial culture can be regarded as a regional asset that is conducive to overcoming lock-in constellations and path dependencies. The positive relationship between a regional entrepreneurial culture, knowledge, and innovation confirms and underlines any approaches that attempt to integrate the different strands of theorizing. Hence, the further development of concepts and theories that regard regional knowledge, entrepreneurship, and innovation as co-evolutionary processes may be a promising way.

In this respect, the entrepreneurial ecosystem approach should be enriched by integrating research and evidence on the historical roots of entrepreneurship and knowledge. The evidence that we presented illustrates the importance of putting the entrepreneurial ecosystem in the historical socio-cultural context (e.g., Wurth et al., 2021). Any ahistorical attempt to understand regional entrepreneurial phenomena ignores important underlying forces and may be doomed to fail.

7. Policy implications

The review of the long-term impact of historical factors on entrepreneurship has a number of policy implications. A first important conclusion is that the role of historical roots of entrepreneurship can considerably differ across regions. These differences clearly confirm the recognition that a one-size-fits-all policy approach for all regions does not exist. Hence, policies should be region-specific in order to account for the particular regional constellation, such as locational fundamentals, industry structures, histories, cultures, and the psychological dispositions of the regional population. Because local actors usually are more familiar with the conditions in their region than decision-makers at the level of the central state, a considerable degree of political decisions and responsibilities should be assigned at the regional level.

A second key conclusion is that, due to the marked persistence of entrepreneurship levels over time, policies aimed at raising the level of regional entrepreneurship and stimulating an entrepreneurial culture may require long periods of time before significant changes can be observed. This is consistent with the recognition that informal institutions, in general, change only rather slowly and over long periods of time (North, 1994; Williamson, 2000). Clearly, creating and improving an entrepreneurship culture is a long-term strategy that requires endurance. It is, however, also a long-term investment since such a culture may generate long-lasting positive effects that include more innovation and higher economic growth. Regions with a pronounced culture of entrepreneurship also tend to be more resilient with regard to abrupt changes in their social, economic, and political context. Thus, they are likely to recover faster from periods of detrimental framework conditions.

What the appropriate measures for building such a culture are, depends to a large degree on the specific characteristics of a region. Since there is no one-and-only recipe for developing regional entrepreneurship, a first step in the development of a respective strategy should be to identify the reasons for a relatively low level or low quality of regional entrepreneurship. A key issue here is to identify missing components in the regional entrepreneurial ecosystem. The results of such an

assessment can then serve as a basis for the development of a region-specific strategy to improve the level of entrepreneurial activity and developing the entrepreneurial culture.

One general advice for improving the entrepreneurial ecosystem is to coordinate the relevant policies at different state levels and government departments. Another important policy goal should be to improve the interplay of the main actors in the ecosystem, i.e., the 'fit' of the several components. A measure in this respect may be to initiate and facilitate discussions of regional futures and coordinate responses to identified challenges. This also includes fostering knowledge spillovers through cooperation of local universities and other public research institutions with regional firms as well as stimulating spin-off firms out of these institutes.

An important starting point of a policy that aims at the long-term evolution of regional entrepreneurship is the regional knowledge base. The empirical evidence reviewed in Section 4.3 clearly suggests that regional knowledge and entrepreneurship co-evolve. Generally, the regional knowledge base can be regarded as an important source of entrepreneurial opportunities conducive to the emergence of innovative start-ups. Since universities contribute to both main components of the knowledge base, education and research (see Section 4.3), they can be key actors in a region's entrepreneurial ecosystem.

Since the empirical evidence suggests that innovative and knowledge-intensive entrepreneurship is particularly important for the persistence of regional entrepreneurship, policy should pay special attention to these types of firms. At the same time, because the sector of innovative and knowledge-intensive firms makes up only a modest share (often less than 1 percent) of all firms in a region, policies should also address the much larger sector of non-innovative and non-knowledge-intensive 'everyday entrepreneurship'. This includes informal firms and small family businesses ('ma and pa businesses') that are important for spreading entrepreneurial abilities and entrepreneurial thinking, thereby fostering the social acceptance of entrepreneurship in the local population (Welter et al., 2017; Aldrich and Ruef, 2018). These small firms can be a fertile breeding ground for start-ups and for the

self-perpetuation of an entrepreneurial culture over time. A further reason to consider non-innovative and non-knowledge-intensive firms is, of course, that such firms may also become economically successful (Henreksson and Johansson, 2010).

8. Avenues for further research

Historical roots of entrepreneurship became a research subject only recently and our knowledge about these phenomena is still incomplete. In this section, we focus on those avenues for further research that we perceive as most relevant and promising. In our discussion of possible reasons for the long-term persistence of regional entrepreneurship in Section 4, we identified entrepreneurial culture as the key concept. Beyond entrepreneurial culture, the notion of a collective memory of places shows theoretical promise, but there are, up to now, only a few empirical studies investigating its effects and origins. Hence, it is important to gain a deeper understanding of these two concepts (Section 8.1). Section 8.2 deals with future research related to the sources of regional culture and collective memory. Here, we focus on the role of first-nature or location fundamentals, the role of the (formal and informal) institutional framework, the deep imprint left by certain historical events, and the interplay between entrepreneurship and regional knowledge.

Section 8.3 discusses further research on explaining the persistence of regional entrepreneurial culture and the mechanisms of its transfer over long periods. Next, we deal with open questions concerning the link between regional entrepreneurial culture and economic performance (Section 8.4). Section 8.5 emphasizes the importance to broaden the available empirical evidence by conducting more studies for more countries and over longer periods. Replicating existing studies—particularly for countries with diverse contexts—should be helpful to judge the extent to which certain findings can be generalized (van Witteloostuijn et al., 2021). Finally, we touch upon promising avenues of future research that are related to deepening the empirical evidence (Section 8.6). A deepening of the empirical evidence comprises at least two things: First, make more and better historical data available. Second, conduct regional case studies to identify relationships in specific regions, which then may be generalized for a number of regions.

8.1 What are the relevant features of a regional culture of entrepreneurship?

The concept of entrepreneurial culture and the development of such a culture was already briefly discussed in Section 4.4 against the background of the empirical evidence on the historical roots of entrepreneurship. In this section, we discuss this concept and its link to other themes in entrepreneurship research in more detail. In particular, we focus on identifying the relevant features of a regional culture of entrepreneurship and how it emerges. This discussion points toward avenues for future research.

As defined in Section 4.4, an entrepreneurship culture is typically defined 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 toward entrepreneurial values, such as individualism, independence, and achievement (for example, McClelland, 1961; Hofstede and McCrae, 2004). Accordingly, a culture of entrepreneurship can be understood as an informal institution that comprises norms, values, and codes of conduct (Baumol, 1990; North, 1994). It is marked by a high level of social acceptance and approval of entrepreneurship (Kibler et al., 2014) resulting in high self-employment rates. Empirical research shows that informal institutions, such as a culture of entrepreneurship, may evolve over several decades, if not several centuries, and tend to change very slowly (see, for example, Nunn, 2012).

A number of studies provide compelling evidence that entrepreneurship culture can vary substantially across regions of a country, even though there are country-wide uniform formal rules (Beugelsdijk and Noorderhaven, 2004; Fritsch and Wyrwich, 2014; Kibler et al., 2014). Since informal institutions are deeply embedded in the population, an entrepreneurship culture should manifest as a relatively high share of persons with an entrepreneurial personality structure, which is characterized by traits such as extraversion, openness to experience, conscientiousness, and the ability to bear risk (Rauch and Frese, 2007; Zhao and Seibert, 2006; Obschonka et al., 2013).

In this respect, it should be noted that culture in general, and entrepreneurial culture in particular, can influence individual behavior in different ways (Beugelsdijk and Maseland, 2011; Thurik and Dejardin, 2012). Based on insights from different strands of sociological, psychological, and institutional literature, Stephan and Uhlaner (2010) argue that it may not be entrepreneurial values alone but also community-specific norms and common behaviors or a 'dominant logic of action' that are cultural drivers of entrepreneurial choice. Thus, if entrepreneurship is widely accepted and pursuing entrepreneurship is well-perceived, then considering an entrepreneurial career can be regarded as a replication of common behaviors in the community. What becomes clear based on previous work is that there are different understandings and definitions of an entrepreneurial culture. A comprehensive and holistic approach combining the different approaches is yet missing. Future research should also explore how the single elements of an entrepreneurship culture interact with each other. Another avenue for future research concerns the link between entrepreneurship culture and other social science concepts developed to explain place-based differences.

Clearly, there is considerable overlap between the notion of entrepreneurial culture and the concept of social capital, as was put forward by Coleman (1988), Fukuyama (1995), Knack and Keefer (1997), Portes (1998), Putnam (1993; 2000) and others. Both, culture and social capital, can "be regarded as an informal counterpart to formal institutions" (Westlund and Adam 2010, p. 902). The conceptual link between entrepreneurship culture and social capital is not yet well-explored and is an avenue for future research. In essence, social capital refers to the social acceptance of certain values and norms with the respective behavior, trust, and 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. Therefore, the existence of social capital may not only have a stimulating effect on the decision to start an own business

but it may also on the ability to do so and be conducive to the quality of the new businesses and their performance. These links deserve attention in future research.[23]

There is a lot of conceptual overlap between entrepreneurial culture and social capital but each concept captures aspects the other one does not include. Thus, entrepreneurial culture captures only that part of social capital that affects the level and the perception of entrepreneurship. It comprises the norms, values, trust, and social acceptance related to entrepreneurship. Furthermore, relevant role models and peer mechanisms in the social interaction of entrepreneurs and non-entrepreneurs come into play here. It does not include the system of relationships as such. At the same time, this broader system of relationships may have an impact on entrepreneurship culture, which is worth to be explored.

On the other hand, a broad definition 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. It is also interesting to explore how institutional features of entrepreneurship culture feed back into social capital.

Exploring the interaction between social capital and entrepreneurship culture is a promising avenue for future research. There is already some work focusing on how both concepts are interlinked. For example, social network relationships that foster the level of entrepreneurship and its social acceptance might lead to the emergence of an institutional and physical infrastructure that is supportive to entrepreneurship and, hence, to the establishment of an entrepreneurial culture. In a similar vein, Westlund and Bolton (2003) develop the concept of an entrepreneurship-facilitating social capital. Based on the literature on social capital, the authors understand entrepreneurship-facilitating social capital as a community characteristic that fosters local entrepreneurship. It represents a part of the entire local

[23] Social capital may also inhibit entrepreneurship if it is marked by values and norms opposed to business formation (Westlund and Bolton, 2003).

social capital, which further includes entrepreneurship-inhibiting social capital and types of social capital that are not directly related to entrepreneurship. The stronger the entrepreneurship-facilitating social capital is in comparison to the inhibiting component, the more entrepreneurial activity happens in a region. Westlund and Bolton (2003) refer to the German Ruhr area as an example of places where entrepreneurship-inhibiting social capital is dominating. The area is marked by personality traits and resource endowments attuned to a growth model that relies on old heavy industries, such as coal mining and steel production, but are not well suited for entrepreneurship (see also, Grabher, 1993).

According to Westlund and Bolton (2003), entrepreneurship-facilitating social capital consists of local resources and preferences in favor of entrepreneurship. Comparing this idea with the concept of entrepreneurial culture, one could regard resources as entrepreneurship-facilitating elements of the policy layer, whereas preferences in favor of entrepreneurship allude to entrepreneurship-facilitating elements of the normative-cognitive layer (see Figure 1). In essence, a high level of entrepreneurship-facilitating social capital should translate into a culture of entrepreneurship. The persistence of entrepreneurship culture can then be regarded as a persistence of resources and preferences that facilitate entrepreneurship. Similarly, a dominance of the entrepreneurship-inhibiting component in the regional social capital would be reflected in a persistent low level of an entrepreneurship culture, as in the German Ruhr area.

Altogether, promising avenues for future research are related to a more comprehensive understanding of the elements of an entrepreneurial culture and their interaction. The same applies to the recursive links between the concept of entrepreneurial culture and social capital. Next to research questions related to the features of an entrepreneurial culture, there are also several questions related to the sources of a regional tradition of entrepreneurship, which we discuss in the following section.

8.2 Explore the sources of a regional entrepreneurial culture

Previous research has already generated valuable knowledge about the sources of a regional tradition of entrepreneurship (Section 4), but there are still several loose ends and missing pieces in this puzzle. In this section, we first deal with the role of natural conditions that can be regarded as an intuitive starting point (Section 8.2.1). Natural conditions—or location fundamentals—can be an important determinant of economic structures and economic activity, such as entrepreneurship, in a region. Moreover, they can also explain the geographic distribution of the population (e.g., Davis and Weinstein, 2002; Combes et al., 2010) and, subsequently, the distribution of talented people that are a crucial source of regional knowledge and entrepreneurship. Hence, natural conditions are an overarching factor behind the emergence of (historical) determinants of entrepreneurship.

In Sections 8.2.2 and 8.2.3, we review those institutional factors that can be regarded as promising avenues for future research to better understand the roots of persistence in entrepreneurship across regions. Finally, we also touch upon research gaps regarding the strength of historical imprints (Section 8.2.4) and the co-evolution of knowledge and entrepreneurship (Section 8.2.5).

8.2.1 The role of first nature and the emergence of industry structures

Certain industries and entrepreneurial activities within these industries may evolve and prosper in a certain location because of factors that can be summarized as location fundamentals or as their ‘first nature.’ This includes the presence of natural and mineral resources, location at a river or at the seaside, soil characteristics, and climate conditions. There are several avenues for future research regarding the link between location fundamentals and the emergence of spatial differences in entrepreneurship.

A prominent example of such a first-nature effect on a region’s industry structure is the presence of rich coal deposits such as coal, ore, and minerals. The link between proximity to coal deposits and the persistence of (low) levels of entrepreneurship is already well-explored (see Section 4.2). Proximity to coal

promoted the emergence of large-scale industries, which is the prime mechanism affecting entrepreneurship negatively. To the best of our knowledge, systematic evidence with regard to other natural resources is still missing.

There is some anecdotal evidence for single regions such as Southern Saxony in Germany, which became an entrepreneurial place in the 19th and the early 20th century (Fritsch et al., 2022b). In this setup, access to silver was crucial. A catalyst of this development was the ‘silver rush’ (*Berggeschrey*), which followed the first silver discoveries near the village of Freiberg in the 12th century and which attracted many people from other regions to the Ore Mountains (*Erzgebirge*). Special features of this initial period were the dominance of surface mining and the "freedom of mining" (*Bergfreiheit*). This allowed everyone to mine precious metals. The only caveat was that a certain share of the proceeds had to be paid to the sovereign. This clearly was conducive to entrepreneurship and attracted people with an entrepreneurial and adventurous mindset.

The technical requirements of the mining industry engendered a high number of inventions and stimulated innovation. These innovations, as well as the smelting and processing of the mined ores, required the involvement of a diverse group of artisans and laborers working together in a complex economic system. An important milestone in the institutionalization of the accumulated knowledge was the foundation of the Freiberg Academy of Mining (*Bergakademie Freiberg*) in 1765. This academy was the world’s first university-level institution for education and research in mining.

The southern part of Saxony (in particular the region of the Ore Mountains) was one of the first German regions to develop industrial production. This region was prominent in the production of machinery, technical instruments, and textiles as well as in electrical engineering and wood processing. These industries were quite successful, with a high proportion of their products being exported to other countries (Gutberlet, 2014). Before WWII, Saxony was the most highly industrialized region in Europe and one of the wealthiest German regions (Tipton, 1976). The industry structure was characterized by many small and medium-sized firms, a skilled

workforce, and an established tradition of entrepreneurial talent (Tipton, 1976; Mieck, 2009).

During the communist GDR regime after WWII, the Ore Mountains and the neighboring region of Dresden managed to preserve the tradition of high industrial diversity (Scherf and Schmidt, 1984). As a result of the entrepreneurial heritage, the region exhibited the highest rate of remaining self-employment at the end of the communist period in 1989. After German reunification, the region was also relatively successful in managing the transition from a soviet-style planned economy to a market system (Fritsch and Wyrwich, 2022). The case of Southern Saxony motivates further and more systematic investigations on the role of proximity to natural resources and the emergence of entrepreneurship.

The Ore Mountains are also an interesting example to illuminate the role of terrain ruggedness for economic development. Rugged landscapes come along with several difficulties in land cultivation. For example, on steep slopes, erosion of land is a potential hazard, and the control of water, such as irrigation, may be challenging. In particular, transportation costs tend to be higher when compared to flatter areas (Nunn and Puga, 2012). Due to such problems, people hardly settled in such areas in medieval times. This typically changed with the discovery of natural deposits of ore, silver, and other minerals implying the emergence of a new trajectory of regional development. In general, settlements in (rugged) mountain areas are an interesting case study. These communities tend to have no agricultural tradition but were initially founded to pursue certain types of crafts (e.g., timbering, charcoal works) and proto-industrial activities. This pattern may have left a long-term imprint on the entrepreneurial culture of these places as compared to regions with a pronounced agricultural tradition. In general, the role of terrain ruggedness—independent of the availability of natural resources in these places—is an interesting avenue for future research as ruggedness is found to play an important role in economic development (Nunn and Puga, 2012).

Further natural conditions that might play a role in understanding the spatial distribution of entrepreneurship are the characteristics of the soil that can impact the

emergence of economic structures through different channels. These channels may also affect the regional distribution of entrepreneurship and its persistence. The limits for agricultural use due to soil characteristics may be an interesting avenue for future research. Low quality or fertility of soil may make a region more attractive for specialization in non-agricultural industries. Runst and Wyrwich (2022) find evidence that regions, where agriculture was predominantly based on crops that do not require high quality of the soil (i.e. oats and rye), had a higher share of craftsmen in the late 19th century. They also find that regional differences in the share of craftsmen persist until today. The prevalence of skilled craftsmen in pre-industrial times was also a condition for the successful emergence of industrialization (Mokyr, 2017; 2018) and may have been the nucleus for persisting entrepreneurship.

Certainly, the link between soil fertility and the emergence of entrepreneurship is rather complex. There are many examples of regions with poor soil that neither developed any significant employment in manufacturing nor an entrepreneurial culture like many areas in the northeast of Germany (Fritsch et al., 2022b). For France, Combes et al. (2010) show that soil fertility is systematically linked to the market potential (i.e., population size) of a region in the 19th century. Since population size tends to be positively related to the availability of knowledge and a skilled workforce, these factors may have been conducive to entrepreneurship. Hence, the link between soil fertility and general settlement patterns may be a second channel through which soil is affecting entrepreneurship.

A third channel is the potential impact of specialization within agriculture on local culture. In this respect, Talhelm et al. (2014) look at the relationship between different agricultural systems (rice vs. wheat) and personality traits in China. They find that individuals living in regions that have a history of growing rice were more holistic in their thinking and more interdependent. This evidence suggests that the type of agricultural land use—which is most probably related to the characteristics of the soil and climate—can significantly affect personality traits of the local population, which in turn influence the prevalence of an entrepreneurial culture.

Further factors that may determine the emergence of industry structures and entrepreneurship are climate and climate change. Like soil characteristics, local climate affects the suitability of a region for agriculture and agricultural specialization. Furthermore, significant changes in climate, such as the “Little Ice Age” (ca. 1300-1850), implied massive economic and structural changes (Fagan, 2019) and are, therefore, likely to have implications for the geographic distribution of entrepreneurship. There is anecdotal evidence for the German state of Bavaria, which is nowadays well-known for its beer-brewing industry. Before the Little Ice Age, Bavaria was a region full of vineyards. However, the natural advantage of producing wine vanished due to decreasing temperatures, leading to a surge in founding beer breweries (Horst, 2010). This somewhat peculiar example is mentioned here as recent research in Europe argues that the type of alcohol consumed in a country is related to the type of entrepreneurship present in this country as it reflects also deep cultural features (Acs and Lappi, 2021). In a nutshell, the authors find that beer-drinking countries are characterized by higher shares of productive entrepreneurship than wine-and spirits-drinking countries. Drinking habits may also be determined by the climate and climate change in a region, though.

One important factor in studying the influence of natural conditions on entrepreneurship is the analyzed time horizon. At what point in time do natural conditions trigger entrepreneurship? Many available studies focus on the course of industrialization or thereafter (e.g., Glaeser et al., 2015; Stuetzer et al., 2016). In this case, industrialization (i.e., the emergence of large-scale industries in close proximity to coal deposits) was an enabling factor for natural conditions to affect the level of entrepreneurship. Put differently, the coal was there for 250 to 300 million years and mere proximity to coal deposits did not trigger the emergence of persisting differences in the spatial distribution of entrepreneurship until there was also a demand for coal due to the industrial transformation of society. This example suggests that certain enabling forces are needed to establish a meaningful link between natural conditions and entrepreneurship.

There might also be a constellation where a historical accident enabled natural conditions to affect the emergence of an entrepreneurial culture. Such a case is

illustrated by Stuetzer et al. (2021) who analyze the gold rush in the mid-19th century in the western part of the US. The authors argue that the presence of gold attracted people with specific personality traits conducive to entrepreneurship. Their analysis shows that counties affected by the gold rush had higher entrepreneurship rates from 1910 until the 2010s.

At the same time, the arrival of such an enabling force does not mean that there was no entrepreneurship in pre-industrial times. Clearly, the process of industrialization as such was an entrepreneurial event that required bottom-up entrepreneurial initiatives to thrive (Doepke and Zilibotti, 2005; Mokyr, 2017; 2018). Hence, entrepreneurial talent—and most likely geographic differences thereof—was already present before industrialization entered the stage of economic history. Baumol (1990) presents evidence for the existence of entrepreneurs in ancient Mesopotamia and Rome as well as in medieval times (see also, Landes et al., 2010; Carlen, 2016). It is likely that certain natural conditions already explained regional differences in entrepreneurial activity long before the onset of industrialization. After all, natural conditions were even more important in pre-industrial times since transport and communication over longer distances were extremely costly back then, while entrepreneurship-promoting agglomeration economies and knowledge spillover hardly existed (see Hall, 1998, for historical examples). To the best of our knowledge, there is neither historical case study evidence nor quantitative research that analyzes the role of natural conditions for the geographic distribution of entrepreneurship in pre-industrial times and whether such historical patterns persist until today.

There might have been other enabling forces stemming from technological and societal change that had repercussions on the relevance of natural conditions for regional entrepreneurship long before industrialization. For example, the invention of watermills as a source of energy supply in medieval times might have triggered craft-related entrepreneurial activities in close proximity to rivers on a smaller scale. Stuetzer et al. (2016) find that regions applying watermills before the invention of the

steam engine—and the subsequent increase in demand for coal—have relatively high self-employment rates today.[24]

The above discussion demonstrates the role of enabling forces that trigger an impact of natural conditions on entrepreneurship. It makes sense to distinguish between the impact of natural conditions on the emergence of entrepreneurship in the pre-industrial period and over the course of industrialization since the mid-18th century. The role of natural conditions on entrepreneurship in pre-industrial times and its persistence until today are fascinating topics. It implies several promising avenues for future research alluding to pre-industrial enabling forces of entrepreneurship and its persistence. This is especially interesting, because the historical milestone event of industrialization would not have been possible without entrepreneurial effort. Hence, future research should explore the interaction between natural conditions, historical events, and human agency in shaping entrepreneurship and the regional culture.

8.2.2 Formal institutions

It is well recognized that the framework of formal institutions can stimulate, discourage, or even prevent entrepreneurship (Boettke and Coyne, 2009; Elert et al., 2017). In particular, formal institutions can shape the incentives for productive entrepreneurship (Baumol, 1990, 1993). The most important elements of the framework of formal institutions for entrepreneurship are the freedom of running a business (e.g., barriers to entry and exit, the openness of markets), the definition of property rights (e.g., private property on the means of production), and the rule of law (e.g., the enforceability of contracts). Many other types of formal institutions, such as employment protection or regulation of financial and product markets, can have important effects on the level and the type of entrepreneurship. It is, however, still an open question to what extent such formal institutions can have long-lasting effects.

Based on these general insights, one could examine the complete bandwidth of entrepreneurship-facilitating factors as discussed, for example, in Elert et al.

---

[24] A similar case is the German region of South Saxony where the use of watermills supported the development of small-scale industries (for details, see Fritsch et al., 2022b).

(2017), and explore how certain regions implemented such entrepreneurship-facilitating (or inhibiting) institutions earlier than others. A second step is then to explore whether this early implementation left a persisting imprint on the level of entrepreneurship. One problem in this respect is that the large majority of formal rules are decided at the national level and more or less uniformly apply across regions. However, history can provide valuable insights since certain regions in contemporaneous countries have been under different regimes and rulers in the past. Although the "rules of the game" are the same in all regions of a country today, the fact that some regions had different formal institutions in the past that were facilitating (or inhibiting) entrepreneurship back then might have initiated a self-perpetuating process of entrepreneurship that is still visible today.

History comes into play in a discussion of the impact of formal institutions on entrepreneurship since there are place-specific formal institutions that were established because of certain (place-specific) historical developments. We know that formal institutions play an important role in economic development (Acemoglu and Robinson, 2012). What is less understood is the mediating role of entrepreneurship in this process. Economic development does not come out of thin air but is largely driven by the agency of entrepreneurs (see Section 5). Investigating how entrepreneurs translate formal institutional change into economic development could be a promising avenue for future research. As a first step, this type of research deserves an understanding of how regional differences in formal institutional framework conditions affect the level of entrepreneurship. In a second step, it is pivotal to determine the effect of the institutional change on growth. The evidence so far focuses only on the effect of entrepreneurship that is due to entrepreneurial tradition (e.g., Fritsch and Wyrwich, 2017). This mechanism, however, rather belongs to the sphere of entrepreneurship culture (see Section 8.5).

In this section, we focus on the impact of historical changes in formal institutional framework conditions that may explain why entrepreneurship thrived in places affected by such changes as compared to places where the institutional framework remained unchanged. An interesting example is the introduction of the

Code Civil by Napoleon[25] in Germany in the early 19th century. The Code Civil introduced a number of liberalizations including economic freedom and protection of private property, which are essential for entrepreneurship. While its effect on economic development is disputed (Acemoglu et al., 2011; Kopsidis and Bromley, 2016; Lecce and Ogliari, 2017), other research identifies an effect of the Code Civil on long-term trust and cooperation (Buggle, 2016). Trust is a crucial source for entrepreneurship (for a review, see Welter, 2012; Mickiewicz and Rebmann, 2020). Therefore, the Code Civil legislation could have an effect on the level of entrepreneurship, which may have consequences for economic development. Put differently, entrepreneurship could be the mechanism linking the introduction of the Code Napoleon to subsequent economic development.

In a similar vein, it might be worthwhile to explore the mediating role of entrepreneurship in other contexts where formal institutions, and changes thereof, are thought to play a pivotal role in economic development. One important debate in this respect concerns the role of medieval guilds. Ogilvie (2011) discusses whether merchant guilds in the medieval and early modern economy (ca. 1000-1800) were efficient institutions that benefited the economy as a whole or not. On the one hand, guilds as such were an institution that regulated vocational education, secured certain rules of conduct and provided social capital for their members. On the other hand, guilds prohibited entrepreneurship and controlled the level of competition by strict regulation of market entry. Hence, exploring the link between medieval institutions, like the merchant guilds of different regions, is a promising avenue for future research. Spatial variation in the dissolution of guilds and other steps of deregulation can help to illuminate the impact of formal institutional changes on the level of entrepreneurship across regions.

When discussing the role of formal institutional change on entrepreneurial initiative, we can once more return to the central theme of industrialization and how institutional change hindered or promoted this process. While this is often discussed at the national level (e.g., Acemoglu and Robinson, 2012), there is only sparse

[25] The Code Civil is frequently also referred to as Code Napoleon.

evidence at the level of regions. One example was studied by Tipton (1976), who vividly demonstrates how institutional structures shaped by owners of large farms (squires, *Gutsherren*) hindered the emergence of the manufacturing industry in the Northeast of Germany. The squires feared that the appearance of industrial entrepreneurs and the emergence of a proletariat of industrial workers would lead to a loss of power. This example illustrates how formal institutional frameworks hindered entrepreneurial initiative and ultimately the process of industrialization. Another interesting case is presented by Heldring et al. (2021). The authors analyze the decision to dissolve English Monasteries after 1535. Their argument is that the dissolution created a market for formerly monastic lands, which could be effectively commercialized as these lands were not in feudal tenure like non-monastic lands. They find that regions affected by the dissolution had more innovation activity over the subsequent centuries and higher levels of industrialization in the 19th century. Although Heldring et al. (2021) do not discuss the role of entrepreneurs in transforming institutional reform into commercialization and economic development, there is good reason to assume that their role was pivotal.

Future research on the roles of entrepreneurs for mediating institutional effects on the industrialization process is clearly warranted. So far, there is often only case study evidence from business history research highlighting how individual entrepreneurs shaped regional economic structures and the industrialization process in specific regions (e.g., Pierenkemper, 1979; Haywood, 1986; Friedricks, 1989; Schumpeter, 1934, 1939; Sifneos, 2013; Wadhwani et al., 2020).

Another interesting avenue for future research is the role of how a formal institutional framework that is tolerant towards immigration shapes entrepreneurship. Literature suggests that tolerant places attract entrepreneurial and highly skilled people (Florida, 2004; Florida and Mellander, 2015). From a historical perspective, skilled immigration in countries that were tolerant towards immigrants, like the US, promoted innovation and economic development (Moser et al., 2014; Akcigit et al., 2017; Kerr and Kerr, 2020). On a smaller regional scale, Hornung (2014) shows how high-skilled protestant Huguenots that were persecuted in 17th century France promoted the regional development of Brandenburg, a region which is nowadays in

eastern Germany. The role of entrepreneurship in linking skilled migration and economic development is an open question for future research. The same applies to the question of whether a historical lead in implementing an institutional framework open for (skilled) migration in certain regions can induce a persisting level of entrepreneurship.

Another interesting topic that deserves some attention in future research is related to changes in formal institutions that promoted opportunities for women to set up their own businesses. The empowerment of women over the last 200 years and its impact on economic development is well-documented (e.g., Duflo, 2012; Fernandez and Wong, 2014; Goldin, 2014). We also know that women entrepreneurship can be an enabler of regional development and inclusive growth (Brush and Cooper, 2012). Relatively little is known, however, about the role of female self-employment in the historical empowerment process of women, let alone about the impact of regional differences with respect to implementing gender equality-promoting institutional changes. To the best of our knowledge, there is no research on how changes in formal institutions, such as the permission for (married) women to set up and run their own businesses, affected the level of entrepreneurship and, ultimately, economic growth. Again, there is only sparse historical case study evidence from business history research on the impact of selected women-entrepreneurs on regions and industries, while the role of formal institutions is only indirectly discussed in these contexts (Munoz and Perez, 2007; van den Heuvel, 2007; Buddle, 2010).

An important question that should be discussed against the background of changing formal institutions that give rise to entrepreneurship is the role of new entrepreneurs in the society before the institutional change occurred. How did these persons act out their entrepreneurial talent under the previous institutional conditions? Baumol (1990) argued that entrepreneurial people are always among us but that they may use their talent in diverse ways. Put differently, the type of entrepreneurial activity may adapt to the ruling institutional conditions. Baumol (1990) uses different historical contexts to prove his theory that specific institutional arrangements influence the direction of entrepreneurial effort, either toward productive or unproductive activities. For example, he argues that the institutions in ancient Rome

made involvement in productive economic activity less attractive and that landholding, usury, and 'political payments' (all unproductive activities) were regarded as more rewarding. Hence, such activities were often favored over productive entrepreneurship (i.e., running a profitable business).[26]

Similarly, Baumol discusses the institutional environment of the Middle Ages in Europe. This environment encouraged engaging in small-scale military skirmishes as a way to gain wealth and power. Baumol calls this destructive entrepreneurship (i.e., warfare), completing his catalog of productive, unproductive, and destructive entrepreneurial activity. The historical examples Baumol uses to substantiate his theory are not limited to those outlined above, but all describe institutional environments that are quite unlike those found in a modern market-based economy. Baumol argues that a modern market-based economy is an institutional environment that favors productive entrepreneurial activities.

In essence, any assessment of the historical roots of entrepreneurship should consider different types of entrepreneurship including unproductive and destructive activities. Such an assessment should also account for the respective institutional contexts. An interesting question in this respect is whether regions that are hotspots of unproductive or destructive entrepreneurial activities can become breeding grounds for productive entrepreneurship in a suited institutional framework. One way to tackle this question is to assess the entrepreneurial potential of regions in Central and Eastern Europe in the transformation from a communist regime with a centrally planned economic system to a market economy. Not surprisingly, there was a sharp rise in start-up activity immediately after the transition to a market economy (e.g., Smallbone and Welter, 2001; 2009). This post-socialist development suggests that the population had entrepreneurial potential that was not completely eradicated by several decades of socialist indoctrination. It also indicates that the pay-off of productive entrepreneurship and the opportunities to get involved in start-up activity changed tremendously (Estrin and Mickiewicz, 2011).

---

[26] There is a debate whether the Romans were as anti-entrepreneurial as the article by Baumol (1990) suggests. Clearly, the role of entrepreneurship underwent some considerable changes over the long period that the Roman Empire existed (see Carlen, 2016).

Recent research for the case of Germany has shown that the recovery of entrepreneurship after the demise of the communist regime was stronger in regions that had an entrepreneurial culture and relatively high remaining levels of self-employment (Wyrwich, 2012; Fritsch et al. 2021c). One explanation for such survival of regional entrepreneurial tradition could be that people in these regions used the leeway that the institutional framework allowed for self-employment more frequently. This is supported by Wyrwich (2012) who shows that in regions with a strong entrepreneurial tradition relatively more craftsmen opted against joining socialist handicraft cooperatives and remained private entrepreneurs within the scope of tolerated business activity. It might also be the case that many entrepreneurs behaved as Baumol's (1990) theory predicts, namely that they engaged in unproductive entrepreneurial activities during the socialist regime. If entrepreneurial talent and ambition are bound to certain people, as Baumol argues, then the new post-socialist (productive) entrepreneurs were already engaged under socialist framework conditions in other less productive types of entrepreneurship, such as rent-seeking or illegal economic activity.

In this respect, Sorgner and Wyrwich (2021) find in the context of East Germany that a significant number of people that demonstrated a strong commitment to the anti-entrepreneurial socialist regime—which can be seen as a form of rent-seeking to obtain material rewards—were active in launching new ventures soon after the fall of the Berlin Wall. They also observe that this group of people were more likely to have an entrepreneurship-prone personality profile, had a higher propensity to become self-employed, and were more successful entrepreneurs. These empirical regularities demonstrate how the persistence of entrepreneurship can survive although it is not acted out in a productive way.

The recognition that the type of entrepreneurial activities may adapt to the ruling institutional framework conditions points to an important issue of assessing and comparing the levels of regional or national entrepreneurship at different points in time. In particular, it is unclear whether developments in the formal institutional framework changed the level of entrepreneurship or only the allocation of entrepreneurial talent, as Baumol (1990) would argue. Hence, future research should

also focus on regional differences in non-productive entrepreneurial activities over the course of history to gain a better understanding of the role of institutional framework conditions for the persistence of entrepreneurship. This allows also to test Baumol's argument at the regional level.

Finally, region-specific informal institutions, such as regional cultures and traditions, are a common explanation for persistent differences in entrepreneurship in countries with uniform contemporaneous but historically different formal institutional conditions. This will be discussed in the next section.

8.2.3 Informal institutions

Next to the impact of formal institutions, informal institutions can play an important role in entrepreneurship. As defined earlier, an informal institution is reflected in norms, values, social practices, and codes of conduct in a society (North, 1994).

Our focus in this section is on the role of history in the emergence of informal institutions that might be favorable for entrepreneurship. Determining the historical roots of informal institutions is faced with the problem that—in contrast to the case of formal institutions—it is largely impossible to specify a moment in time when certain codes of conduct and social practices emerged. This is mainly the case because informal institutions tend to evolve over longer periods of time (Williamson, 2000), which also makes it difficult to identify a causal effect of informal institutions on entrepreneurship.

An example of an informal institution that may affect regional entrepreneurship is the mode of inheritance. In many countries and in many time periods, people had the opportunity to freely choose how they wanted to pass over their land to the next generation even if a certain mode was formally proposed. Quite interestingly, considerable regional variation of the dominating inheritance mode can be found and the region-specific method of inheriting did not change over a long period of time. If, for example, it was common practice in a region to divide the land among the beneficiaries into real terms (equal partition), the resulting small lots created an incentive to shift economic activity from agriculture toward some type of

craft business, maybe at first as a secondary occupation that later became the main source of income. This is an often-heard explanation for the emergence of an economic structure characterized by relatively many small firms in some regions of South Germany (Hunning and Wahl, 2021). Such a shift in economic activity would not have been so likely to occur if the land was cohesively transferred to one beneficiary only (primogeniture), as was the case in other regions (Bartels et al., 2020). Such examples suggest that attempts to explain the emergence of a regional entrepreneurship culture may need to reach far back into a region's economic history.

Another type of social practice that can have an effect on regional entrepreneurship is the level of corruption. Studying corruption is particularly interesting here because this type of activity might be perceived as a form of unproductive entrepreneurship. It is well known that corruption is marked by large variation across countries and regions (e.g., Shleifer and Vishny, 1993; Dininio and Orrtung, 2005; Del Monte and Papagni, 2007). Also, there is abundant evidence that corruption has a negative impact on start-up activity (e.g., Aidis et al., 2012).[27] Although the historical roots for the geographic differences in corruption are often attributed to national cultures (Rose-Ackerman and Palifka, 2016), there are often pronounced regional differences within a country that might be explained by historical processes. A case in point is the study by Becker et al. (2016) that finds lower levels of corruption in those regions of Southeastern European countries that were once part of the Habsburg Empire. The authors explain their finding with the legacy of high-quality government of the Habsburg Empire that created low incentives for corruption.

The legacy of the Habsburg Empire is an interesting historical case showing how institutional quality—which is also an important source for entrepreneurship in general (e.g., Bjornskov and Foss, 2008; Bradley and Klein, 2016)—curbs the level of corruption in the regions exposed to this historical regime and leaves a long-run regional imprint. Hence, regional differences in the quality of government in the past

[27] There is also the argument that corruption can „grease the wheel" in the sense of getting things done in the context of weak institutions (Dreher et al. 2013).

can feedback on the social practice of corruption, which is an informal institution. It would be interesting to understand how this pattern affects entrepreneurship. In this respect, it would be also of interest to explore whether past institutional quality already affected historical entrepreneurship in the regions of the Habsburg Empire.

The case of corruption is also interesting for another reason. The example of the Habsburg Empire (Becker et al., 2016) suggests that historical formal institutions (here: the general institutional quality) shape informal institutions (here: corruption). Hence, there may be considerable interplay between formal and informal institutions. The same mechanism is likely to be at play in the aforementioned study by Buggle (2016) who finds that the formal institutional framework that was introduced during the French occupation of German lands over the Napoleonic wars shaped trust, which is an informal institution. At the same time, the prevalence of certain informal institutions may lead to the establishment of certain regulatory frameworks. This makes it difficult to disentangle the effects of formal and informal institutions on entrepreneurship.

Making things even more complex certain informal and formal institutions may emerge because of location fundamentals. Hunning and Wahl (2021), for example, show that the emergence of the dominant regional mode of inheritance can be partly explained by soil quality. According to their results, the inheritance practice of equal partition is more likely in areas with better soil quality and lower elevation. This example shows that natural conditions can shape the emergence of informal institutions.

For determining the impact of informal institutions it might be helpful and important to search for historical events (‘natural experiments’; for a review, see Diamond and Robinson, 2010) that affected the emergence or decline of specific cultural habits. Such historical events could be exogenously imposed borders due to occupation or annexation of territories. An example is the case of Polish history that was analyzed by Fritsch et al. (2021a) to understand the long-run emergence of regional differences in entrepreneurship. Future research should particularly explore such natural experiments to disentangle the impact of natural conditions as well as

formal and informal institutions on entrepreneurship and its persistence in the long run.

8.2.4 The deep imprint of historical events

We already discussed the example of natural conditions that only became relevant for entrepreneurship and regional development when certain enabling forces, like the process of industrialization, occurred (Section 8.2.1). This section revolves around the question at what moment in time an important impulse for the development of a region happened. What is the relevant time horizon for an analysis of the historical roots of regional entrepreneurship?

Against this background, Fritsch et al. (2021b) find that German regions that were occupied by the Romans nearly 2,000 years ago have today higher levels of entrepreneurship and innovation activity. Moreover, the authors find that today's population living in the former Roman part of Germany scores higher on certain entrepreneurship-promoting personality traits (Obschonka et al., 2022). These relationships remain statistically significant when controlling for other historical influences and more recent events in German history. The findings show that regions under Roman rule have higher present-day levels of economic development in terms of GDP per capita (e.g., Wahl, 2017).

When addressing potential channels of the long-term effect of Roman rule, the data indicates that the density of the Roman road network played an important role as an imprinting mechanism. This pattern is in line with other research highlighting the importance of the Roman road network for economic development (Flueckiger, et al. 2022). Roman roads had an influence on the level of interregional mobility and the geography of social and economic interactions. In particular, higher levels of mobility and interregional interactions could have affected the attitudes of the population towards strangers, its level of risk aversion, tolerance towards change, and its openness to new ideas. It is also important to note that these routes connected the Roman part of Germany with other areas of the Roman Empire. This may have helped to establish a certain early civilization advantage in these German regions, compared to the less developed "barbaric" cultures North-East of the Limes.

A question that is not answered by Fritsch et al. (2021b) is when the impact on innovation and entrepreneurship kicked in. Were the Roman regions more entrepreneurial and innovative over the last 2,000 years or was there an enabling historical process within this period that activated the Roman legacy effect? Was there a mark-up already in medieval times?

It is an open question how the Roman legacy is affecting entrepreneurship and innovation across German regions. Given the significance of Roman culture for Europe, more research on other countries is needed to understand the deep imprint that ancient cultures may have left. It is also not clear how the potential impact of ancient cultures on entrepreneurship and innovation is translating into growth in regions that were exposed to these cultures in comparison to regions that were not. This also applies to other ancient cultures and long-term population movements since the Neolithic revolution, like the “out-of-Africa”-migration (Ashraf and Galor, 2018), whose impact on entrepreneurship and subsequent economic development is not yet explored.

Next to the role of ancient cultures, the deep imprint of religion might be an interesting avenue for future research. Religions are with us for centuries, if not millennia, but there is only a relatively small body of literature that has explored the links between religion and entrepreneurship (Audretsch et al., 2013; Parboteeah et al., 2015; Zelekha et al., 2014). This lack of research is surprising since religion can not only be the source of cultural value systems, which are likely to shape attitudes towards entrepreneurial activities, but may also affect entrepreneurship via its impact on social capital and social networks (Hoogendoorn et al., 2016; Henley, 2017; Rietveld and Hoogendoorn, 2021). We still lack a clear understanding of how the imprint of religion affects entrepreneurship and its persistence. Most research on the effect of religion on entrepreneurship focuses on the emergence of Protestantism. In this respect, Nunziata and Rocco (2016; 2017) find that Protestants have a higher entrepreneurial intention than Catholics—based on the ethical guiding principles of Protestantism—but only in regions where Protestants represent an ethnic minority. An explanation for this finding could be that in minority communities adherence to ethical guiding principles of faith is particularly strong.

An interesting feature of religious differences across regions is that in many countries, such as Germany, religion was imposed on the local population historically by local rulers (Cantoni, 2012). Hence, the introduction of a new religion can be treated as an external historical impulse that may have initiated a new regional development trajectory, also changing the prospects for entrepreneurship to thrive. The external nature of adopting a new religion makes such historical cases especially useful for identifying the causal effects of religion on economic outcomes. In the case of Protestantism, human capital formation, related to the rise of this faith, spurred industrialization and economic progress (Becker and Woessmann, 2009; Becker et al., 2011). The role of entrepreneurship in this process is, however, not well-explored and deserves future attention since industrialization required entrepreneurial initiative. Vice versa, industrialization may have been an enabling process that was needed for Protestantism to take effect on entrepreneurship.

There are several avenues for future research to understand how deeply embedded cultural factors related to religion exert an influence on entrepreneurship across regions. In this respect, future work should also broaden the scope and consider other religions than Western Christianity. In general, research on entrepreneurship in non-Christian contexts is rather rare (for example, Ramadani et al., 2017; Liu et al., 2019). Analyzing the impact of religion is most fruitful in countries where not all regions were exposed to religious forces in the same way. Altogether, the deep imprint of ancient cultures and religion on regional entrepreneurship deserves more attention in future research. In this respect, it would be promising to explore whether the impact is present over centuries, if not millennia, or whether certain historical events were needed to give an impulse.

8.2.5 The co-evolution of knowledge and entrepreneurship

It is well-recognized that there is a close relationship between entrepreneurship and knowledge. In particular, the regional knowledge base can be regarded as an important determinant of entrepreneurial opportunities and innovation (Acs et al., 2009). One clear indication of such a relationship is the close geographic proximity between universities and start-ups in innovative industries (Fritsch and Aamoucke,

2017; Fritsch and Wyrwich, 2018). These insights call for further exploration of a long-term co-evolution of regional knowledge and entrepreneurship. In essence, future research needs to consider how the previously discussed factors, such as natural conditions, formal and informal institutions, and historical events, are not only affecting entrepreneurship but also the local knowledge base and the interaction between the two. Another question for future research is how the quality of university education and research is linked to entrepreneurship.

Historical events and processes may play an important role in the co-evolution of entrepreneurship and knowledge. For example, the rise of Protestantism came along with an increase in human capital that was decisive for economic development (Becker and Woessmann, 2009). At the same time, human capital formation and the subsequent increase in the local knowledge base may have led to the emergence of entrepreneurial opportunities and innovation—in line with the knowledge spillover theory of entrepreneurship (Acs et al., 2009). In a similar vein, Dittmar and Meisenzahl (2020a) show how changes in formal institutions across German cities in the 16th century affected the provision of public goods, led to the attraction of human capital, and fueled economic growth. They also observe that there is an interaction of this institutional change with the Protestant Reformation.

One potential mechanism linking knowledge to growth is entrepreneurship, as knowledge spurs entrepreneurship (Acs et al., 2009) and entrepreneurship promotes economic growth (e.g., Fritsch and Wyrwich, 2017). In another study, Dittmar and Meisenzahl (2020b) can show how higher education in the 19th century helped transform the economy in the process of industrialization. It is safe to assume that (local) entrepreneurship played a crucial role to make use of this knowledge for the transition toward industrial capitalism. However, this process deserves further investigation.

Altogether, future research on the mediating role of knowledge in the emergence and persistence of entrepreneurship is clearly warranted. Furthermore, knowledge spillovers emerging from entrepreneurship and reinforcing subsequent entrepreneurship is another interesting arena for future research.

8.3 How can persistence of an entrepreneurship culture be explained?

The reasons for persistence of an entrepreneurial culture and the ways it is transmitted across generations are largely unclear. One important channel through which an entrepreneurial attitude in the regional population may be transferred is the presence of entrepreneurial role models in the social environment (see Section 4.4). These give rise to demonstration and peer effects by providing opportunities to learn about entrepreneurial tasks and capabilities. In particular, the presence of entrepreneurial role models reduces the uncertainty that potential entrepreneurs may feel about starting their own business and can help them acquire entrepreneurial skills and necessary information(Minniti, 2005). Such 'learning by example' can be viewed as a non-pecuniary externality that reduces the ambiguity and influences the decision to pursue an entrepreneurial career (Minniti, 2005).

It is not far-fetched to assume that it is mostly the example of economically successful entrepreneurs that can generate positive peer effects. Seeing the success of others may increase individual self-confidence in the sense of 'if they can do it, I can do it, too'. Moreover, being able to observe entrepreneurs in action, especially successful ones, may raise social acceptance of entrepreneurship (Bosma et al., 2012; Kibler et al., 2014; Stuart and Sorenson, 2003). This subsequently, also increases the likelihood of others to adopt entrepreneurial behavior. Hence, individuals may perceive entrepreneurship as a favorable career option just from observing successful entrepreneurship among their peers (for a detailed exposition of this argument, see Fornahl, 2003). Historical examples of successful entrepreneurs may also be important for a collective memory that can have stimulating effects on entrepreneurship today. The formation of such a collective memory is, however, still largely unclear.

Since people typically start their firm close to where they reside, such role model effects tend to be concentrated in the respective region and may not spill over to other areas. Thus, the presence of entrepreneurial role models in a region—particularly those that are economically successful—can be regarded as a region-specific trigger of entrepreneurship.

Learning through peers tends to be more effective the closer the contact is with the entrepreneur. For this reason, the employment share in small and young firms is a good predictor of the effectiveness of entrepreneurial role models because employees in smaller firms have relatively close contact with the entrepreneur. This close proximity to the role model provides valuable opportunities to acquire entrepreneurial human capital. Furthermore, employees in small firms usually perform a much greater variety of tasks than their counterparts in larger firms where work tends to be more specialized. Such a variety of skills is conducive to starting an own business (Lazear, 2004). Accordingly, it is a stylized fact of empirical research that, for different reasons, employees in small firms have a higher propensity of starting their own business than large-firm employees (Parker, 2009). Because most start-ups remain small, regions with high levels of new business formation not only have many entrepreneurs but also high employment shares in small businesses. This structural characteristic of entrepreneurial regions may also contribute to the persistence of regional entrepreneurial culture.

Another factor that may contribute to this persistence is a strong intergenerational transmission of entrepreneurial values and behaviors from parents or grandparents to their offspring, which may be mainly based on socialization and peer effects. That is, a person has a considerably higher propensity to start an own firm if at least one of his or her parents (or grandparents) is or was self-employed (for example, Laspita et al., 2012). One cannot completely exclude that genetic inheritance of entrepreneurial personality traits may play a role in this respect, but the empirical evidence clearly suggests that the effect of socialization is considerably stronger (Lindquist et al., 2015).

A number of studies have demonstrated that entrepreneurial values, attitudes, and behaviors tend to be transmitted from parents or grandparents to children (Lindqvist et al., 2015; Vladasel et al., 2020; Laspita et al., 2012). Niittykangas and Tervo (2005), in a study for Finland, find regional differences in this intergenerational transmission of self-employment but the analysis does not distinguish in regard to the regional levels of entrepreneurship. Fritsch and Rusakova (2012) compare intergenerational transmission of entrepreneurship in former

communist East Germany with the western part of the country and show that forty years of the anti-entrepreneurial regime in the communist East had a negative effect. For children that attained a university degree in East Germany, the coefficient for the intergenerational transmission was even insignificant. The authors discuss two possible explanations for this result. First, the communist regime had a pronounced tendency to admit only those persons to higher education that declared conformity with socialist values. Second, university students were exposed to particularly strong indoctrination with anti-capitalist and anti-entrepreneurial ideology because they were supposed to be the future elite.

Such an effect of anti-capitalistic propaganda is confirmed by Block et al. (2022) who find that children raised by self-employed parents from (communist) North Vietnam have lower start-up intentions than children from self-employed parents in (capitalist) South Vietnam. Slavtchev and Wyrwich (2021) exploit the fact that TV programs from the capitalist West could for technical reasons not be received in all parts of the GDR. They find that East Germans that were exposed to Western TV had a higher propensity to start up a business after unification, and also their children tend to have higher entrepreneurial intentions.

Intergenerational transmission of entrepreneurial values, attitudes, and behaviors can explain a tendency of regional entrepreneurship levels to persist for at least some generations, but the available empirical evidence comprises ‘only’ a period of considerably less than a century. Since micro-level evidence over longer time spans is unavailable, it is unknown if and to what extent the transmission of entrepreneurship between entrepreneurial ancestors and the current generation becomes weaker when several generations are involved. But even if the intergenerational transmission remains relatively strong over longer periods of time, it can explain only a part of the regional persistence found in reality. This is due to geographic mobility of people. Intergenerational transmission cannot explain the persistence of regional entrepreneurship found in regions that experienced an exchange of more or less the entire population (Fritsch et al., 2019; Fritsch et al., 2021a). A largely unexplored aspect of people’s mobility is location choice and the self-selection of certain types of people into certain types of regions. It may be the

case that entrepreneurial places, like the Silicon Valley, attracted particularly entrepreneurial people for some time, but there is no solid and broad evidence that this is a general tendency able to explain persistent entrepreneurship.

Another arena for future research is the reputation of places. The Silicon Valley, for example, is often regarded as the prototype region of hosting a vibrant entrepreneurial culture. This image certainly induces selective migration, constantly rejuvenating the entrepreneurial culture in the valley. Another interesting aspect that deserves future attention is the role of a place-based collective memory and its contribution to the persistence or reactivation of entrepreneurial culture.

Altogether, our understanding of how an entrepreneurial culture is transferred over time is still rather limited. There are several interesting avenues for future research that may help to understand the underlying mechanisms.

8.4 Effects of a regional culture of entrepreneurship on regional performance

It is difficult to link a rather comprehensive and somewhat elusive concept such as entrepreneurial culture to growth measures. Therefore, it may be more appropriate to investigate the impact of particular elements of such a culture—for example, a persistently high share of entrepreneurial role models or the presence of people with an entrepreneurship-prone personality profile. We already mentioned the study for (West) Germany by Fritsch and Wyrwich (2017) who found that the component of start-up activity that can be attributed to historical levels of entrepreneurship is more important for regional performance than start-up activity in general. Since there is still no comparable evidence for other countries, we do not know whether there are cross-country differences with respect to the impact of a regional entrepreneurial culture on economic performance.

It is also unclear whether there are regional differences within countries when it comes to the relationship between entrepreneurial culture, entrepreneurial behaviors (e.g., new business formation, self-employment), and economic performance. An interesting example in this respect is the German area of Stuttgart, which is commonly regarded as being a region with a pronounced entrepreneurial culture

because of a high share of people with an entrepreneurship-prone personality profile (Fritsch et al., 2019b). However, the level of start-up activity and self-employment in this region was relatively low for decades, while the economic performance of the region is clearly above average, not at least due to some successful larger firms (e.g., Bosch and Daimler-Benz) that were founded more than a century ago. This contrasts with the area of Munich, where the relationship between a high share of the population with an entrepreneurial personality profile and regional prosperity goes together with high levels of new business formation. Such differences between regions clearly indicate that the link between entrepreneurship and growth is not uniform across regions but that there are different regional growth regimes (Audretsch and Fritsch, 2002).[28]

There is also a lack of cross-country evidence when it comes to the link between the share of people with an entrepreneurship-prone personality profile and economic development. Stuetzer et al. (2018) find such a link for the US, but there is no evidence for other countries so far, which has partly to do with the availability of data. It would be particularly interesting to understand how the share of people with an entrepreneurial mindset links to regional recovery from periods of unfavorable institutional conditions and disruptive shocks, like wars, anti-entrepreneurial regimes, or global economic crises.

Fritsch and Wyrwich (2022) show in the case of East Germany a highly significant positive relationship between the regional share of self-employed people at the end of the socialist regime and economic recovery in the subsequent transformation to a market economic system. It is up to future research to come up with creative approaches to develop other measures for a historical entrepreneurial culture that can be linked to subsequent growth (see Section 8.6.1). The main open question is whether the negative effects of external shocks are less intensive in entrepreneurial regions, and whether they recover faster. Empirical evidence for East Germany does indeed indicate a faster recovery (Fritsch and Wyrwich, 2022), but

[28] The area of Stuttgart is regarded as a “routinized regime“, marked by a population with an entrepreneurial mindset and an industry structure dominated by large established firms, while Munich is regarded an “entrepreneurial regime“ with start-ups playing an important role in the local economy.

broader and deeper empirical evidence is needed to gain a clearer understanding of such a link. In a similar vein, future research should investigate whether regions with a pronounced culture of entrepreneurship benefit disproportionately from positive shocks, such as the introduction of radical innovations that provide manifold entrepreneurial opportunities.

As we discussed earlier in Section 5.3, entrepreneurship at its very core includes behaviors such as creativity, opportunity recognition, taking initiative, readiness to assume risk, and introducing new ideas, products and services to the market. Such behaviors are not only conducive to setting up one's own business but can also be relevant for innovation activity. For Germany, Fritsch et al. (2019b) can show that the local share of people with an entrepreneurship-prone personality profile is positively linked to measures of innovative activity, such as the share of R&D employees, the number of patents over the regional population, and the set-up of new businesses in innovative industries. There is no evidence for other countries and contexts. Future research should seek to understand whether the patterns found in Germany can be replicated in other countries.

We also discussed the interplay of historical determinants of persistent entrepreneurship and economic development. Except for studies for Germany and Italy (Del Monte et al., 2022; Fritsch and Wyrwich, 2022), we are not aware of any study that investigates how the regional context accommodates the link between entrepreneurial culture and economic development. This is another arena for future research.

Previous research considered employment, GDP growth, and innovation activity. There is a growing amount of research on well-being in entrepreneurship, mostly focusing on the individual level (Wiklund et al., 2019). The studies find that entrepreneurs are happier than paid employees. Fritsch et al. (2019c; 2021d) find that both employees and the self-employed are happier when institutions are entrepreneurship-facilitating. Insights from this stream of research at the individual level provoke the question of whether the level of regional entrepreneurship is also linked to well-being at the aggregate level.

Altogether, the most important task for future research is to gather further evidence on the link between entrepreneurial culture and different regional performance measures. It is important to understand how entrepreneurial culture links to economic development across different regions and countries. In this respect, it is a key challenge to disentangle the effect of the single elements and components of an entrepreneurial culture on entrepreneurship. Assessing their interplay is another empirical challenge that deserves creative research approaches. Furthermore, future research should explore under which conditions entrepreneurship culture does (not) link to regional development and how regions with an entrepreneurship culture respond to positive and negative economic shocks.

8.5 Broadening the empirical evidence: More studies for more countries

Empirical studies of the long-term development of regional entrepreneurship demonstrate that historical events and conditions can have deep imprinting effects on new business formation and self-employment in later periods, thereby shaping regional development. Since these studies are still limited to just a few countries and regions, it remains unclear to what extent potential explanations can be generalized. Hence, more studies on other countries should be conducted to gain a clearer picture. In particular, such studies should show to what extent the findings rely on the specific context of a country or region and what the impact of this specific context might be. Moreover, studies for countries with different sets of formal and informal institutions may allow us to identify the effect of these different institutional framework conditions on regional trajectories of development (see van Witteloostuijn et al, 2021).

When it comes to understanding differences in institutional framework conditions, developing countries would be an interesting case for future analyses. So far there is no evidence for developing countries, which may have to do with issues of obtaining reliable historical data. Developing countries are of particular interest to our understanding of the historical roots of entrepreneurship for several reasons. First, developing countries are often marked by significant institutional voids, i.e., a lack of formal and informal institutions that help foster market transactions and

entrepreneurship (Khanna and Palepu, 2010). At the same time, these voids create incentives for institutional entrepreneurship, i.e., persons proactively engaging in institution building. Institutional voids create opportunities for entrepreneurs that require and allow for creativity, experimentation, and bricolage in shaping their businesses (e.g., Mair and Martí, 2009; Miller et al., 2009; Puffer et al., 2010; Ge et al., 2019). Analyzing the persistence of entrepreneurship in this particular type of context could contribute to clarifying the role of certain institutional framework conditions in the self-perpetuation process of entrepreneurship over time.

Second, studying developing countries could enable us to learn about the long-term impact of colonial legacy on entrepreneurship. Such analyses would broaden our understanding of past formal institutional framework conditions on today's entrepreneurship. Especially, because the departure of these historical institutions were often followed by periods of economic turbulence and political instability. Several studies have investigated the impact of colonial legacy on regional differences in economic development and informal institutions, such as interpersonal trust (Nunn, 2008; Nunn and Wantchekon, 2011; Nunn and Puga, 2012). Still, we know only little about how economic conditions in colonial times and the resulting informal institutions translated into entrepreneurship.

Furthermore, the investigation of other regions might be able to shed light on the heritage of formal institutions. One interesting area in this regard are the countries in Southeastern Europe that once belonged to the Habsburg Empire. Becker et al. (2016) find a genuine positive Habsburg effect on trust. More precisely, people in Southeastern European countries that were part of the Austro-Hungarian Habsburg Empire until 1918 reveal higher levels of generalized trust than residents of Southeastern European regions that did belong to the Ottoman Empire. The reason behind this finding may be that the Habsburg Empire was characterized by a well-developed and well-functioning framework of formal institutions in comparison to the Ottoman Empire. Since trust is a very important resource for entrepreneurship (Welter, 2012; Mickiewicz and Rebmann, 2020), there could be also long-term effects on entrepreneurship.

Similarly, for places in developing countries, for example, in Africa, persistent spatial differences in (mis-)trust related to the legacy of colonial practices, such as the slave trade (Nunn and Wantchekon, 2011; Nunn and Puga 2012), may have implications for entrepreneurship and its persistence over time, as well. It would be interesting to learn whether the past institutional framework affects levels of entrepreneurship in these countries via their impact on current formal and informal institutions.

Another interesting set of countries comprises the settler colonies, such as the US, Canada, and Australia. The settler movements initially created or radically shaped local institutional framework conditions and local culture. Local cultures and institutions were not influenced by historical processes before the time of discovery around the year 1500. Hence, such countries allow for a cleaner measurement of historical development, as pre-discovery-age processes often hardly matter. While there is already evidence for the US and the impact of coal mining (Glaeser et al., 2015), several further channels, like the frontier movement and the emergence of a specific culture in the American West (Bazzi et al., 2020) in the 19th century, could be explored (Stuetzer et al., 2021).

Former settler colonies are also interesting arenas to assess the cultural impact of the settler's countries of origin on local entrepreneurship levels, and how a transfer of informal institutions could have initiated a self-perpetuating local culture. The empirical evidence available so far documents pronounced impacts of the settlers' countries of origin on economic development—particularly, the formation of informal institutions resembling those in the settlers' home countries (e.g., Nisbett and Cohen, 1996; Rodriguez-Pose and von Berlepsch, 2015; Kleinhempel et al., 2020b). There is also recent evidence for Switzerland that this pattern works at the small-scale regional level. Ehrhardt and Haenni (2021) find for people from the same municipality that those with ancestry from the German-speaking part of the country are more likely to start new firms than individuals with ancestry from the French-speaking part. These differences persist over generations and are apparently independent of the local culture of the municipality the people are living in.

Ethnic fragmentation and segregation that is due to specific settlement patterns may impact the self-perpetuation process of entrepreneurship. As peer effects can be regarded as a crucial mechanism behind this process (see Section 4.3), an interesting question is whether ethnic fragmentation hinders the transmission of entrepreneurial values in the local community. This might be the case when peer effects are largely limited to specific ethnic groups with the consequence that a self-perpetuation process is only developing within ethnic communities. This could be the case in post-colonial societies where ethnic conflict is a significant obstacle to economic development[29].

In general, studies for countries marked by persistently unstable institutional environments may also help us understand the role of institutional framework conditions. We understand from previous literature that entrepreneurship can re-emerge after historical shocks and catastrophic events, such as civil wars, when the formal institutions become stable again. Yet, we know little about the persistence of entrepreneurship and the mechanisms sustaining entrepreneurship in such contexts (Miller and Le-Breton Miller, 2017). There is only sparse individual-level evidence on entrepreneurial activity under extreme conditions, such as enduring civil wars (Bullough et al., 2014).

Finally, it would be worthwhile to further explore countries that witnessed disruptive historical shocks and saw significant changes in the composition of their population due to episodes of forced migration (for a review, see Becker and Ferrara, 2019). Many of these countries faced a situation similar to formerly German regions after WWII (e.g., Silesia and Kalinigrad) where the effects of an exchange of the original population on the persistence of entrepreneurship were analyzed (see Section 3).

Altogether, extending the analysis of persistence of entrepreneurship and its historical determinants to other countries means much more than just replicating what

[29] For a discussion of the impact of ethnic segmentation on economic development, see Alesina et al. (2003) and Karnane and Quinn (2019).

we already know from existing studies. Such studies could lead to a better understanding of the role of institutional and historical context conditions.

8.6 Deepening the empirical evidence

8.6.1 Making more and better entrepreneurship data available

A key bottleneck for investigating the role of history in regional entrepreneurship is the availability of data. More and better historical data may lead to a more detailed picture and can help to identify causal relationships. The request for the improvement of data includes the digitization of historical statistics, such as census data and other archival material. It is important that historical data provide the opportunity to distinguish different sectors, industries, and regions. Since it has been shown that self-employment in agriculture represents a rather special case, it is particularly important that historical data separate agriculture from other sectors. It would also be beneficial to be able to distinguish different types of self-employment (e.g., homeworkers) and to have information on the size and the economic success of firms. The same applies to the qualification of the self-employed and to whether the respective business made use of advanced technologies or was otherwise involved in innovation activities.

We also need more and better information about the regional knowledge base and innovation activities in a historical context. While historical patent data is getting more and more available, as is the case for the US (Petralia et al., 2016), especially data on activities and structures of universities are often not available in digital form. Since the empirical evidence shows that the presence of historical universities can play an important role for entrepreneurship today (see Section 4.3), combining such data with information on historical entrepreneurship would allow a better understanding of the co-evolution of knowledge and entrepreneurship discussed earlier (see Sections 4.2 and 4.3).

It is important to keep in mind that it is unlikely to find historical entrepreneurship data that are perfectly in line with our contemporaneous understanding of high-tech, quality, and economic success. Nevertheless, there are

several options to use historical data for making inferences about how advanced entrepreneurial activity was in a region. Fritsch et al. (2019a), for example, use the information on the use of electric motors (in units of horsepower) per enterprise in an industry in the 1920s to infer the technology-intensity of local entrepreneurship. Information on historical income tax revenues from the self-employed and non-self-employed population—for example, available for the year 1925 in Germany (Statistik des Deutschen Reichs, 1929)—can be a valuable source to assess regional differences in economic success and the quality of historical entrepreneurship.

Making use of historical data sources might require some creativity for retrieving information on entrepreneurship (see, for example, Bennett and Newton, 2014). Apart from that, there might also exist unique historical data on entrepreneurship that allows for investigating the self-perpetuation process over time.[30] The point we want make here is that researchers should not only look for historical statistics on self-employment and entrepreneurship that match similar statistics for current years to create a panel data set. Besides that, they should also search for broader historical information related to self-employment, explaining the mechanisms behind persistence in entrepreneurship. At least for major developed countries, there are often diverse historical data available that remain to be digitized and applied in empirical analyses.[31]

One key bottleneck of historical research on the persistence of regional entrepreneurship is information on an entrepreneurial culture. Stuetzer et al. (2016) and Fritsch et al. (2019b), for example, use the personality profiles of the contemporaneous population as a measure for the current entrepreneurial culture in a region, but there is no information on the traits of previous generations. Generally, information on values and attitudes in the regional population in history is missing. Using second-order data that reveal entrepreneurial attitudes among the population in

[30] In the case of Germany, there is information available on the family size of self-employed in the year 1925. This data may be used to test for the role of family size in the intergenerational transmission of entrepreneurial values and, hence, self-perpetuation of entrepreneurship and of an entrepreneurship culture. The underlying assumption would be that larger families provide more options for intergenerational transmission.

[31] A good example is the Prussian Economic History Database; see Becker et al. (2014).

the past may be helpful in this respect. One idea is to apply a recent approach of media analyses to distant historical episodes. Cardon et al. (2011), for example, analyze reports of entrepreneurial failures from major US newspapers, and how the reasons for business failure are framed to understand the cultural sense-making (i.e., attribute a meaning) of failures across US regions. They find huge regional variation reflecting local cultural differences. In a study for Germany von Bloh et al. (2020) assess publications of the German Press Agency to analyze the link between news reports about start-up activity and the actual local entrepreneurial activity. Their findings do not support the argument that there is a relationship between the local level of entrepreneurial activities and their coverage in the news. The authors also state that more sophisticated methods could be promising and may change the picture. Hence, local media can be informative about local entrepreneurial activity and mentality.

In a historical context, this calls for assessing historical newspaper reports, which are either available in digital archives or still need to be digitized. Utilizing large data sets (big data approaches) becomes more and more useful for studying entrepreneurship (Obschonka and Audretsch, 2020) and assessing the historical roots of an entrepreneurial culture. Historical newspapers and other documents may also allow analyzing the development of regional cultural sense-making of entrepreneurship over time and across generations.

Another encouraging approach is to assess historical surveys. Holler and Schaefer (2021), for example, make use of large-scale survey data of German-speaking villages from the 1930s—the German Ethnographic Atlas—to investigate drivers of cooperation, gender, and religious norms. They find that local differences in the structure of social relationships can explain regional heterogeneity in norms. While their research is not focused on entrepreneurship it could be insightful to apply the data to historical and current entrepreneurship levels. Furthermore, it could influence current household surveys to understand how local norms relate to an entrepreneurial culture and its persistence. There are certainly also many options based on machine learning that can help to understand cultural traits (for a

comprehensive approach, see Michalopoulos and Meng Xue, 2021) and can be applied to entrepreneurship.

8.6.2 Regional case studies within countries

For at least two reasons, in-depth case studies for certain regions can help to understand the long-term development of entrepreneurship. First, focusing research effort on one or a limited number of regions may make a great wealth of information available that allows to dig deeper into history. This can even include qualitative information, such as descriptions of local culture or common regional narratives. Second, regional case studies may be well-suited to identify causal relationships by investigating certain important cases, events, and decision processes.

There are several case studies on regions that can be regarded as exceptional entrepreneurial breeding grounds like the Silicon Valley (Saxenian, 1994; Kenney and von Burg, 1999) and the Capitol Hill region (Feldman, 2001; Feldman et al., 2005) in the US, the Cambridge region in the UK (Garnsey and Hefernan, 2005), the Gnosjö region in Sweden (Wigren, 2003), or Munich in Germany (Sternberg and Tamasy, 1999). Research has analyzed how particular historical events and conditions shaped specific processes that finally made these places entrepreneurial. Other studies focused on the long-term emergence of informal institutions, such as attitudes toward entrepreneurial activity across space (e.g., Hjalager, 1989; Lafuente et al., 2007; Aoyama, 2009). Lafuente et al. (2007), for instance, argue that the presence of regional role models and entrepreneurial tradition can explain why rural Catalonia was, and currently is, more entrepreneurial than the rest of Spain.

While case studies of single regions may provide interesting insights, disentangling and isolating the impact of the national-level, formal institutions may require considering more than one region within a country. Referring to the Japanese regions of Hamamatsu and Kyoto, Aoyama (2009) illustrates how historically-grown regional cultures play an important role in shaping technology-oriented entrepreneurship in very different ways today. This topic is also touched upon in Saxenian's (1994) comparison between the Silicon Valley and the Route 128 in Boston. Fritsch et al. (2022b) compare two regions in post-socialist East Germany, namely the regions of

South Saxony and Mecklenburg-Western Pomerania. Both regions were exposed to the same institutional framework since the late 19th century. While Southern Saxony developed in the early 20th century into one of the most entrepreneurial regions in Europe and is still relatively entrepreneurial today (see also Section 8.3.1.), Mecklenburg-Western Pomerania never developed a local entrepreneurship culture. Fritsch et al. (2022b) explain the economic success of South Saxony with the early emergence of small-scale innovative industries initiated by ore mining that began in the 12th century. In contrast, the economy in Mecklenburg-Western Pomerania has a long and lasting tradition of large-scale agriculture with a rather weak knowledge base and very low shares of manufacturing.

A general disadvantage of case studies is, however, that it often remains unclear how far the results are specific to the studied region and to what extent they also apply to other regions and countries. Therefore, an important task of case study research is to identify unifying and generalizable features. What is lacking to date is a comprehensive (meta) review of regional case studies that elaborates on unifying features that would allow making inferences about historical drivers of exceptional entrepreneurial breeding grounds. Such an assessment is a promising avenue for future research that may also imply a rediscovery of historical regional case studies (for a review, see Soltow, 1968).

8.7 Summary

Persistence of entrepreneurship and regional culture of entrepreneurship are phenomena that have been recognized only recently. Therefore, research on these issues is still at an early stage. Table 2 provides an overview of the directions of further research on these topics that we discussed above. A fundamental issue of research in the field is an adequate definition of regional entrepreneurial culture.

Table 2: Overview of important directions of future research on regional cultures of entrepreneurship

FUTURE RESEARCH DIRECTION	RESEARCH QUESTIONS
Features of a culture of	What is an adequate definition of a culture of entrepreneurship?

entrepreneurship	How do the elements of an entrepreneurial culture interact? What are the main (recursive) links between social capital and entrepreneurship culture? What are the appropriate metrics for assessing an entrepreneurial culture?
Sources of an entrepreneurial culture	
• Natural conditions (first nature)	What is the role of location fundamentals in the emergence of different types of entrepreneurship and an entrepreneurial culture? How do interactions between natural conditions, historical events, and human agency contribute to the emergence of an entrepreneurial culture?
• Historical events	Why do some specific historical events affect current entrepreneurship and entrepreneurial culture levels and others do not? When does the effect of historical events kick in? What is the role of religion in a culture of entrepreneurship?
• Formal/informal institutions	To what extent can different types of institutions have long-lasting effects on entrepreneurship? How did institutions affect different types of entrepreneurship (culture) in different historical periods? To what extent is the link between institutional change and economic development driven by entrepreneurship and entrepreneurial culture?
• Knowledge	What main factors determine the co-evolution of regional knowledge and entrepreneurship? How does knowledge link historical events and institutional change to the emergence of an entrepreneurial culture?
Sources of persistence of an entrepreneurial culture	What are the main ways of transferring entrepreneurship culture over time? What is the influence of family, peers, firms, and regional and national factors on the persistence of entrepreneurship? What is the role of selective migration in the persistence of an entrepreneurial culture? Which factors and events can activate a collective memory of entrepreneurship in the current population?
Entrepreneurial culture and regional development	Which elements of an entrepreneurial culture are most important for its effect on regional development? Under which conditions is a regional culture of entrepreneurship (not) linked to growth? How do regions with an entrepreneurial culture respond to economic shocks?
Broadening and deepening the evidence	To what extent can the results attained so far be generalized? How does entrepreneurship culture emerge across countries with distinct legacies? How to come up with better measures and data to capture entrepreneurship culture and its persistence?

Still, there is not sufficient clarity on this definition and the link to other related concepts, such as social capital. What is also rather unclear are the main

elements of an entrepreneurial culture and how these main elements are related to each other. There is also an important measurement issue: what are appropriate indications of a regional culture of entrepreneurship and how can it be measured?

Very little is known about the dynamics of an entrepreneurial culture. Key aspects here are the role of natural conditions, historical events, the development of formal and informal institutions, and the regional knowledge base. A closely related question is why a regional culture of entrepreneurship tends to remain over long periods of time once it has been established. Much more should also be known about the relationship between entrepreneurial culture and regional development. For instance, under what conditions is a regional culture of entrepreneurship linked to growth and how do regions with and without such a culture react to external shocks?

Since the empirical evidence attained so far is limited to a rather small number of countries, for the purpose of generalization, it is very important to analyze the persistence of regional entrepreneurship for more and for different types of countries. Broadening the empirical evidence is also important to learn how different national histories and welfare levels shape entrepreneurship and entrepreneurial culture. Further empirical research should also attempt to dig deeper in the sense of making more and better data about historical periods available to enable the identification of historical roots. Regional case studies that include rich qualitative information could play an important role in this respect. A meta-analysis of the already available case studies in this field would be highly desirable.

9. Concluding remarks

Economic development never begins at "zero" and in a social vacuum, but always has a concrete starting point. This starting point and the subsequent evolution can have a strong impact on future developments. In particular, they may strongly shape the response of individuals, regions, and countries to external challenges. The historical roots are manifest not only in economic structures, knowledge levels, and economic performance but also in traditions, mentalities, and value attitudes of the population (Obschonka et al., 2021). All of these are essential elements of a regional "culture."

The exploration of the historical roots of entrepreneurship and regional cultures falls into the realm of various academic disciplines, such as economics, history, sociology, psychology, and political and cultural sciences. This clearly suggests that studies in this field could considerably benefit from a collaboration of scholars of different disciplines.

References

Abdellaoui, A., D. Hugh-Jones, L. Yengo, K. E. Kemper, M. G. Nivard, L. Veul,, Y. Holtz, B. P. Zietsch, T. M. Frayling, N. T. Wray, J. Yang, K. J. H. Verweij and P. M.Visscher (2019), "Genetic correlates of social stratification in Great Britain". *Nature Human Behaviour* 3, 1332-1342. https://doi.org/10.1038/s41562-019-0757-5

Acemoglu, D. Cantoni, S. Johnson and J.A. Robinson (2011), "The Consequences of Radical Reform: The French Revolution". *American Economic Review* 101, 3286-3307. https://www.aeaweb.org/articles/pdf/doi/10.1257/aer.101.7.3286

Acemoglu, D. and J. A. Robinson (2012), *Why nations fail: The Origins of Power, Prosperity, and Poverty*. Profile Books: London.

Acs, Z. J. and P. Mueller (2008), "Employment effects of business dynamics: Mice, Gazelles and Elephants". *Small Business Economics* 30 (1), 85–100.

Acs, Z. J., P. Braunerhjelm, D. B. Audretsch and B. Carlsson (2009), "The knowledge spillover theory of entrepreneurship". *Small Business Economics* 32(1), 15–30. https://doi.org/10.1007/s11187-008-9157-3

Acs, Z. J., and E. Lappi (2021). "Entrepreneurship, culture, and the epigenetic revolution: a research note". *Small Business Economics* 56, 1287-1307. https://doi.org/10.1007/s11187-019-00230-0

Ashraf, Q. H., and O. Galor (2018), "The Macrogenoeconomics of Comparative Development". *Journal of Economic Literature* 56, 1119-55. https://doi.org/10.1257/jel.20161314

Aidis, R., S. Estrin and T. M. Mickiewicz (2012), "Size matters: entrepreneurial entry and government". *Small Business Economics* 39, 119–139. https://doi.org/10.1007/s11187-010-9299-y

Agrawal, A., and A. Goldfarb (2008), "Restructuring research: Communication costs and the democratization of University Innovation". *American Economic Review* 98, 1578–1590. https://doi.org/10.1257/aer.98.4.1578

Akcigit, U. J. Grigsby, and T. Nicholas (2017), "Immigration and the Rise of American Ingenuity". *American Economic Review: Papers and Proceedings* 107, 327-331. https://doi.org/10.1257/aer.p20171021

Aldrich, H. and M. Ruef (2018), "Unicorns, Gazelles, and Other Distractions on the Way to Understanding Real Entrepreneurship in the United States". *Academy of Management Perspectives* 33, 458-472. https://doi.org/10.5465/amp.2017.0123

Alesina A, A. Devleeschauwer, W. Easterly, S. Kurlat and R. Wacziarg (2003), "Fractionalization". *Journal of Economic Growth* 8, 155–194. https://doi.org/10.1023/A:1024471506938

Andersson, M. and S. Koster (2011), "Sources of persistence in regional start-up rates—evidence from Sweden". *Journal of Economic Geography*. 11(1), 179–201. https://doi.org/10.1093/jeg/lbp069

Andersson, M. and J. P. Larsson (2016), "Local entrepreneurship clusters in cities". *Journal of Economic Geography* 16, 39–66, https://doi.org/10.1093/jeg/lbu049

Aoyama, Y. (2009), "Entrepreneurship and Regional Culture: The Case of Hamamatsu and Kyoto, Japan". *Regional Studies* 43, 495–512. https://doi.org/10.1080/00343400902777042

Arauzo-Carod, J.M., and M. Teruel-Carrizosa (2005), "An Urban Approach of Firm Entry: The Effect of Urban Size". *Growth and Change* 36, 508-528. https://doi.org/10.1111/j.1468-2257.2005.00292.x

Armington, C. and Z. J. Acs (2002), "The Determinants of Regional Variation in New Firm Formation". *Regional Studies* 36, 33-45. https://doi.org/10.1080/00343400120099843

Aslund, A. (1985), *Private Enterprise in Eastern Europe*. Palgrave Macmillan: London.

Audretsch, D. B. and M. Fritsch (1994), "On the Measurement of Entry Rates". *Empirica* 21, 105-113. https://doi.org/10.1007/BF01383974

Audretsch, D. B. and M. Fritsch (2002), "Growth Regimes over Time and Space". *Regional Studies* 36, 113-124. https://doi.org/10.1080/00343400220121909

Audretsch, D. B., Bönte, W., and Tamvada, J. P. (2013), "Religion, social class and entrepreneurial choice". *Journal of Business Venturing* 28, 774-789. https://doi.org/10.1016/j.jbusvent.2013.06.002

Baptista, R., V. Escária and P. Madruga (2008), "Entrepreneurship, regional development and job creation: the case of Portugal". *Small Business Economics* 30, 49–58. https://doi.org/10.1007/s11187-007-9055-0

Barbini, F.M., M. Corsino. and P. Giuri (2021), "How do universities shape founding teams? Social proximity and informal mechanisms of knowledge transfer in student entrepreneurship". *Journal of Technology Transfer* 46, 1046–1082. https://doi.org/10.1007/s10961-020-09799-1

Bartels, C., S. Jäger and N. Obergruber (2020), "Long-Term Effects of Equal Sharing: Evidence from Inheritance Rules for Land". NBER Working Paper No. 28230, Cambridge (MA): National Bureau of Economic Research. https://doi.org/10.3386/w28230

Baumol, W. J. (1990), "Entrepreneurship: Productive, Unproductive, and Destructive". *Journal of Political Economy* 98, 893-921. https://doi.org/10.1086/261712

Baumol, W. J. (1993), *Entrepreneurship, Management, and the Structure of Payoffs*. Cambridge, M.A.: MIT Press.

Baumol, W.J., R. Litan and C.J. Schramm (2007), *Good Capitalism, Bad Capitalism, and the Economics of Growth and Prosperity*. New Haven: Yale University Press.

Bazzi, S., M. Fiszbein and M. Gebresilasse (2020), "Frontier Culture: The Roots and Persistence of "Rugged Individualism" in the United States". *NBER Working Paper*, 23997. https://doi.org/10.3386/w23997

Becker, S.O., K. Boeckh, C. Hainz and L. Woessmann (2016), "The Empire Is Dead, Long Live the Empire! Long-Run Persistence of Trust and Corruption in the Bureaucracy". *The Economic Journal* 126, 40-74. https://doi.org/10.1111/ecoj.12220

Becker, S.O., F. Cinnirella, E. Hornung and L. Woessmann (2014), "iPEHD: The ifo Prussian Economic History Database". *Historical Methods* 47, 57-66. https://doi.org/10.1080/01615440.2013.852370

Becker, S.O. and A. Ferrara (2019), "Consequences of forced migration: A survey of recent findings". *Labour Economics*. https://doi.org/10.1016/j.labeco.2019.02.007

Becker, S.O., E. Hornung and L. Woessmann (2011), "Education and catch-up in the Industrial Revolution". *American Economic Journal: Macroeconomics* 3, 92–126. https://doi.org/10.1257/mac.3.3.92

Becker, S.O. and L. Woessmann (2009), "Was Weber wrong? A human capital theory of Protestant economic history". *Quarterly Journal of Economics* 124, 531–596. https://doi.org/10.1162/qjec.2009.124.2.531

Beesley, M.E. and R.T. Hamilton (1984), "Small Firms' Seedbed Role and the Concept of Turbulence". *Journal of Industrial Economics* 33, 217–231.

Belitski, M., Y. Tsareva and S. Zemtsov (2022), "Geography and Persistence of Entrepreneurship in Russia". *Mimeo*.

Bennett, R.J. and G. Newton (2014), "Identifying employers in the population census in England and Wales in 1881". *Local Population Studies* 94, 29-49

Beugelsdijk, S. and N. Noorderhaven (2004), "Entrepreneurial attitude and economic growth: A cross-section of 54 regions". *Annals of Regional Science* 38, 199-218. https://doi.org/10.1007/s00168-004-0192-y

Beugelsdijk, S. (2007), "Entrepreneurial culture, regional innovativeness and economic growth". *Journal of Evolutionary Economics 17*(2), 187–210. https://doi.org/10.1007/s00191-006-0048-y

Beugelsdijk, S. and R. Maseland (2010), *Culture in Economics*. Cambridge: Cambridge University Press.

Bjørnskov, C. and N. J. Foss (2008), "Economic freedom and entrepreneurial activity: some cross country evidence". *Public Choice* 134, 307–328.

Block, J., C. Fisch, T.L. Nguyen and M. Wyrwich (2022), "Historical Institutional Differences and Entrepreneurship: The Case of the Socialist Legacy in Vietnam". *International Review of Entrepreneurship*, forthcoming.

Bloh, J. v., T. Broekel, B. Özgun and R. Sternberg (2020), "New(s) data for entrepreneurship research? An innovative approach to use Big Data on media coverage" *Small Business Economics* 55, 673–694. https://doi.org/10.1007/s11187-019-00209-x

Boettke, P. J. and C. J. Coyne (2009), "Context matters: Institutions and entrepreneurship". *Foundations and Trends in Entrepreneurship* 5, 135–209. https://doi.org/10.1561/0300000018

Bonaccorsi, A., M. Colombo, M. Guerini and C. Rossi-Lamastra (2013), "University specialization and new firm creation across industries". *Small Business Economics* 41, 837–863, https://doi.org/10.1007/s11187-013-9509-5

Boschma, R. (2005), "Proximity and innovation: a critical assessment". *Regional Studies*, 39(1), 61–74. https://doi.org/10.1080/0034340052000320887

Bosma, N., J. Hessels, V. Schutjens, M. Van Praag and I. Verheul (2012), "Entrepreneurship and role models". *Journal of Economic Psychology 33*(2), 410–424. https://doi.org/10.1016/j.joep.2011.03.004

Bosma, N. and R. Sternberg (2014), "Entrepreneurship as an Urban Event? Empirical Evidence from European Cities". *Regional Studies* 48, 1016-1033, https://doi.org/10.1080/00343404.2014.904041

Bradley, S.W. and P. Klein (2016), "Institutions, economic freedom, and entrepreneurship: the contribution of management scholarship". *Academy of Management Perspectives* 30(3), 211–221. https://doi.org/10.5465/amp.2013.0137

Breschi, S., and F. Lissoni (2009), "Mobility of skilled workers and co-invention networks: an anatomy of localized knowledge flows". *Journal of Economic Geography* 9, 439–468. https://doi.org/10.1093/jeg/lbp008

Brezinski, H. and M. Fritsch (1995), "Transformation: The shocking German way". *MOCT-MOST: Economic Policy in Transitional Economies* 5(4), 1–25. https://doi.org/10.1007/BF00996593

Brush, C.G. and S.Y. Cooper (2012), "Female entrepreneurship and economic development: An international perspective". *Entrepreneurship and Regional Development* 24, 1-6, https://doi.org/10.1080/08985626.2012.637340

Buddle, M. (2010), *The Business of Women: Marriage, Family, and Entrepreneurship in British Columbia, 1901–51*. Vancouver: University of British Columbia Press.

Buggle, J.C. (2016), "Law and social capital: Evidence from the Code Napoleon in Germany". *European Economic Review* 87, 148-175. https://doi.org/10.1016/j.euroecorev.2016.05.003

Bullough, A., M. Renko, and T. Myatt (2014), "Danger Zone Entrepreneurs: The Importance of Resilience and Self-Efficacy for Entrepreneurial Intentions". *Entrepreneurship: Theory and Practice* 38, 473–499. https://doi.org/10.1111/etap.12006

Cantoni, D. (2012), “Adopting a new religion: The case of Protestantism in 16th century Germany”. *Economic Journal* 122, 502–531. https://doi.org/10.1111/j.1468-0297.2012.02495.x

Cardon, M. S., C. E. Stevens and D. R. Potter (2011), “Misfortunes or mistakes? Cultural sensemaking of entrepreneurial failures”. *Journal of Business Venturing* 26, 79–92. https://doi.org/10.1016/j.jbusvent.2009.06.004

Carlen, J. (2016), *A Brief History of Entrepreneurship: The Pioneers, Profiteers, and Racketeers Who Shaped Our World*. Columbia University Press.

Chlosta, S., H. Patzelt, S. B. Klein and C. Dormann (2012), “Parental role models and the decision to become self-employed: the moderating effect of personality”. *Small Business Economics* 38, 121–138. https://doi.org/10.1007/s11187-010-9270-y.

Coleman, J.S. (1988), “Social capital in the creation of human capital”. *American Journal of Sociology* (Supplement) 94, 95–120. https://doi.org/10.1086/228943

Colombelli, A. (2016), “The impact of local knowledge bases on the creation of innovative start-ups in Italy”. *Small Business Economics* 47, 383– 96. https://doi.org/10.1007/s11187-016-9722-0

Combes, P.-P., G. Duranton, L. Gobillon, S. Roux (2010), “Estimating agglomeration economies with history, geology, and worker effects”. In E. Glaeser (ed.) *The Economics of Agglomeration*. Chicago, IL: University of Chicago Press, pp. 15-66. https://www.nber.org/chapters/c7978

Cosci, S., V. Meliciani and M. Pini (2021), “Historical roots of innovative entrepreneurial culture: the impact of firms using motive power in 1927 on Italian provincial start-up rate”. *Regional Studies*. https://doi.org/10.1080/00343404.2021.2002838

Christensen, Clayton M., Michael Raynor, and Rory McDonald. "What Is Disruptive Innovation?" Harvard Business Review 93, no. 12 (December 2015): 44–53.

Dahl, M.S. and O. Sorenson (2009), “The embedded entrepreneur”. *European Managament Review* 6, 172–181. https://doi.org/10.1057/emr.2009.14.

Davidsson, P. and B. Honig (2003), “The role of social and human capital among nascent entrepreneurs”. *Journal of Business Venturing* 18, 301–331. https://doi.org/10.1016/S0883-9026(02)00097-6

Davis, D. R. and D. E. Weinstein (2002), “Bones, bombs, and break points: The geography of economic activity”. *American Economic Review* 92(5), 1269–1289. https://doi.org/10.1257/000282802762024502

Davies, N. (2011), *Vanished kingdoms: The history of half-forgotten Europe*. London: Penguin.

De Blasio, G. and G. Nuzzo (2009), “Historical Traditions of civicness and local economic development”. *Journal of Regional Science* 50, 833-857. https://doi.org/10.1111/j.1467-9787.2009.00624.x

Del Monte, A. and E. Papagni (2007), "The determinants of corruption in Italy: Regional panel data analysis". *European Journal of Political Economy* 23, 379-396. https://doi.org/10.1016/j.ejpoleco.2006.03.004

Del Monte, A. and L. Pennacchio (2020), "Historical roots of regional entrepreneurship: The role of knowledge and creativity". *Small Business Economics* 55, 1–22. http://doi.org/10.1007/s11187-019-00139-8

Del Monte, A., S. Moccia and L. Pennacchio (2022), "Regional entrepreneurship and innovation: historical roots and the impact on the growth of regions". *Small Business Economics* 58, 451-473. https://doi.org/10.1007/s11187-020-00425-w

Diamond, J. M. and J. A. Robinson (2010), *Natural experiments of history*. Cambridge, MA: Belknap Press of Harvard University Press.

Dininio, P. and R. Orrtung (2005), "Explaining Patterns of Corruption in the Russian Regions". *World Politics* 57, 500-29. https://doi.org/10.1353/wp.2006.0008

Dittmar, J. and R.R. Meisenzahl (2020a), "Public goods institutions, human capital, and growth: evidence from German history". *Review of Economic Studies* 87, 959–996. https://doi.org/10.1093/restud/rdz002

Dittmar, J. and R.R. Meisenzahl (2020b), "The Research University, Invention, and Industry: Evidence from Germany 1760-1900". *Mimeo*.

Doepke, M. and F. Zilibotti (2005), "Social Class and the Spirit of Capitalism". *Journal of the European Economic Association* 3, 516-524. https://doi.org/10.1162/jeea.2005.3.2-3.516

Dohmen, T., A. Falk, D. Huffman and U. Sunde (2012), "The Intergenerational Transmission of Risk and Trust Attitudes". *Review of Economic Studies* 79, 645-677. https://doi.org/0.1093/restud/rdr027

Duflo, E. (2012), "Women Empowerment and Economic Development". *Journal of Economic Literature* 50, 1051-79, https://doi.org/10.1257/jel.50.4.1051

Earle, J.S. and Z. Sakova (2000), "Business Start-ups or Disguised Unemployment? Evidence on the Character of Self-Employment from Transition Economies". *Labour Economics* 7, 575-601. https://doi.org/10.1016/S0927-5371(00)00014-2

Eesley, C.E. and W.F. Miller (2018), "Impact: Stanford University's Economic Impact via Innovation and Entrepreneurship". *Foundations and Trends® in Entrepreneurship* 14 (2), 130-278. http://dx.doi.org/10.1561/0300000074

Ehrhardt, K. and S. Haenni (2021), "The Cultural Roots of Firm Entry, Exit, and Growth". *CESifo Working Paper* 9198.

Elert, N., M. Henrekson and M. Stenkula (2017), *Institutional Reform for Innovation and Entrepreneurship—An Agenda for Europe*. Springer Nature, Cham. https://doi.org/10.1007/978-3-319-55092-3

Elfenbein, D. W., B. H. Hamilton and T. R. Zenger (2010), "The small firm effect and the entrepreneurial spawning of scientists and engineers". *Management Science* 56, 659–681 https://doi.org/10.1287/mnsc1090.1130

Estrin, S. and T. Mickiewicz (2011), "Entrepreneurship in Transition Economies: The Role of Institutions and Generational Change". In M. Minniti (ed.), *The Dynamics of Entrepreneurship: Evidence from Global Entrepreneurship Monitor Data*. Oxford: Oxford University Press, pp. 181–208. https://doi.org/10.1093/acprof:oso/9780199580866.003.0009

Etzioni, A. (1987), "Entrepreneurship, adaptation and legitimation: A macro-behavioral perspective". *Journal of Economic Behavior and Organization 8*(2), 175–189. https://doi.org/10.1016/0167-2681(87)90002-3

Etzkowitz, H. (2000), *The second academic revolution: MIT and the rise of entrepreneurial science*. London: Gordon and Breach.

Fagan, B. (2019), *The Little Ice Age: How Climate Made History 1300-1850*. Basic Books.

Feldman, M.P. (2001), "The Entrepreneurial Event Revisited: Firm Formation in a Regional Context". *Industrial and Corporate Change* 10, 861-891. https://doi.org/10.1093/icc/10.4.861

Feldman, M.P., J. Francis and J. Bercovitz (2005), "Creating a Cluster While Building a Firm: Entrepreneurs and the Formation of Industrial Clusters". *Regional Studies* 39, 129-141. https://doi.org/10.1080/0034340052000320888

Fernandez, R. and J.C. Wong (2014), "Unilateral divorce, the decreasing gender gap, and married women's labor force participation". *American Economic Review* 104, 342-347. https://doi.org/10.1257/aer.104.5.342

Florida, R. (2004), *The Rise of the Creative Class*. Basic Books: New York.

Florida, R. and C. Mellander (2015), "Talent, cities, and competitiveness". In: *The Oxford Handbook of Local Competitiveness*. Oxford: Oxford University Press, pp. 34-53.

Flueckiger, M., E, Hornung, M. Larch, M. Ludwig and A. Mees (2022), "Roman Transport Network Connectivity and Economic Integration". *Review of Economic Studies* 89, 774-810. https://doi.org/10.1093/restud/rdab036

Fornahl, D. (2003) "Entrepreneurial activities in a regional context". In: D. Fornahl and T. Brenner (eds.): *Cooperation, networks, and institutions in regional innovation systems*. Cheltenham: Elgar, pp. 38–57.

Fotopoulos, G. (2014), "On the spatial stickiness of UK new firm formation rates". *Journal of Economic Geography 14*(3), 651–679. https://doi.org/10.1093/jeg/lbt011

Fotopoulos, G. and D. J. Storey (2017), "Persistence and change in interregional differences in entrepreneurship: England and Wales, 1921–2011". *Environment and Planning A 49*(3), 670–702. https://doi.org/10.1177/0308518x16674336

Freytag, A. and R. Thurik (2007), "Entrepreneurship and its determinants in a cross-country setting". *Journal of Evolutionary Economics* 17, 117–131. https://doi.org/10.1007/s00191-006-0044-2

Friedricks, W. B. (1989), "A Metropolitan Entrepreneur Par Excellence: Henry E. Huntington and the Growth of Southern California, 1898–1927". *Business History Review* 63, 329-355, https://doi.org/10.2307/3115699

Fritsch, M. and O. Falck (2007), "New Business Formation by Industry over Space and Time: A Multidimensional Analysis". *Regional Studies* 41(2), 157–172. https://doi.org/10.1080/00343400600928301

Fritsch, M. and P. Mueller (2007), "The Persistence of Regional New Business Formation-Activity over Time—Assessing the Potential of Policy Promotion Programs". *Journal of Evolutionary Economics* 17, 299-315. https://doi.org/10.1007/s00191-007-0056-6

Fritsch, M. (2011), "Start-ups in Innovative Industries – Causes and Effects". In: D.B. Audretsch, O. Falck, S. Heblich and A. Lederer (eds.): *Handbook of Innovation and Entrepreneurship*, Cheltenham 2011: Elgar, pp. 365-381.

Fritsch, M. and A. Rusakova (2012), "Self-Employment after Socialism: Intergenerational Links, Entrepreneurial Values, and Human Capital". *International Journal of Developmental Science* 6, 167–175. https://doi.org/10.3233/DEV-2012-12106

Fritsch, M. (2013), "New Business Formation and Regional Development—A Survey and Assessment of the Evidence". *Foundations and Trends in Entrepreneurship* 9, 249–364. https://doi.org/10.1561/0300000043

Fritsch, M. and M. Wyrwich (2014), "The Long Persistence of Regional Levels of Entrepreneurship: Germany, 1925-2005". *Regional Studies 48*(6), 955–973. https://doi.org/10.1080/00343404.2013.816414

Fritsch, M. and M. Wyrwich (2016), "The Persistence of Regional Entrepreneurship – Are all types of self-employment equally important?" In: E. Mack and H. Qian (eds.): *Geographies of Entrepreneurship*. Abindgdon: Routledge, pp. 48-67.

Fritsch, M. and R. Aamoucke (2017), "Fields of knowledge in higher education institutions, and innovative start-ups: An empirical investigation". *Papers in Regional Science* 96, S1-S27. https://doi.org/10.1111/pirs.12175

Fritsch, M. and M. Wyrwich (2017), "The Effect of Entrepreneurship for Economic Development—An empirical analysis using regional entrepreneurship culture". *Journal of Economic Geography* 17, 157-189. https://doi.org/10.1093/jeg/lbv049

Fritsch, M. and M. Wyrwich (2018), "Regional Knowledge, Entrepreneurial Culture and Innovative Start-ups over Time and Space—An Empirical Investigation". *Small Business Economics* 51, 337-353. https://doi.org/10.1007/s11187-018-0016-6

Fritsch, M. and S. Kublina (2019), "Persistence and Change of Regional New Business Formation in the National League Table". *Journal of Evolutionary Economics* 29, 891-917. https://doi.org/10.1007/s00191-019-00610-5

Fritsch, M., A. Sorgner, M. Wyrwich and E. Zazdravnykh (2019a), "Historical Shocks and Persistence of Economic Activity: Evidence on Self-Employment from a Unique Natural Experiment". *Regional Studies* 53, 790-802. https://doi.org/10.1080/00343404.2018.1492112

Fritsch, M., M. Obschonka and M. Wyrwich (2019b), "Historical roots of entrepreneurship-facilitating culture and innovation activity: an analysis for German regions". *Regional Studies* 53(9), 1296–1307. https://doi.org/10.1080/00343404.2019.1580357

Fritsch, M., A. Sorgner and M. Wyrwich (2019c), "Self-Employment and Well-Being across Institutional Contexts". *Journal of Business Venturing* 34, 105946. https://doi.org/10.1016/j.jbusvent.2019.105946

Fritsch, M. and M. Wyrwich (2019), *Regional Trajectories of Entrepreneurship, Knowledge, and Growth—The Role of History and Culture*. Cham: Springer. https://link.springer.com/book/10.1007%2F978-3-319-97782-9

Fritsch, M., K. Pylak and M. Wyrwich (2021a), "Historical Roots of Entrepreneurship in Different Regional Contexts—The Case of Poland". *Small Business Economics*. https://doi.org/10.1007/s11187-021-00535-z

Fritsch, M., M. Obschonka, F. Wahl and M. Wyrwich (2021b), "Cultural Imprinting: Ancient Origins of Entrepreneurship and Innovation in Germany". *Jena Economic Research Papers* #2020-012, Friedrich Schiller University Jena. https://ideas.repec.org/p/jrp/jrpwrp/2021-012.html

Fritsch, M., M. Greve and M. Wyrwich (2021c), "One Transition Story Does Not Fit Them All: Initial regional conditions and new business formation after communism". *Post-Communist Economies*. https://doi.org/10.1080/14631377.2021.1943912

Fritsch, M., A. Sorgner and M. Wyrwich (2021d), "Types of Institutions and Well-Being of Self-Employed and Paid Employees in Europe". *Small Business Economics* 56, 877-901. https://doi.org/10.1007/s11187-019-00274-2

Fritsch, M. and M. Wyrwich (2022), "Initial Conditions and Regional Performance in the Aftermath of Disruptive Shocks: The Case of East Germany after Socialism". *Industrial and Corporate Change*. https://doi.org/10.1093/icc/dtac033

Fritsch, M., M. Greve and M. Wyrwich (2022a), "The Long-run Effects of Communism and Transition to a Market System on Self-Employment: The Case of Germany". *Entrepreneurship Theory and Practice*. https://doi.org/10.1177/10422587221094498

Fritsch, M., M. Greve and M. Wyrwich (2022b), "The Deep Historical Roots of Industrial Culture and Regional Entrepreneurship—A case study of two regions. In: R. Huggins, F. Kitagawa, D. Prokop, C. Theodoraki and P.

Thompson (eds.): *Entrepreneurial Ecosystems in Cities and Regions: Emergence, Evolution, and Future*. Oxford: Oxford University Press (forthcoming).

Fukuyama, F. (1995), *Trust: The Social Virtues and the Creation of Prosperity*. New York: Free Press.

Garnsey, E. and P. Heffernan (2005), "High-technology clustering through spin-out and attraction: The Cambridge case". *Regional Studies* 39 (8), 1127–1144. https://doi.org/10.1080/00343400500328289

Ge, J., M. Carney and F. Kellermanns (2019), "Who fills Instiutional Voids? Entrepreneurs' Utilization of Political and Family Ties in Emerging Markets". *Entrepreneurship: Theory and Practice* 43, 1124-1147. https://doi.org/10.1177/1042258718773175

Gelderen, M. van, (2016), "Entrepreneurial autonomy and its dynamics". *Applied Psychology: an International Review* 65, 541-567. https://doi.org/10.1111/apps.12066

Geroski, P. A. (1995), "What do we know about entry?". *International Journal of Industrial Organization* 13, 421–440. https://doi.org/10.1016/0167-7187(95)00498-X

Gherhes, C., T. Vorley and N. Williams (2018), "Entrepreneurship and local economic resilience: The impact of institutional hysteresis in peripheral places". *Small Business Economics* 51(3), 577–590. https://doi.org/10.1007/s11187-017-9946-7

Gherhes, C., T. Vorley and C. Brooks (2020), "Making Sense of Industrial Decline: how Legacies of the Past Influence the Development of Entrepreneurship Cultures in Formerly Industrialized Places". *Entrepreneurship & Regional Development* 32, 899-921. https://doi.org/10.1080/08985626.2020.1842914

Giannetti, M.and A. Simonov (2009), "Social interactions and entrepreneurial activity". *Journal of Economics and Management Strategy* 18, 665–709. https://doi.org/10.1111/j.1530-9134.2009.00226.x

GierynT.F. (2000), "A Space for Place in Sociology". *Annual Review of Sociology* 26, 453-496. https://doi.org/10.1146/annurev.soc.26.1.463

Glaeser, E.L. (2007), "Entrepreneurship and the City". *NBER Working Paper* 13551, Cambridge, MA: National Bureau of Economic Research. http://www.nber.org/papers/w13551

Glaeser E., P. Ker and W. R. Kerr (2015), "Entrepreneurship and Urban Growth: An Empirical Assessment with Historical Mines". *Review of Economics and Statistics* 97(2), 498–520. https://doi.org/10.1162/REST_a_00456

Goethner, M. and M. Wyrwich (2020), "Cross-faculty proximity and academic entrepreneurship: the role of business schools". *Journal of Technology Transfer* 45, 1016-1062. https://doi.org/10.1007/s10961-019- 09725-0

Goldin, C. (2014), "A Grand Gender Convergence: Its Last Chapter". *American Economic Review* 104, 1091-1119. https://doi.org/10.1257/aer.104.4.1091

Grabher G (1993) The weakness of strong ties—the lock-in of regional development in the Ruhr area. In: G. Grabher (ed.): *The embedded firm. Routledge*, London, pp. 255–277.

Graf, H. (2011), "Gatekeepers in regional networks of innovators". *Cambridge Journal of Economics* 35, 173–198. https://doi.org/10.1093/cje/beq001

Guiso, L., Sapienza, P. and L. Zingales (2006), "Does Culture Affect Economic Outcomes?" *Journal of Economic Perspectives* 20(2), 23-48. https://doi.org/10.1257/jep.20.2.23

Gutberlet, T. (2014), "Mechanization and the spatial distribution of industries in the German Empire, 1875 to 1907". *Economic History Review* 67, 463–491. https://doi.org/10.1111/1468-0289.12028

Guzman, J. and S. Stern (2020), "The State of American Entrepreneurship: New Estimates of the Quantity and Quality of Entrepreneurship for 32 US States 1988–2014". *American Economic Journal: Economic Policy* 12, 212–243. https://www.aeaweb.org/articles?id=10.1257/pol.20170498

Hall, P. (1998): *Cities in Civilization*. New York: Pantheon.

Haywood, R.C. (1986), *Trails South: The Wagon-Road Economy in the Dodge City-Panhandle Region*. Norman: University of Oklahoma Press.

Heldring, L., J. A. Robinson and S. Vollmer (2021), "The Long-Run Impact of the Dissolution of the English Monasteries". *Quarterly Journal of Economics* 136(4), 2093–2145. https://doi.org/10.1093/qje/qjab030

Helsley, R. W. and W. C. Strange (1991), "Agglomeration economies and urban capital markets". *Journal of Urban Economics* 29, 96–112. https://doi.org/10.1016/0094-1190%2891%2990029-7

Henrekson, M. and D. Johansson (2010), "Gazelles as job creators: a survey and interpretation of the evidence". *Small Business Economics* 35, 227–244. https://doi.org/10.1007/s11187-009-9172-z

Henley, A. (2017), "Does religion influence entrepreneurial behaviour?" *International Small Business Journal* 35, 597-617. https://doi.org/10.1177/0266242616656748

Heuvel, D.v.d. (2007), *Women and Entrepreneurship: Female Traders in the Northern Netherlands, c.1580–1815.* Amsterdam: Aksant.

Hjalager, A.-M. (1989), "Why No Entrepreneurs? Lifemodes, Every-day Life, and Unemployment Strategies in an Underdeveloped Region". *Entrepreneurship and Regional Development* 1, 85-97. https://doi.org/10.1080/08985628900000008

Hofstede, G. and R.R. McCrea (2004), "Personality and Culture Revisited: Linking Traits and Dimensions of Culture". *Cross-Cultural Research* 38(1), 52-88. https://doi.org/10.1177/1069397103259443

Holler, R. and P.I. Schäfer (2021), "Norm Prevalence and Interdependence: Evidence from a Large-Scale Historical Survey of German speaking Villages". Working Paper University of Bonn and University of Cologne, Germany. http://hdl.handle.net/10419/248660

Hoogendoorn, B., C.A. Rietveld and A. van Stel (2016) "Belonging, believing, bonding, and behaving: the relationship between religion and business ownership at the country level". *Journal of Evolutionary Economics* 26, 519-550. https://doi.org/10.1007/s00191-016-0447-7

Hornung, E. (2014), "Immigration and the Diffusion of Technology: The Huguenot Diaspora in Prussia". *American Economic Review* 104, 84-122. https://doi.org/10.1257/aer.104.1.84

Horst, T. (2010), „In Altbayern gab es einst Weinbau. Der „Baierwein" im Spiegel frühneuzeitlicher Karten". *Schönere Heimat* 99, 25–30.

Hsu, D. H., E. B. Roberts and C. E. Eesley (2007), "Entrepreneurs from technology-based universities: Evidence from MIT". *Research Policy* 36, 768–788. https://doi.org/10.1016/j.respol.2007.03.001

Huggins, R. and P. Thompson (2016), "Socio-Spatial Culture and Entrepreneurship: Some Theoretical and Empirical Observations". *Economic Geography* 92, 269-300. https://doi.org/10.1080/00130095.2016.1146075

Hunning, Th. R. and F. Wahl (2021), "The origins of agricultural inheritance traditions". *Journal of Comparative Economics*. https://doi.org/10.1016/j.jce.2021.01.004

Jacobs, J. (1969), *The economy of cities.* New York: Random House.

Jaffe, A. B., M. Trajtenberg and R. Henderson (1993), "Geographic localization and knowledge spillovers as evidenced by patent citations". *Quarterly Journal of Economics* 108, 577–598. https://doi.org/10.2307/2118401

Karlsson, C. and J. Larsson (1993), "A macro view of the Gnosjo entrepreneurial spirit". *Entrepreneurship and Regional Development* 5, 117-140. https://doi.org/10.1080/08985629300000009

Karnane, P. and M.A. Quinn (2019), "Political instability, ethnic fractionalization and economic growth". *International Economics and Economic Policy* 16, 435–461. https://doi.org/10.1007/s10368-017-0393-3

Kauffeld-Monz, M. and M. Fritsch (2013), "Who Are the Knowledge Brokers in Regional Systems of Innovation? A Multi-Actor Network Analysis". *Regional Studies* 47, 669–685. https://doi.org/10.1080/00343401003713365

Kenney, M. and U. von Burg (1999), "Technology and Path Dependence: The Divergence between Silicon Valley and Route 128". *Industrial and Corporate Change* 8, 67-103. https://doi.org/10.1093/icc/8.1.67

Kenney, M. and D.A. Patton (2005), "Entrepreneurial Geographies: Support Networks in Three High-Technology Industries". *Economic Geography* 81, 201-228, https://doi.org/10.1111/j.1944-8287.2005.tb00265.x

Kerr, S.P. and W.R. Kerr (2020), „Immigrant entrepreneurship in America : evidence from the survey of business owners 2007 & 2012". *Research Policy* 49, 103918. https://doi.org/10.1016/j.respol.2019.103918

Khanna, T. and K.G. Palepu (2010), *Winning in Emerging Markets: A Road Map for Strategy and Execution*. Harvard Business Review Press: Boston, MA.

Kibler, E., T. Kautonen and M. Fink (2014), "Regional Social Legitimacy of Entrepreneurship: Implications for Entrepreneurial Intention and Start-up Behaviour". *Regional Studies* 48(6), 995–1015. https://doi.org/10.1080/00343404.2013.851373

Kleinhempel, J., S. Beugelsdijk and M. Klasing (2020a), "The Changing Role of Social Capital During the Venture Creation Process: A Multilevel Study". *Entrepreneurship: Theory and Practice*. https://doi.org/10.1177/1042258720913022

Kleinhempel, J, S. Beugelsdijk and M. Klasing (2020b), "Cultural Roots of Entrepreneurship: Evidence from Second-Generation Immigrants". *Academy of Management Proceedings* 17453. https://doi.org/10.5465/AMBPP.2020.17453abstract

Klepper, S. (1997), "Industry Life Cycles". *Industrial and Corporate Change* 6, 145–182. https://doi.org/10.1093/icc/6.1.145

Klepper, S. (2010), "The origin and growth of industry clusters: The making of Silicon Valley and Detroit". *Journal of Urban Economics* 67, 15-32. https://doi.org/10.1016/j.jue.2009.09.004

Knack, S. and P. Keefer (1997), "Does social capital have an economic payoff? A cross-country investigation". *Quarterly journal of economics* 112, 1251–1288.

Kobayashi, N. (2020): A factor analysis of business start-up rates in Japan: contemporary and historical context. Nishinomiya: Kwansei Gakuin University (Discussion paper no. 202).

Kopsidis, M. and D. W. Bromley (2016), "The French revolution and German industrialization: dubious models and doubtful causality". *Journal of Institutional Economics* 12, 161-190. https://doi.org/10.1017/S1744137415000223

Koster, S. and L. Hans (2017), "History repeating! Spatial dynamics in Dutch start-up rates (1996–2013)". *Tijdschrift voor Economische en Sociale Geografie* 108, 250-257. https://doi.org/10.1111/tesg.12242

Lafuente, E., Y. Vaillant and J. Rialp (2007), "Regional Differences in the Influence of Role Models: Comparing the Entrepreneurial Process of Rural Catalonia". *Regional Studies* 41, 779-796. https://doi.org/10.1080/00343400601120247

Landes, D.S., J. Mokyr and W.J. Baumol (2010), *The Invention of Enterprise: Entrepreneurship from Ancient Mesopotamia to Modern Times.* Princeton: Princeton University Press.

Laspita, S., N. Breugst, S. Heblich and P. Patzelt (2012), "Intergenerational transmission of entrepreneurial intentions". *Journal of Business Venturing* 27, 414–435. https://doi.org/10.1016/j.jbusvent.2011.11.006

Lazear, E.P. (2004), "Balanced skills and entrepreneurship". *American Economic Review* 94, 208–211. https://doi.org/10.1257/0002828041301425

Lazear, E.P. (2005), "Entrepreneurship". *Journal of Labor Economics* 23, 649–680. https://doi.org/10.1086/491605

Lecce, G. and L. Ogliari (2017), "Institutional Transplant and Cultural Proximity: Evidence from Nineteenth-Century Prussia". *Igier Working Paper* 598.

Lee, S.-Y., R. Florida and Z.J. Acs (2004), "Creativity and Entrepreneurship: A Regional Analysis of New Firm Formation". *Regional Studies* 38, 879-891, https://doi.org/10.1080/0034340042000280910

Lerner, J. and U. Malmendier (2013), "With a Little Help from My (Random) Friends: Success and Failure in Post-Business School Entrepreneurship". *The Review of Financial Studies* 26, 2411–2452. https://doi.org/10.1093/rfs/hht024

Lindquist, M., J. Sol and M. v. Praag (2015), "Why do entrepreneurial parents have entrepreneurial children?" *Journal of Labour Economics* 33, 269–296. https://doi.org/10.1086/678493

Liu, S. (2015), "Spillovers from universities: Evidence from the land-grant program". *Journal of Urban Economics* 87, 25-41. https://doi.org/10.1016/j.jue.2015.03.001

Liu, Z., Z. Xu, Z. Zhou and Y. Li (2019), "Buddhist entrepreneurs and new venture performance: The mediating role of entrepreneurial risk-taking". *Small Business Economics* 52, 713-727. https://doi.org/10.1007/s11187-017-9981-4

Mahoney, J. (2000), "Path dependen in historical sociology". *Theory and Society* 29, 507-548. https://doi.org/10.1023/A:1007113830879

Mair, J., and I. Martí (2009), "Entrepreneurship in and around institutional voids: a case study from Bangladesh". *Journal of Business Venturing* 24, 419-435. https://doi.org/10.1016/j.jbusvent.2008.04.006

Marquis, C. and J. Battilana (2009), "Acting globally but thinking locally? The enduring influence of local communities on organizations". *Research in Organizational Behavior* 29, 283-302. https://doi.org/10.1016/j.riob.2009.06.001

Marshall, A. (1920), *Principles of Economics*. 8th edition, London: McMillan.

Martin, R. and P. Sunley (2006), "Path dependence and regional economic evolution". *Journal of Economic Geography* 6, 395–437. https://doi.org/10.1093/jeg/lbl012

McClelland, D.C. (1961), *The Achieving Society*. Princeton, NJ: Van Nostrand Reinhold.

McCrae, R.R. et al. (2005), “Personality Profiles of Cultures: Aggregate Personality Traits”. *Journal of Personality and Social Psychology* 89, 407–425. https://doi.org/10.1037/0022-3514.89.3.407

Michalopoulos, S. and M.M. Xue (2021), „Folklore“. *The Quarterly Journal of Economics* 136 (4), 1993–2046. https://doi.org/10.1093/qje/qjab003

Michelacci, C. and O. Silva (2007), “Why so many local entrepreneurs?”. *Review of Economics and Statistics* 89, 615–33. https://doi.org/10.1162/rest.89.4.615

Mickiewicz, T. and A. Rebmann (2020), "Entrepreneurship as Trust". *Foundations and Trends in Entrepreneurship* 16, 244-309. http://dx.doi.org/10.1561/0300000088

Mieck, I. (2009), *Kleine Wirtschaftsgeschichte der neuen Bundesländer*. Geschichte. Stuttgart: Steiner.

Miller, D., J. Lee S. Changand I. Le Breton-Miller (2009), “Filling the institutional void: The social behavior and performance of family vs non-family technology firms in emerging markets”. *Journal of International Business Studies* 40, 802–817. https://doi.org/10.1057/jibs.2009.11

Miller, D. and I. Le Breton-Miller (2017), “Underdog Entrepreneurs: A Model of Challenge–Based Entrepreneurship”. *Entrepreneurship Theory and Practice* 41, 7–17. https://doi.org/10.1111/etap.12253

Minniti, M. (2005), “Entrepreneurship and network externalities”. *Journal of Economic Behavior and Organization* 57(1), 1–27. https://doi.org/10.1016/j.jebo.2004.10.002

Mokyr, J. (2017), *A culture of growth: The origins of the modern economy*. Princeton, NJ: Princeton University Press.

Mokyr, J. (2018), “Bottom-up or top-down? The origins of the industrial revolution”. *Journal of Institutional Economics* 14, 1003–24. https://doi.org/10.1017/S174413741700042x

Moser, P., A. Voena and F. Waldinger (2014), “German-Jewish Émigrés and U.S. Invention”. *American Economic Review* 104, 3222-3255. https://doi.org/10.1257/aer.104.10.3222

Munoz, L.G., and P.F. Perez (2007), “Female Entrepreneurship in Spain during the Nineteenth and Twentieth Centuries”. *Business History Review* 81, 495-515. https://doi.org/10.1017/S0007680500036692

Mueller, S.J. and A.S. Thomas (2001), “Culture and entrepreneurial potential: A nine country study of locus of control and innovativeness”. *Journal of Business Venturing* 16, 51-75. https://www.sciencedirect.com/science/article/abs/pii/S0883902699000397

Mueller, P., A. van Stel and D. J. Storey (2008), “The effect of new firm formation on regional development over time: The case of Great Britain”. *Small Business Economics* 30, 59–71. https://doi.org/10.1007/s11187-007-9056-z

Nanda, R. and J.B. Sorensen (2010), "Workplace Peers and Entrepreneurship". *Management Science* 56(7), 1116–1126. https://doi.org/10.1287/mnsc.1100.1179

Nisbett, R. E. and D. Cohen (1996), *Culture of honor: The psychology of violence in the South.* Westview Press.

Niittykangas, H. and H. Tervo (2005), "Spatial variations in intergenerational transmission of self-employment". *Regional Studies* 39 (3), 319–332. https://doi.org/10.1080/00343400500087166

North, D.C. (1994), "Economic performance through time". *American Economic Review* 84(3), 359–368.

Noseleit, F. (2010), "The Entrepreneurial Culture: Guiding Principles of the Self-Employed". In: A. Freytag and R. Thurik (eds.): *Entrepreneurship and Culture*. Springer, Berlin, Heidelberg, pp. 41-54. https://doi.org/10.1007/978-3-540-87910-7_3

Noseleit, F. (2013), "Entrepreneurship, Structural Change, and Economic Growth". *Journal of Evolutionary Economics* 23, 735–766. https://doi.org/10.1007/s00191-012-0291-3

Noseleit, F. (2015), "The role of entry and market selection for the dynamics of regional diversity and specialization". *Regional Studies* 49, 76-94. https://doi.org/10.1080/00343404.2012.708729

Novosák, J., L. Severová, J. Novosáková, K. Šrédl, O. Hájek and D. Spiesová (2020), "Long-Term Persistence in Entrepreneurship: Case of Post-Socialist Czechia (1930-2011)". *Mimeo*.

Nunn, N. (2008), "The Long Term Effects of Africa's Slave Trades". *Quarterly Journal of Economics* 123, 139-176. https://doi.org/10.1162/qjec.2008.123.1.139

Nunn, N. (2009), "The importance of history for economic development". *Annual Review of Economics* 1, 65-92. https://doi.org/10.1146/annurev.economics.050708.143336

Nunn, N. and L. Wantchekon (2011), "The Slave Trade and the Origins of Mistrust in Africa". *American Economic Review* 101, 3221-3252. https://doi.org/10.1257/aer.101.7.322

Nunn, N. and D. Puga (2012), "Ruggedness: The Blessing of Bad Geography in Africa". *Review of Economics and Statistics* 94, 20-36. https://doi.org/10.1162/REST_a_00161

Nunziata, L. and L. Rocco (2016), "A Tale of Minorities: Evidence on Religious Ethic and Entrepreneurship". *Journal of Economic Growth* 27, 189-224. https://doi.org/10.1007/s10887-015-9123-2

Nunziata, L. and L. Rocco (2017), "The Protestant Ethic and Entrepreneurship: Evidence from Religious Minorities in the Former Holy Roman Empire".

European Journal of Political Economy 51, 27-43. https://doi.org/10.1016/j.ejpoleco.2017.04.001

Obschonka, M., E. Schmitt-Rodermund, R. K. Silbereisen, S. D. Gosling and J. Potter (2013), "The regional distribution and correlates of an entrepreneurship-prone personality profile in the United States, Germany, and the United Kingdom: a socioecological perspective". *Journal of Personality and Social Psychology* 105, 104–122. https://doi.org/10.1037/a0032275

Obschonka, M., M. Stuetzer, S. D. Gosling, P. J. Rentfrow, M. E. Lamb, J. Potter and D. B. Audretsch (2015), "Entrepreneurial regions: do macro-psychological cultural characteristics of regions help solve the "knowledge paradox" of economics?" *PLoS One* 10, e012933. https://doi.org/10.1371/journal.pone.0129332

Obschonka, M. and D. B. Audretsch (2020), "Artificial intelligence and big data in entrepreneurship: a new era has begun." *Small Business Economics* 55 (3), 529–539. https://doi.org/10.1007/s11187-019-00202-4

Obschonka, M., M. Fritsch and M. Stuetzer (2021), *The Geography of Entrepreneurial Psychology*. Cheltenham: Elgar.

Obschonka, M., M. Fritsch, F. Wahl, M. Wyrwich, S. Gosling and J. Rentfrow (2022), "The psychological legacy of ancient high cultures: The Roman Empire, present-day personality and well-being variation in Germany". *Mimeo*.

Ochsner, C. and F. Roesel (2017), "Activated History - The Case of the Turkish Sieges of Vienna". CESifo Working Paper No. 6586. https://www.cesifo.org/de/publikationen/2017/working-paper/activated-history-case-turkish-sieges-vienna

OECD (2020), *International Compendium of Entrepreneurship Policies*. Paris: OECD Publishing. https://doi.org/10.1787/338f1873-en

Ogilvie, S. (2011), *Institutions and European Trade: Merchant Guilds, 1000–1800*. Cambridge: Cambridge University Press.

Olick, J.K., V. Vinitzky-Seroussi and D. Levy (2011), "Introduction". In: J.K. Olick, V. Vinitzky-Seroussi and D. Levy (eds.): *The Collective Memory Reader*. Oxford: Oxford University Press, pp. 3-62.

Opper, S. and F. N. G. Andersson (2019), "Are entrepreneurial cultures stable over time? Historical evidence from China". *Asia Pacific Journal of Management* 36, 1165–1192. https://doi.org/10.1007/s10490-018-9573-0

O'Shea, R.P., T.J. Allen, A. Chevalier and F. Roche (2005), "Entrepreneurial orientation, technology transfer and spinoff performance of U.S. universities". *Research Policy* 34, 994-1009. https://doi.org/10.1016/j.respol.2005.05.011

Parboteeah, K.P., S.G. Walter and J.H. Block (2015), "When does Christian religion matter for entrepreneurial activity? The contingent effect of a country's

investments into knowledge". *Journal of Business Ethics* 130, 447-465. https://doi.org/10.1007/s10551-014-2239-z

Parker, S. (2009), "Why do small firms produce the entrepreneurs?". *Journal of Socio-Economics* 38, 484-494. https://doi.org/10.1016/j.socec.2008.07.013

Park, N., and C. Peterson (2010), "Does it matter where we live? The urban psychology of character strengths". *American Psychologist* 65, 535-547. https://doi.org/10.1037/a0019621

Paunov, C., D. Guellec, N. El-Mallakh, S. Planes-Satorra andL. Nuese (2019), "On the concentration of innovation in top cities in the digital age". *OECD Science. Technology and Innovation Policy Papers* 85.

Petralia, S., P.A. Balland and D.L. Rigby (2016), "Unveiling the geography of historical patents in the United States from 1836 to 1975". *Scientific Data* 3 (August), 160074. https://doi.org/10.1038/sdata.2016.74

Pickel, A. (1992), *Radical Transitions: The Survival and Revival of Entrepreneurship in the GDR*. Boulder: Westview Press.

Pierenkemper, T. (1979), "Entrepreneurs in Heavy Industry: Upper Silesia and the Westphalian Ruhr Region, 1852 to 1913". *Business History Review* 53, 65-78. https://doi.org/10.2307/3114687

Portes, A. (1998), "Social Capital: Its Origins and Applications in Modern Sociology". *Annual Review of Sociology* 24, 1–24. https://doi.org/10.1146/annurev.soc.24.1.1

Prokop, D. (2021), "University entrepreneurial ecosystems and spinoff companies: Configurations, developments and outcomes". *Technovation* 107, 102286. https://doi.org/10.1016/j.technovation.2021.102286

Puffer, S. M., D. J. McCarthy and M. Boisot (2010), "Entrepreneurship in Russia and China: The impact of formal institutional voids". *Entrepreneurship Theory and Practice* 34, 441–467, https://doi.org/10.1111/j.1540-6520.2009.00353.x

Putnam, R.D. (1993), *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton, NJ: Princeton University Press.

Putnam, R.D. (2000), *Bowling Alone: The Collapse and Revival of American Community*. New York: Simon & Schuster.

Qian, H. (2017), "Skills and knowledge-based entrepreneurship: evidence from US cities". *Regional Studies* 51, 1469-1482. https://doi.org/10.1080/00343404.2016.1213383

Qian, H. (2022), Leapfrogging of US Regional Entrepreneurial Ecosystems: Interim Report. University of Iowa.

Ramadani, V., L.-P. Dana, S. Gërguri-Rashiti and V. Ratten (2017), *Entrepreneurship and Management in an Islamic Context*. Cham: Springer.

Rauch, A. and M. Frese (2007), "Let's put the person back into entrepreneurship research: A meta-analysis on the relationship between business owners'

personality traits, business creation, and success". *European Journal of Work and Organizational Psychology* 16(4), 353–385. https://doi.org/10.1080/13594320701595438

Rauch, A. and W. Hulsink (2021), "Just one Damned Thing After Another: Towards an Event-based Perspective of Entrepreneurship". *Entrepreneurship Theory and Practice*. https://doi.org/10.1177%2F10422587211061738

Rentfrow, P. J. (2010), "Statewide differences in personality: Toward a psychological geography of the United States". *American Psychologist* 65(6), 548-558. https://doi.org/10.1037/a0018194

Rentfrow P. J., S. D. Gosling and J. Potter (2008), "A theory of the emergence, persistence, and expression of geographic variation in psychological characteristics." *Perspective on Psychological Science* 3, 339–369. https://doi.org/10.1111/j.1745-6924.2008.00084.x

Reynolds, P D., D. J. Storey and P. Westhead (1994), "Cross-National Comparisons of the Variation in the New Firm Formation Rates." *Regional Studies* 28, 443-456. https://doi.org/10.1080/00343409412331348386

Rietveld, C. A. and B. Hoogendoorn (2021), "The mediating role of values in the relationship between religion and entrepreneurship". *Small Business Economics*. https://doi.org/10.1007/s11187-021-00454-z

Rodriguez-Pose, A. and V. v. Berlepsch (2015), "European Migration, National Origin and Long-term Economic Development in the United States". *Economic Geography* 91, 393-424. https://doi.org/10.1111/ecge.12099

Rose-Ackerman, S. and B. Palifka (2016), "Culture and Corruption". In: *Corruption and Government: Causes, Consequences, and Reform*. Cambridge: Cambridge University Press, pp. 233-272. https://doi.org/10.1017/CBO9781139962933.009

Runst, P. and M. Wyrwich (2022), "Poor soil as a fertile breeding ground: The role of historical agricultural specialization for the persistence of regional differences in crafts." *Annals of Regional Science*. https://doi.org/10.1007/s00168-022-01137-7

Samila, S. and O. Sorenson (2011), "Venture capital, entrepreneurship, and economic growth". *Review of Economics and Statistics* 93, 338–349. https://doi.org/10.1162/REST_a_00066

Saxenian, A. (1994), *Regional Advantage: Culture and Competition in Silicon Valley and Route 128*. Harvard University Press, Cambridge.

Scherf, K. and H. Schmidt (1984), "The southern agglomeration zone of the GDR—Regional structure and development". *GeoJournal* 8, 33–44. https://doi.org/10.1007/BF00155609

Schmitt, D. P., J. Allik, R. R. McCrae and V. Benet-Martínez (2007), "Geographic distribution of Big Five personality traits: Patterns and profiles of human self-

description across 56 nations". *Journal of Cross-Cultural Psychology* 38, 173-212. https://doi.org/10.1177/0022022106297299

Schubert, T. and H. Kroll (2016), "Universities' effects on regional GDP and unemployment: the case of Germany". *Papers in Regional Science* 95(3), 467–489. https://doi.org/10.1111/pirs.12150,

Schumpeter, J. A. (1934), *The theory of economic development – An inquiry into profits, capital, credit, interest, and the business cycle*. Cambridge, MA: Harvard University Press (repr. New Bunswick: Transaction, 1983).

Schumpeter, J. A. (1939), *Business cycles: A theoretical, historical, and statistical analysis of the capitalist process*. New York: McGraw-Hill.

Schumpeter, J. A. (1947), "The Creative Response in Economic History". *Journal of Economic History* 7, 149-159.

Schumpeter, J. A. (1949), "Economic Theory and Entrepreneurial History". In R. R. Wohl (ed.), *Change and the Entrepreneur: Postulates and the Patterns for Entrepreneurial History* (). Cambridge, MA: Harvard University Press, pp. 131-142.

Shane, S. (2000), "Prior Knowledge and the Discovery of Entrepreneurial Opportunities". *Organizational Science* 11, 448–469, https://doi.org/10.1287/orsc.11.4.448.14602

Shane, S. A. (2004), *Academic entrepreneurship: University spinoffs and wealth creation*. Cheltenham: Edward Elgar Publishing.

Shleifer, A. and R. W. Vishny (1993), "Corruption". *Quarterly Journal of Economics* 108, 599-617, https://doi.org/10.2307/2118402

Sifneos, E. (2013), "Greek Family Firms in the Azov Sea Region, 1850–1917". *Business History Review* 87, 279-308, https://doi.org/10.1017/S0007680513000433

Sinn, H.-W. and G. Sinn (1992), *Jumpstart. The Economic Unification of Germany*. Cambridge, MA: MIT-Press.

Slavtchev, V. and M. Wyrwich (2021), "TV and Entrepreneurship". *Jena Economic Research Papers* #2021-010, Friedrich Schiller University Jena. http://www2.wiwi.uni-jena.de/Papers/jerp2021/wp_2021_010.pdf

Smallbone, D. and F. Welter (2001), "The distinctiveness of entrepreneurship in transition economies". *Small Business Economics* 16, 249-262. https://doi.org/10.1023/A:1011159216578

Smallbone, D. and F. Welter (2009), *Entrepreneurship and Small Business Development in Post-socialist Economies*. London: Routledge.

Soltow, J.H. (1968), "The Entrepreneur in Economic History". *American Economic Review, Papers and Proceedings* 58, 84-92

Sorenson, O. and P. G. Audia (2000), "The social structure of entrepreneurial activity: geographic concentration of footwear production in the United

States, 1940–1989". *American Journal of Sociology* 106, 424–462. https://doi.org/10.1086/316962

Sorenson, O. (2017), "Regional ecologies of entrepreneurship". *Journal of Economic Geography* 17, 959-974. https://doi.org/10.1093/jeg/lbx031

Sorenson, O. (2018), "Social networks and the geography of entrepreneurship". *Small Business Economics* 51, 527-537, https://doi.org/10.1007/s11187-018-0076-7

Sorgner, A. and M. Wyrwich (2021), "Calling Baumol: what telephones can tell us about the allocation of entrepreneurial talent in the face of radical institutional changes". *IZA DP No. 14458*, IZA Institute of Labor Economics.

Spigel, B. (2017), "Bourdieu, culture, and the economic geography of practice: entrepreneurial mentorship in Ottawa and Waterloo, Canada". *Journal of Economic Geography* 17, 287–310. https://doi.org/10.1093/jeg/lbw019

Stam, E., van de Ven, A. (2021), Entrepreneurial ecosystem elements. *Small Business Economics*, 56, 809–832. https://doi.org/10.1007/s11187-019-00270-6

Statistisches Reichsamt (1929), Einkommen- und Körperschaftsteuerveranlagung für 1925. In: *Statistik des Deutschen Reichs* (Ed.), Band 348. Berlin.

Stephan, U. and L.M. Uhlaner (2010), "Performance-based vs socially supportive culture: A cross-national study of descriptive norms and entrepreneurship". *Journal of International Business Studies* 41, 1347–1364. https://doi.org/http://dx.doi.org/10.1057/jibs.2010.14

Stephan, U. and S. Pathak (2016), "Beyond cultural values? Cultural leadership ideals and entrepreneurship". *Journal of Business Venturing* 31, 505-523. http://dx.doi.org/10.1016/j.jbusvent.2016.07.003

Sternberg, R. and C. Tamasy (1999), "Munich as Germany's No. 1 High Technology Region: Empirical Evidence, Theoretical Explanations and the Role of Small Firm/Large Firm Relationships". *Regional Studies* 33, 367-377, https://doi.org/10.1080/713693560

Storper, M., and A. J. Venables (2004), "Buzz: Face-to-face contact and the urban economy". *Journal of Economic Geography* 4, 351–370. https://doi.org/10.1093/jnlecg/lbh027

Stuart, T. and O. Sorenson (2003), "The geography of opportunity: spatial heterogeneity in founding rates and the performance of biotechnology firms". *Research Policy* 32, 229–253. https://doi.org/10.1016/S0048-7333(02)00098-7

Stuetzer, M., M. Obschonka, D. B. Audretsch, M. Wyrwich, P. J. Rentfrow, M. J. Coombes, L. Shaw-Taylor and M. Satchell (2016), "Industry structure, entrepreneurship, and culture: An empirical analysis using historical coalfields". *European Economic Review* 86, 52–72. https://doi.org/10.1016/j.euroecorev.2015.08.012

Stuetzer, M., D. B. Audretsch, M. Obschonka, S. D. Gosling, P. J. Rentfrow and J. Potter (2018), "Entrepreneurship culture, knowledge spillovers and the growth

of regions". *Regional Studies* 52(5), 608-618. https://doi.org/10.1080/00343404.2017.1294251

Stuetzer, M., M. Obschonka, A. Brodeur, D. B. Audretsch, J. P. Rentfrow, J. Potter and S. D. Gosling (2021), "A golden opportunity: The gold rush, entrepreneurship and culture". Discussion Paper No. 14894. Bonn: Institute of Labor Economics. https://docs.iza.org/dp14894.pdf

Talhelm, T., X. Zhang, S. Oishi, C. Shimin, D. Duan, X. Lan, and S. Kitayama (2014), "Large-scale psychological differences within China explained by rice versus wheat agriculture". *Science* 344, 603–608. https://doi.org/10.1126/science.1246850

Tavassoli, S., M. Obschonka and D. B. Audretsch (2021), "Entrepreneurship in Cities". *Research Policy* 50(7), 104255. https://doi.org/10.1016/j.respol.2021.104255

Thurik, R. and M. Dejardin (2012), "Entrepreneurship and Culture". In M. van Gelderen and E. Masurel (eds.): *Entrepreneurship in Context*, London: Routledge, pp. 175-186.

Tipton, F. B. (1976), *Regional Variations of Economic Development of Germany During the Nineteenth Century*. Middletown (Connecticut): Wesleyan University Press.

Unger, J. M., A. Rauch, M. Frese and N. Rosenbusch (2011), "Human capital and entrepreneurial success: a meta-analytical review". *Journal of Business Venturing* 26, 341–358.https://doi.org/10.1016/j.jbusvent.2009.09.004

Van Hippel, E. (1994), ""Sticky Information" and the Locus of Problem Solving: Implications for Innovation". *Management Science* 40, 429-439. https://doi.org/10.1287/mnsc.40.4.429

van Stel, A. and K. Suddle (2008), "The Impact of New Firm Formation on Regional Development in the Netherlands". *Small Business Economics* 30, 31–47. https://doi.org/10.1007/s11187-007-9054-1

van Witteloostuijn, A., M. Dejardin and J.M. Pollack (2021), "Replication in entrepreneurship". *Journal of Business Venturing Insights* 16, e00271. https://doi.org/10.1016/j.jbvi.2021.e00271

Vladasel, T., M. J. Lindquist, J. Sol and M. v. Praag (2021), "On the origins of entrepreneurship: Evidence from sibling correlations". *Journal of Business Venturing* 36 (5), 106017. https://doi.org/10.1016/j.jbusvent.2020.106017

Voth, H.-J. (2021) "Persistence – myth and mystery". In A. Bisin and G. Federico (eds.): *The Handbook of Historical Economics*, London: Elsevier, pp. 243-267. https://doi.org/10.1016/B978-0-12-815874-6.00015-0

Wadhwani, D. R., D. Kirsch, F. Welter, W. B. Gartner and G. G. Jones (2020), "Context, time, and change: Historical approaches to entrepreneurship research". *Strategic Entrepreneurship Journal* 14, 3-19, https://doi.org/10.1002/sej.1346

Wahl, F. (2017), “Does European Development Have Roman Roots? Evidence from the German Limes”. *Journal of Economic Growth* 22(3), 313-349. https://doi.org/10.1007/s10887-017-9144-0

Wang, Z., H. Yang and X. Zhang (2021), “History matters: the effects of Chinese ports from 170 years ago on entrepreneurship today”. *Regional Studies* 55, 630-644. https://doi.org/10.1080/00343404.2020.1839641

Welter, F. (2012), “All you need is trust? A critical review of the trust and entrepreneurship literature”. *International Small Business Journal* 30, 193-212. https://doi.org/10.1177/0266242612439588

Welter, F., T. Baker, D. B. Audretsch and W. B. Gartner (2017), “Everyday Entrepreneurship—A Call for Entrepreneurship Research to Embrace Entrepreneurial Diversity”. *Entrepreneurship Theory and Practice* 41, 311-321. https://doi.org/10.1111%2Fetap.12258

Wennekers, S. and R. Thurik (1999), “Linking entrepreneurship and economic growth”. *Small Business Economics* 13, 27–56. https://doi.org/10.1023/A:1008063200484

Westlund, H. and R.E. Bolton (2003), “Local social capital and entrepreneurship”. *Small Business Economics* 21, 77–113. https://doi.org/10.1023/A:1025024009072.

Westlund, H. and F. Adam (2010), “Social Capital and Economic Performance: A Meta-analysis of 65 Studies”. *European Planning Studies* 18, 893-919. https://doi.org/10.1080/09654311003701431

Westlund, H., J.P. Larsson and A.R. Olsson (2014), “Startups and local social capital in Swedish municipalities”. *Regional Studies* 48, 974–994. https://doi.org/10.1080/00343404.2013.865836

Wigren, C. (2003), *The Spirit of Gnosjö: The Grand Narrative and Beyond*. JIBS Dissertation Series 017, Jönköping International Business School.

Wiklund, J., B. Nikolaev, N. Shir, M. -D. Foo and S. Bradley (2019), “Entrepreneurship and well-being: Past, present, and future”. *Journal of Business Venturing* 34 (4), 579–588. https://doi.org/10.1016/j.jbusvent.2019.01.002

Williamson, O. E. (2000), “The new institutional economics: Taking stock, looking ahead”. *Journal of Economic Literature* 38, 595–613. https://doi.org/10.1257/jel.38.3.595

Winter, S. G. (1984), “Schumpeterian competition in alternative technological regimes”. *Journal of Economic Behavior and Organization* 5, 287–320. https://doi.org/10.1016/0167-2681(84)90004-0

Wurth, B., E. Stam and B. Spigel (2022), “Toward an Entrepreneurial Ecosystem Research Program”. *Entrepreneurship Theory and Practice*, 46, 729-778. https://doi.org/10.1177/1042258721998948

Wyrwich, M. (2012), “Regional Entrepreneurial Heritage in a Socialist and a Postsocialist Economy”. *Economic Geography*. 88, 423–445. https://doi.org/10.1111/j.1944-8287.2012.01166.x

Wyrwich, M. (2014), “Ready, set, go! Why are some regions entrepreneurial jump starters?” *The Annals of Regional Science* 53, 487–513. https://doi.org/10.1007/s00168-014-0629-x

Zhao, H. and S.E. Seibert (2006), “The Big Five Personality Dimensions and Entrepreneurial Status: A Meta-Analytical Review”. *Journal of Applied Psychology* 91(2), 259-271. https://doi.org/10.1037/0021-9010.91.2.259

Zelekha, Y., G. Avnimelech and E. Sharabi (2014). “Religious institutions and entrepreneurship.” *Small Business Economics* 42, 747-767. https://doi.org/10.1007/s11187-013-9496-6

Zukin, S. (2011), “Reconstructing the authenticity of place”. *Theory and Society* 40, 161-165. https://doi.org/10.1007/s11186-010-9133-1

List of research reports

17001-EEF: Trinks, A., B. Scholtens, M. Mulder, and L. Dam, Divesting Fossil Fuels: The Implications for Investment Portfolios

17002-EEF: Angelini, V., and J.O. Mierau, Late-life Health Effects of Teenage Motherhood

17003-EEF: Jong-A-Pin, R., M. Laméris, and H. Garretsen, Political Preferences of (Un)happy Voters: Evidence Based on New Ideological Measures

17004-EEF: Jiang, X., N. Hermes, and A. Meesters, Financial Liberalization, the Institutional Environment and Bank Efficiency

17005-EEF: Kwaak, C. van der, Financial Fragility and Unconventional Central Bank Lending Operations

17006-EEF: Postelnicu, L. and N. Hermes, The Economic Value of Social Capital

17007-EEF: Ommeren, B.J.F. van, M.A. Allers, and M.H. Vellekoop, Choosing the Optimal Moment to Arrange a Loan

17008-EEF: Bekker, P.A., and K.E. Bouwman, A Unified Approach to Dynamic Mean-Variance Analysis in Discrete and Continuous Time

17009-EEF: Bekker, P.A., Interpretable Parsimonious Arbitrage-free Modeling of the Yield Curve

17010-GEM: Schasfoort, J., A. Godin, D. Bezemer, A. Caiani, and S. Kinsella, Monetary Policy Transmission in a Macroeconomic Agent-Based Model

17011-I&O: Bogt, H. ter, Accountability, Transparency and Control of Outsourced Public Sector Activities

17012-GEM: Bezemer, D., A. Samarina, and L. Zhang, The Shift in Bank Credit Allocation: New Data and New Findings

17013-EEF: Boer, W.I.J. de, R.H. Koning, and J.O. Mierau, Ex-ante and Ex-post Willingness-to-pay for Hosting a Major Cycling Event

17014-OPERA: Laan, N. van der, W. Romeijnders, and M.H. van der Vlerk, Higher-order Total Variation Bounds for Expectations of Periodic Functions and Simple Integer Recourse Approximations

17015-GEM: Oosterhaven, J., Key Sector Analysis: A Note on the Other Side of the Coin

17016-EEF: Romensen, G.J., A.R. Soetevent: Tailored Feedback and Worker Green Behavior: Field Evidence from Bus Drivers

17017-EEF: Trinks, A., G. Ibikunle, M. Mulder, and B. Scholtens, Greenhouse Gas Emissions Intensity and the Cost of Capital

17018-GEM: Qian, X. and A. Steiner, The Reinforcement Effect of International Reserves for Financial Stability

17019-GEM/EEF: Klasing, M.J. and P. Milionis, The International Epidemiological Transition and the Education Gender Gap

2018001-EEF: Keller, J.T., G.H. Kuper, and M. Mulder, Mergers of Gas Markets Areas and Competition amongst Transmission System Operators: Evidence on Booking Behaviour in the German Markets

2018002-EEF: Soetevent, A.R. and S. Adikyan, The Impact of Short-Term Goals on Long-Term Objectives: Evidence from Running Data

2018003-MARK: Gijsenberg, M.J. and P.C. Verhoef, Moving Forward: The Role of Marketing in Fostering Public Transport Usage

2018004-MARK: Gijsenberg, M.J. and V.R. Nijs, Advertising Timing: In-Phase or Out-of-Phase with Competitors?

2018005-EEF: Hulshof, D., C. Jepma, and M. Mulder, Performance of Markets for European Renewable Energy Certificates

2018006-EEF: Fosgaard, T.R., and A.R. Soetevent, Promises Undone: How Committed Pledges Impact Donations to Charity

2018007-EEF: Durán, N. and J.P. Elhorst, A Spatio-temporal-similarity and Common Factor Approach of Individual Housing Prices: The Impact of Many Small Earthquakes in the North of Netherlands

2018008-EEF: Hermes, N., and M. Hudon, Determinants of the Performance of Microfinance Institutions: A Systematic Review

2018009-EEF: Katz, M., and C. van der Kwaak, The Macroeconomic Effectiveness of Bank Bail-ins

2018010-OPERA: Prak, D., R.H. Teunter, M.Z. Babai, A.A. Syntetos, and J.E. Boylan, Forecasting and Inventory Control with Compound Poisson Demand Using Periodic Demand Data

2018011-EEF: Brock, B. de, Converting a Non-trivial Use Case into an SSD: An Exercise

2018012-EEF: Harvey, L.A., J.O. Mierau, and J. Rockey, Inequality in an Equal Society

2018013-OPERA: Romeijnders, W., and N. van der Laan, Inexact cutting planes for two-stage mixed-integer stochastic programs

2018014-EEF: Green, C.P., and S. Homroy, Bringing Connections Onboard: The Value of Political Influence

2018015-OPERA: Laan, N. van der, and W. Romeijnders, Generalized aplha-approximations for two-stage mixed-integer recourse models

2018016-GEM: Rozite, K., Financial and Real Integration between Mexico and the United States

2019001-EEF: Lugalla, I.M., J. Jacobs, and W. Westerman, Drivers of Women Entrepreneurs in Tourism in Tanzania: Capital, Goal Setting and Business Growth

2019002-EEF: Brock, E.O. de, On Incremental and Agile Development of (Information) Systems

2019003-OPERA: Laan, N. van der, R.H. Teunter, W. Romeijnders, and O.A. Kilic, The Data-driven Newsvendor Problem: Achieving On-target Service Levels.

2019004-EEF: Dijk, H., and J. Mierau, Mental Health over the Life Course: Evidence for a U-Shape?

2019005-EEF: Freriks, R.D., and J.O. Mierau, Heterogeneous Effects of School Resources on Child Mental Health Development: Evidence from the Netherlands.

2019006-OPERA: Broek, M.A.J. uit het, R.H. Teunter, B. de Jonge, J. Veldman, Joint Condition-based Maintenance and Condition-based Production Optimization.

2019007-OPERA: Broek, M.A.J. uit het, R.H. Teunter, B. de Jonge, J. Veldman, Joint Condition-based Maintenance and Load-sharing Optimization for Multi-unit Systems with Economic Dependency

2019008-EEF: Keller, J.T. G.H. Kuper, and M. Mulder, Competition under Regulation: Do Regulated Gas Transmission System Operators in Merged Markets Compete on Network Tariffs?

2019009-EEF: Hulshof, D. and M. Mulder, Renewable Energy Use as Environmental CSR Behavior and the Impact on Firm Profit

2019010-EEF: Boot, T., Confidence Regions for Averaging Estimators
2020001-OPERA: Foreest, N.D. van, and J. Wijngaard. On Proportionally Fair Solutions for the Divorced-Parents Problem

2020002-EEF: Niccodemi, G., R. Alessie, V. Angelini, J. Mierau, and T. Wansbeek. Refining Clustered Standard Errors with Few Clusters

2020003-I&O: Bogt, H. ter, Performance and other Accounting Information in the Public Sector: A Prominent Role in the Politicians' Control Tasks?

2020004-I&O: Fisch, C., M. Wyrwich, T.L. Nguyen, and J.H. Block, Historical Institutional Differences and Entrepreneurship: The Case of Socialist Legacy in Vietnam

2020005-I&O: Fritsch, M. and M. Wyrwich. Is Innovation (Increasingly) Concentrated in Large Cities? An Internatinal Comparison

2020006-GEM: Oosterhaven, J., Decomposing Economic Growth Decompositions.

2020007-I&O: Fritsch, M., M. Obschonka, F. Wahl, and M. Wyrwich. The Deep Imprint of Roman Sandals: Evidence of Long-lasting Effects of Roman Rule on Personality, Economic Performance, and Well-Being in Germany

2020008-EEF: Heijnen, P., On the Computation of Equilibrium in Discontinuous Economic Games

2020009-EEF: Romensen, G.J. and A.R. Soetevent, Improving Worker Productivity Through Tailored Performance Feedback: Field Experimental Evidence from Bus Drivers

2020010-EEF: Rao, Z., M. Groneck, and R. Alessie, Should I Stay or Should I Go? Intergenerational Transfers and Residential Choice. Evidence from China

2020011-EEF: Kwaak, C. van der, Unintended Consequences of Central Bank Lending in Financial Crises

2020012-EEF: Soetevent, A.R., Determinants choice set variation in demand estimation – with an application to the electric vehicle public charging market

2020013-EEF: Kwaak, C. van der, Old-Keynesianism in the New Keynesian model

2020014-EEF: Plaat, m. van der, Loan Sales and the Tyranny of Distance in U.S. Residential Mortgage Lending

2020015-I&O: Fritsch, M., and M. Wyrwich, Initial Conditions and Regional Performance in the Aftermath of Disruptive Shocks: The Case of East Germany after Socialism

2020016-OPERA: Laan, N. van der, and W. Romeijnders, A Converging Benders' Decomposition Algorithm for Two-stage Mixed-integer Recourse Models

2021001-OPERA: Baardman, L., K.J. Roodbergen, H.J. Carlo, and A.H. Schrotenboer, A Special Case of the Multiple Traveling Salesmen Problem in End-of-aisle Picking Systems

2021002-EEF: Wiese, R., and S. Eriksen, Willingness to Pay for Improved Public Education and Public Health Systems: The Role of Income Mobility Prospects.

2021003-EEF: Keller, J.T., G.H. Kuper, and M. Mulder, Challenging Natural Monopolies: Assessing Market Power of Gas Transmission System Operators for Cross-Border Capacity

2021004-EEF: Li, X., and M. Mulder, Value of Power-to-Gas as a Flexibililty Option in Integrated Electricity and Hydrogen Markets
2021005-GEM: Rozite, K., J.P.A.M. Jacobs, and D.J. Bezemer, Investor Sentiment and Business Investment

2021006-EEF: Spierdijk, L., and T. Wansbeek, Differencing as a Consistency Test for the Within Estimator

2021007-EEF: Katz, M., and C. van der Kwaak, To Bail-in or to Bailout: that's the (Macro) Question

2021008-EEF: Haan, M.A., N.E. Stoffers, and G.T.J. Zwart, Choosing Your Battles: Endogenous Multihoming and Platform Competition

2021009-I&O: Greve, M., M. Fritsch, and M. Wyrwich, Long-Term Decline of Regions and the Rise of Populism: The Case of Germany

2021010-MARK: Hirche, C.F., T.H.A. Bijmolt, and M.J. Gijsenberg, When Offline Stores Reduce Online Returns

2021011-MARK: Hirche, C.F., M.J. Gijsenberg, and T.H.A. Bijmolt, Promoting Product Returns: Effects of Price Reductions on Customer Return Behavior

2021012-MARK: Hirche, C.F., M.J. Gijsenberg, and T.H.A. Bijmolt, Asking Less, Getting More? The Influence of Fixed-Fee and Threshold-Based Free Shipping on Online Orders and Returns

2021013-I&O: Sorgner, A., and M. Wyrwich, Calling Baumol: What Telephones Can Tell Us about the Allocation of Entrepreneurial Talent in the Face of Radical Institutional Changes

2021014-I&O: Slavtchev, V., and M. Wywich, TV and Entrepreneurship

2021015-EEF: Kate, F. ten, M.J. Klasing, and P. Milionis, Diversity, Identity and Tax Morale

2021016-EEF: Bergemann, A., and R.T. Riphahn, Maternal Employment Effects of Paid Parental Leave

2021017-GEM: Abolhassani, M., Productivity Spillovers of Multinational Enterprises through Worker Mobility: New Evidence for the Netherlands

2021018-GEM: Abolhassani, M., Productivity Spillovers of Superior Firms through Worker Mobility

2022001-GEM: Oosterhaven, J., A Price Reinterpretation of the Leontief Quantity Model

2022002-EEF: Ghaemi, S, X. Li, and M. Mulder, Economic Value of Flexibility Provided by Power to gas Conversion Systems in Low-voltage Distribution Grids

2022003-OB: Meer, P.H. van der, Are All Self-employed Happy?

2022004-EEF: Perey, P., and M. Mulder, International Competitiveness of Low-carbon Hydrogen Supply to the North-west European Market

2022005-OPERA: Kasper, A., M. Land, and R. Teunter, University of Groningen, Faculty of Economics and Business, Department of Operations.

2022006-I&O: Fritsch, M., and M. Wyrwich, Entrepreneurship in the Long-run: Empirical Evidence and Historical Mechanisms

www.rug.nl/feb