



JENA ECONOMIC RESEARCH PAPERS



2014 – 014

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www.jenecon.de

ISSN 1864-7057

The JENA ECONOMIC RESEARCH PAPERS is a joint publication of the Friedrich Schiller University and the Max Planck Institute of Economics, Jena, Germany. For editorial correspondence please contact markus.pasche@uni-jena.de.

Impressum:

Friedrich Schiller University Jena
Carl-Zeiss-Str. 3
D-07743 Jena
www.uni-jena.de

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Kahlaische Str. 10
D-07745 Jena
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April 2014

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Abstract

We use the historical self-employment rate as an indicator of a regional culture of entrepreneurship and link this measure to economic growth in recent periods. The results indicate that German regions with a high level of entrepreneurship in the mid-1920s have higher start-up rates about 80 years later. Furthermore, we find that the effect of current start-up activity on regional employment is significantly higher in regions with a pronounced entrepreneurial culture. We conclude that a regional culture of entrepreneurship is an important resource for regional growth.

Keywords: Entrepreneurship, economic development, self-employment, new business formation, entrepreneurship culture, institutions

JEL classification: L26, R11, O11

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1. Introduction¹

There are pronounced regional differences in the rates and types of new business formation and self-employment. To a large extent, these regional differences are related to characteristics that are fairly easily measured, such as industry structure, qualification of the workforce, and population density, as well as the regional knowledge stock and regional innovation activity (Sutaria and Hicks 2004; Fritsch and Falck 2007; Sternberg 2011). However, little is known about those region-specific factors that are more intangible or “in the air,” such as a regional “spirit” or a “culture of entrepreneurship.”

This paper investigates the relationship between a regional culture of entrepreneurship and regional development. We assume that a regional entrepreneurship culture does just not appear out of thin air, but that there are historical reasons for a region’s entrepreneurial tradition, or lack thereof. Hence, we identify a regional entrepreneurship culture by means of historical self-employment rates in the year 1925. Our results show that a regional tradition of entrepreneurship is persistent and can outlast drastic changes in the socioeconomic environment, even significant changes in governing formal institutions. We also find that regions with a pronounced entrepreneurial culture tend to have relatively high employment growth. We discover via instrumental variables regressions that this growth is affected by variation in start-up activity that can be attributed to a historic entrepreneurial culture. The results of our empirical analysis show that a regional entrepreneurship culture and start-up activity can make an important positive contribution to the region’s economic performance.

The remainder of the paper is organized as follows. Section 2 elaborates on the nature of a regional entrepreneurship culture. We then derive hypotheses and provide an overview of relevant empirical evidence from earlier studies (Section 3). Section 4 introduces the data and

¹ We are indebted to Oliver Falck, Mark Sanders, and Michael Stuetzer for helpful comments on earlier versions of this paper.

summarizes the historical development of German regions over the period under consideration here. Results of the empirical analysis of the relationship between entrepreneurial culture and regional development are presented in Section 5. The final section concludes.

2. Regional Cultures of Entrepreneurship?

An entrepreneurial culture is typically defined as a “positive collective programming of the mind” (Beugelsdijk 2007, 190) or an “aggregate psychological trait” (Freytag and Thurik 2007, 123) of the population oriented toward entrepreneurial values such as individualism, independence, and achievement (e.g., McClelland 1961; Hofstede and McCrae 2008). 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, Kautonen and Fink 2014) that results 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 (North 1994; Williamson 2000). In contrast, formal institutions (e.g., property rights), governance structures, and resource allocation change much more frequently and can be viewed as embedded in the informal institutional framework.

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.² Since informal institutions are deeply embedded in a population, an entrepreneurship culture should manifest as a relatively high share of persons with an entrepreneurial personality, which is characterized by traits such as extraversion, openness to experience, conscientiousness,

² For example, Andersson (2012), Aoyama (2009), Beugelsdijk (2007), Davidsson (1995), Davidsson and Wiklund (1997), Etzioni (1987), Kibler, Kautonen and Fink (2014), Rentfrow, Gosling and Potter (2008), Westlund and Bolton (2003), Westlund and Adam (2010), and Westlund, Larsson and Olsson (2014).

and the ability to bear risk (Rauch and Frese 2007; Zhao and Seibert 2006; Obschonka et al. 2013).

Several studies of established market economies, such as West Germany (Fritsch and Mueller 2007), the Netherlands (van Stel and Suddle 2008), Sweden (Andersson and Koster 2011), the United Kingdom (Mueller, van Stel and Storey 2008), and the United States (Acs and Mueller 2008), show that regional levels of new business formation and self-employment tend to be persistent over relatively long periods of time. Our recent analysis of Germany provides strong evidence for the persistence of relatively high and low levels of regional entrepreneurship over an 80-year period that was characterized by severe shocks to the economic environment such as devastating wars and radical changes of the economic regime and the respective property-rights structure (Fritsch and Wyrwich 2014). We view such long persistence of a high level of entrepreneurship as an indication of an entrepreneurship culture.

Why entrepreneurship culture is so persistent is as yet unclear. It is likely that role model effects are key to the transmission of a positive entrepreneurial attitude in the regional population and particularly across generations (Laspita et al. 2012). In economic terms, role models provide a non-pecuniary externality that reduces ambiguity and influences the decision to pursue an entrepreneurial career (Minniti 2005). Being able to observe entrepreneurs in action, especially successful ones, may increase social acceptance of and self-confidence in regard to attempting entrepreneurship (Bosma et al. 2012; Kibler, Kautonen and Fink 2014; Stuart and Sorenson 2003) and in this way reinforce a regional culture of entrepreneurship.

The interplay between a high level of social acceptance of entrepreneurship, widespread self-employment, and the resulting role model effects can make a regional entrepreneurship culture—once established—self-perpetuating. Hence, a regional culture of entrepreneurship can be expected to foster persistent regional differences in self-employment and new business formation over time.

3. The Effect of a Regional Culture of Entrepreneurship on Regional Development—Hypotheses and Empirical Evidence

There is, to date, only sparse and problematic empirical evidence as to how an entrepreneurship culture affects regional development. A study by Beugelsdijk and Noorderhaven (2004) relates a measure for entrepreneurial culture, based on survey data, to regional GDP growth and finds a significantly positive relationship. This result, however, may suffer from endogeneity problems because the measured values and attitudes could have emerged as a response to long-term growth. Tabellini (2010) establishes a causal link between a population's values and growth but he does not focus on entrepreneurship culture.

Glaeser, Kerr and Kerr (2014) attempt to dispel endogeneity concerns by using an indicator of regional entrepreneurial culture in a much earlier time period that they assume to be independent from current economic growth. The measure they use is a region's distance from coal mines that were operating in 1900. The idea behind using this indicator is based on the observation that coal mining areas were characterized by large-scale plants and relatively low levels of self-employment. Glaeser, Kerr and Kerr (2014) argue that geographic proximity to historical mines at the beginning of the 20th century is negatively related to the emergence of an entrepreneurial culture over time, leading to relatively low current levels of entrepreneurship. They justify their identification strategy by reference to Chinitz (1961). In this study, Chinitz compares the economic structures of Pittsburgh and New York City and explains the low levels of self-employment in Pittsburgh with the presence of large-scale industries such as coal mining and steel, which, in turn, contributed to the emergence of an entrepreneurship-inhibiting climate that has to some degree persisted until today. Glaeser, Kerr, and Kerr (2014) find that there is indeed a negative relationship between proximity to historical mines and the level of entrepreneurship today that affects current growth.

In contrast to Glaeser, Kerr and Kerr (2014), we measure entrepreneurial tradition and culture by historical self-employment rates in the year 1925. We focus on Germany as it is a particularly well suited

context for exploiting historical self-employment as an instrument to measure the effect of entrepreneurship on growth. Since 1925, German regions have experienced a number of serious shocks to the social-economic framework, such as the world economic crisis of the late 1920s and early 1930s, World War II, heavy in-migration of refugees from former German territories, occupation by allied powers, and reconstruction of the economic base. After World War II, the Western allies rather quickly began to assist in building a modern market economic system in West Germany. However, East Germany was occupied by the Soviets, who just as quickly installed a socialist regime with a centrally planned economic system, the German Democratic Republic (GDR). The socialist regime adopted a rigorous anti-entrepreneurship policy with the aim of completely abolishing privately owned firms. As a consequence of political pressure and severe economic problems, there was massive out-migration by East Germans into the West until the East German border was closed in 1961. The socialist GDR collapsed in late 1989 and East and West Germany were reunified in 1990. The consequent transformation of the East German economy into a market economic system was a kind of “shock treatment” (e.g., Brezinski and Fritsch 1995; Hall and Ludwig 1995). This development induced rapid and massive structural change, accompanied by an almost complete replacement of the incumbent firms. In the course of the transformation process, the eastern regions again experienced massive out-migration, especially of young and qualified workers (Hunt 2006).

In another study (Fritsch and Wyrwich 2014), we show that German regions with high levels of self-employment in the year 1925 also had high levels of self-employment and high start-up rates about 80 years later. Given the number of disruptive shocks mentioned above, this high level of persistence can hardly be explained by gradual changes of the framework conditions. Based on this evidence and on the observation that informal institutions tend to change slowly and over relatively long periods (North

1994; Williamson 2000), we regard the 1925 self-employment rate³ as an indicator of the presence of a regional culture of entrepreneurship.

Therefore, we expect:

Hypothesis I: Regions with high historical levels of self-employment will have high levels of new business formation today.

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

Hypothesis II: Regions with high start-up rates have higher growth rates.

Testing Hypothesis II by regressing regional growth rates on start-up rates at the beginning of the period of analysis poses an endogeneity problem because new business formation might be a symptom of growth rather than a source (see Anyadike-Danes, Hart, and Lenihan 2011). For example, larger markets and growth-related structural change could create additional entrepreneurial opportunities. Variation in historical levels of self-employment in 1925 is an appropriate instrument for circumventing this endogeneity problem. That is, due to the massive disruptions that occurred in Germany in the 20th century, current regional growth (other than via current start-up activity) can be regarded as independent of the self-employment rates 50 years earlier.

³ The self-employment rate is the number of self-employed persons over the total number of employees.

A culture of entrepreneurship may stimulate not only the level of new business formation in a region but may also lead to a relatively strong effect of these start-ups on development. There are at least three channels through which entrepreneurial culture can affect start-up-induced growth:

- First, the presence of relatively many entrepreneurial people and successful new businesses can result in high levels of knowledge spillovers (e.g., peer effects) that can create a fertile breeding ground, particularly for innovative new firms that pose a significant challenge to incumbents (Acs et al. 2009). Hence, regions with a pronounced entrepreneurial culture may be home to more promising projects as well as to more people not only willing to seize these opportunities (Stuetzer et al. 2014), but having the ability to realize their potential.
- Second, areas with an entrepreneurial culture are characterized not only by high levels of social approval of self-employment but may also have a rich infrastructure of supporting institutions that provide relatively easy access to finance and quality advice, both of which are factors in the success of new businesses.⁴
- There are a number of reasons for expecting that the competition between start-ups and incumbents will be more pronounced in regions with a high share of smaller firms, and thus that the effect of new business formation on growth will be stronger. For example, the size-localized competition hypothesis argues that competition is more intense among firms with similar characteristics, including size (Bothner 2005; Hannan and Freeman 1977; Ranger-Moore, Breckenridge and Jones 1995). Accordingly, new businesses that tend to be of small scale should compete more with other small firms than with larger ones. Given that regions with high levels of new business formation tend to have high shares of small firms (Fritsch and Falck 2007), the competitive threat imposed by newcomers on regional incumbents should be more pronounced in entrepreneurial regions. Another reason

⁴ See Westlund and Bolton (2003) for an entrepreneurial choice model that incorporates the effect of entrepreneurial climate on the financing decisions of external investors.

to expect particularly strong competition between start-ups and small local firms is that smaller firms tend to be focused on the local market while larger firms are more likely to operate on geographically more diverse output markets (Bernard and Wagner 1997; Bernard and Jensen 1999) so that for them, the competitive threat generated by local start-ups is much less pronounced.⁵

Thus, our third hypothesis states:

Hypothesis III: Start-up activity that can be attributed to entrepreneurial tradition has a positive effect on long-term growth.

In earlier work, we provided evidence in support of Hypothesis I (Fritsch and Wyrwich 2014). There are also a number of studies that provide empirical evidence in support of Hypothesis II (for an overview, see Fritsch 2013). A novelty of this study is that we circumvent the potential endogeneity problem inherent in such an analysis by applying an instrumental variables approach based on historical self-employment rates. Our main contribution is to present evidence that part of the effect that regional start-up activity has on growth can be attributed to entrepreneurial tradition.

4. Data

The spatial framework of our analysis is comprised of the 91 planning regions of Germany,⁶ which represent functionally integrated spatial units comparable to labor market areas in the United States. Our data on new

⁵ Fritsch and Noseleit (2013) found empirical support for this assumption. In their analysis the effect of new business formation on incumbent firms is generally positive and considerably more pronounced in regions with a high share of small firm employment. Since high levels of new business formation in regions with a pronounced culture of entrepreneurship tend to result in high shares of small firm employees, this finding is consistent with the hypothesis that an entrepreneurship culture leads to a relatively strong effect of new business formation on regional growth.

⁶ There are 97 German planning regions. For administrative reasons, the cities of Hamburg and Bremen are defined as planning regions even though they are not functional economic units. To avoid distortions, we merged these cities with adjacent planning regions. Hamburg is merged with the region of Schleswig-Holstein South and Hamburg-Umland-South. Bremen is merged with Bremen-Umland. Thus, the number of regions in our sample is 91. Further, we exclude the planning region "Saarland" from the regression analysis since most of the areas within this planning region were not completely under German administration at the time of the survey.

business formation are from the Establishment History File of the German Social Insurance Statistics. This dataset contains every establishment in Germany that employs at least one person obliged to make social insurance contributions (Spengler 2008). Establishments that consist of only the owner (solo self-employment) are not included in these data. The start-up rate is the yearly number of new businesses in the private sector divided by the private-sector labor force (in 1,000s).⁷ In contrast to previous studies, we employ a novel and more reliable method of identifying start-ups based on workflow analyses (Hethey and Schmieder 2010). The regional start-up rate is the number of new establishments in a region's nonagricultural private-sector industries as recorded in the Social Insurance Statistics divided by the regional workforce. Table A1 in the Appendix provides definitions of variables.⁸ The indicator for the historical level of entrepreneurship is the self-employment rate in 1925. This is the number of self-employed persons in nonagricultural private sectors divided by the total regional labor force.

The historical data are derived from a comprehensive full-sample census conducted in 1925 (Statistik des Deutschen Reichs 1927). Although the definition of administrative districts at that time is considerably different from what is defined as a district today, it is nevertheless possible to assign the historical districts to current planning regions. If a historical district is located in two or more current planning regions, we assigned the employment to the respective planning regions based on each region's share of the geographical area.

The self-employment rate in 1925 measures the share of role models within the total regional labor force, thereby reflecting how widespread self-employment was at that time. Figure 1 shows the regional distribution of historical self-employment rates. In 1925, the levels of self-

⁷ Start-ups in agriculture are not considered in the analysis.

⁸ Summary statistics for East Germany and correlations between these variables are provided in Tables A2 and A3. Descriptive statistics and correlations for the basic variables for West Germany are set out in Tables A4 and A5.

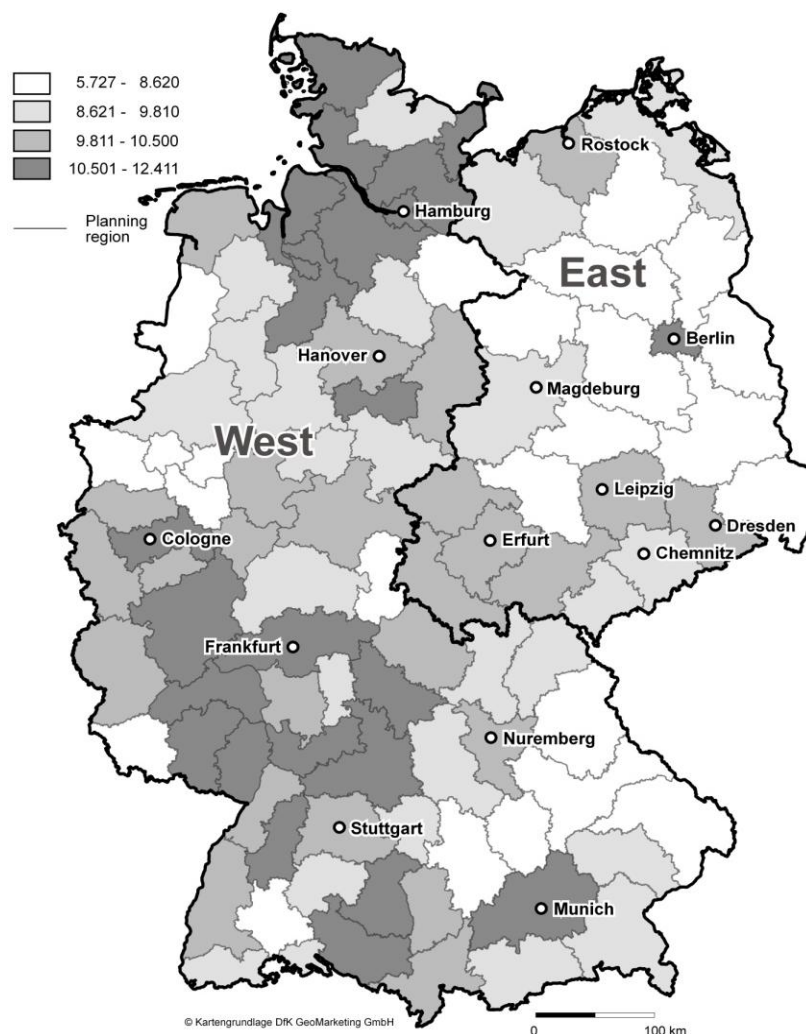


Figure 1: Share of self-employed persons in nonagricultural sectors in total employment in German regions, 1925⁹

employment were relatively high in a number of agglomerated areas, such as Hamburg, Frankfurt, Cologne, Munich, and Nuremberg. Self-employment rates were relatively high in the southwestern State of Baden-Wuerttemberg, too, an area known for its innovative spirit and entrepreneurial culture (e.g., Baten et al. 2007). Regions with relatively low historical self-employment rates in West Germany include the Ruhr area north of Cologne, which has a high concentration of large-scale industries such as mining and steel processing, and a number of rural regions in the east and the southeast. In the eastern part of the country, there was a

⁹ The data for Saarland (white shaded area in the southwest of Frankfurt) are incomplete. The map contains information for the only two districts within this state for which data were available.

pronounced north-south divide. Most of the northern part of East Germany was characterized for centuries by large-scale agriculture and economic backwardness, whereas a number of regions in the south, such as Chemnitz and Dresden, were a heartland of industrialization in the 19th century, home to a high share of the mechanical engineering and textile industries (Tipton 1976).

In the following, we run an analysis for West German regions only because East Germany experienced a completely different type of development over the course of the 20th century, in that it was under a socialist regime for about 40 years, and thus requires a separate analysis (Fritsch et al. 2014). Unfortunately, the small number of East German planning regions does not allow an analysis of this part of the country comparable to that possible for West Germany.

5. Empirical Analysis for West Germany

5.1 Estimation Approach

Our framework and hypotheses are centered on identifying a causal relationship between entrepreneurship—based on the historical regional entrepreneurial tradition—and economic growth. The basic model for investigating the effect of entrepreneurship on economic growth is

$$(1) \frac{Emp_r^{t+n}}{Emp_r^t} = \beta E_r^t + Z_r + \varepsilon_r$$

where Emp is employment in the private sector (log) in year t in region r . We use employment growth because this is the most reliable available metric for regional development at the level of planning regions, which are the units of our analysis. The measure of current entrepreneurship, E_r^t , is the annual number of start-ups in a region divided by the regional workforce (number of employees).¹⁰ In our main analysis we investigate

¹⁰ This follows the labor market approach for calculating start-up rates (Audretsch and Fritsch 1994). We do not include the number of unemployed because this information is not available at a regional level for the early years of our analysis. Not including the unemployed in the denominator of the start-up rate should not lead to any serious distortion because unemployed persons who do start up a business typically do so out of

employment growth for the longest possible period for which we have data available, 1976 to 2008, taking the start-up rate in 1976 as a proxy for entrepreneurship in the first year of this period. The coefficient β measures the effect of new business formation on employment growth. Z_r represents a vector of control variables designed to capture the role of regional factors other than start-up activity in economic development.

These controls include the level of private-sector employment in 1976 (log), population density, and market potential, as well as dummies for Federal States. Private-sector employment in 1976 represents the economic situation at the outset of the analyzed growth period and particularly controls for the effects that the historical rate of entrepreneurship in 1925 may have had on regional development. Population density can be viewed as a “catch-all” variable for diverse characteristics of the regional environment since it is correlated with several other metrics that might have an effect on the level of entrepreneurship and regional development. It particularly represents all kinds of agglomeration economies and diseconomies as well as regional human capital.¹¹ Because regional growth may be influenced by spatial proximity to other regions, we include a Harris-type market potential function intended to account for spatial dependencies among regions. This variable is defined as the distance-weighted sum of total population in all other districts (see Redding and Sturm 2008; Suedekum 2008). The Federal State dummies are intended to capture differences related to entrepreneurship policy across regions. To control for the effect of industry structure on historical self-employment rates, measures for industry

necessity and are unlikely to have dependent employees. Since our data capture start-ups with at least one employee, most of the businesses set up by unemployed are not included anyway.

¹¹ The correlation between population density and the share of employees with a tertiary degree is about 0.71 for the 70 West German planning regions that we investigate. We do not include a proxy for regional human capital in our main analysis in order to avoid multicollinearity problems.

structure in 1925 are included.¹² We employed the Huber-White procedure in all regressions to account for heteroskedasticity.

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

$$(2) E_r^t = \gamma E_r^{25} + Z_r^{first} + \varepsilon_r^{first}$$

where E_r^{25} is the self-employment rate in 1925. The same controls are included at both stages of the estimation procedure in order to make the results comparable.

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

Table 1 presents the results for the first-stage regression that explains regional start-up activity in the mid-1970s by the level of self-employment in 1925, which is our measure for entrepreneurship culture (entrepreneurial tradition). The results in Column I show that the coefficient estimate of the historical self-employment rate is statistically significant at the 1 percent level conditional on the covariates. While the coefficient estimate for the level of employment in the first year of the period under analysis is insignificant, the coefficient for population density is statistically significant with a positive sign. Market potential appears to be significantly negatively related to the start-up rate. Column II shows that the size and significance of the coefficient of the self-employment rate in 1925 is virtually unaffected when excluding population density and market potential.

¹² The industry controls account for the regional structure of manufacturing and comprise the employment share in the public sector, in mining, construction, and the remaining manufacturing industries within the region. We did not consider the share of agriculture because this would introduce severe multicollinearity problems due to its extremely high correlation with population density.

Table 1: Results of first-stage regressions

<i>Dependent variable: Start-up rate 1976</i>	I	II	III	IV	V
Self-employment rate 1925	0.684*** (0.174)	0.617*** (0.192)	0.698*** (0.174)	0.709*** (0.179)	0.698*** (0.178)
Employment 1976	-0.0400 (0.0701)	0.0398 (0.0472)	-0.0273 (0.0734)	-0.0101 (0.0770)	-0.0205 (0.0751)
Population density 1974	0.142** (0.0695)	-	0.122 (0.0746)	0.0785 (0.0912)	0.0935 (0.0875)
Market potential 1974	-0.535*** (0.152)	-	-0.533*** (0.158)	-0.494*** (0.179)	-0.492*** (0.173)
Employment growth 1925–1975	-	-	-0.154 (0.0959)	-0.145 (0.0939)	-
Share of self-employed expellees 1950	-	-	-	-0.0854 (0.0618)	-0.0929 (0.0635)
Federal State dummies	Yes***	Yes***	Yes***	Yes***	Yes***
Industry structure 1925	Yes***	Yes***	Yes***	Yes***	Yes***
First-stage F-statistics	15.42***	10.39***	16.01***	15.78***	15.28***
F-value	39.72***	108.93***	36.95***	63.39***	108.09***
R-squared	0.620	0.548	0.635	0.646	0.632

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

In the specification shown in Column III we included population density and the market potential indicator again and additionally control for the growth trend prior to 1976 by introducing regional nonagricultural private-sector employment growth between 1925 and 1975. This variable is intended to account for a possible influence of in-migration and economic development after 1925 since it could be argued that entrepreneurially-minded people and people seeking jobs select into regions with an entrepreneurial tradition. That the coefficient of the self-employment rate in 1925 remains unchanged indicates that prior employment growth and the start-up rate appear to be unrelated.

A development that may have particularly affected the entrepreneurial culture in West German regions is the massive inflow of expellees from former German territories after World War II. These people may have had relatively high rates of self-employment for at least two reasons. First, those refugees with a more entrepreneurial mindset might have decided to settle in regions with a high entrepreneurial culture.

Second, problems of integration into regional labor markets might have pushed relatively many expellees into starting their own ventures. This could then have had effects on levels of regional new business formation in the mid-1970s. If such an effect is relevant, then this part of entrepreneurial activity in the mid-1970s cannot legitimately be considered a consequence of the destination region's entrepreneurial tradition because expellees were socialized in other regions. Therefore, we control for self-employment among expellees in Models IV and V by making use of census data from 1950 that provide information on the occupational status of expellees (Census 1950 various volumes). This is based on the assumption that self-employment of expellees just after arriving in West Germany reflects an entrepreneurial tendency developed in the region of origin rather than an adaptation to the destination's local culture. Neither variable—employment change in the 1925–1975 period or the share of self-employed expellees within the total population in 1950—is statistically significant and their inclusion does not lead to any noteworthy change of the coefficient estimate for the historical self-employment rate.

Taken together, the results suggest that a region's entrepreneurial tradition is positively related to start-up activity in later years. This confirms the results of previous analyses for the period between 1984 and 2005 (Fritsch and Mueller 2007; Fritsch and Wyrwich 2014) and is in line with Hypothesis I. The value of the F-statistics in all models except Model II is above 15, indicating the appropriateness of our instrument—the historical self-employment rate—for explaining new business formation in later years.

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

Table 2: Reduced-form relationship

<i>Dependent variable: Private-sector employment change 1976–2008</i>	I	II	III	IV	V
Self-employment rate 1925	0.429*** (0.142)	0.492*** (0.148)	0.421*** (0.140)	0.416*** (0.138)	0.423*** (0.142)
Employment 1976	0.0306 (0.0533)	-0.0109 (0.0289)	0.0234 (0.0507)	0.0159 (0.0527)	0.0218 (0.0551)
Population density 1974	-0.0743 (0.0702)	-	-0.0630 (0.0706)	-0.0441 (0.0729)	-0.0526 (0.0758)
Market potential 1974	0.0420 (0.120)	-	0.0408 (0.114)	0.0237 (0.121)	0.0230 (0.126)
Employment growth 1925–1975	-	-	0.0865 (0.146)	0.0822 (0.146)	-
Share of self-employed expellees 1950	-	-	-	0.0373 (0.0629)	0.0416 (0.0550)
Federal State dummies	Yes***	Yes***	Yes***	Yes***	Yes***
Industry structure 1925	Yes***	Yes***	Yes***	Yes***	Yes***
F-values	4.69***	5.34***	4.47***	4.19***	4.40***
R-squared	0.586	0.576	0.594	0.597	0.590

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

employment in 1925 have higher employment growth in post-World War II West Germany, it can be regarded as an indication that regional entrepreneurship culture has a positive effect on regional development.

Table 2 presents the results for the different specifications, which are identical to the ones in Table 1 except that employment growth between 1976 and 2008 is now the outcome variable. The coefficient of interest, the self-employment rate in 1925, is positive and statistically significant at the 1 percent level in all specifications. The results clearly show that regions with an entrepreneurial tradition did indeed exhibit higher employment growth in post-war West Germany.

5.3 Instrumental Variables Estimate

We next instrument the start-up rate at the beginning of the period of analysis with the historical self-employment rate and investigate the effect of new business formation on economic performance. In all models of

Table 3: Results of instrumental variables regressions

<i>Dependent variable: Private-sector employment change 1976–2008</i>	I	II	III	IV	V
Start-up rate 1976	0.626*** (0.187)	0.797*** (0.266)	0.603*** (0.167)	0.586*** (0.162)	0.606*** (0.181)
Employment 1976	0.0556 (0.0498)	-0.0426 (0.0398)	0.0399 (0.0463)	0.0219 (0.0461)	0.0342 (0.0485)
Population density 1974	-0.163*** (0.0614)	-	-0.136** (0.0616)	-0.0901 (0.0627)	-0.109* (0.0654)
Market potential 1974	0.377*** (0.130)	-	0.362*** (0.126)	0.313*** (0.117)	0.321** (0.126)
Employment growth 1925–1975	-	-	0.180 (0.123)	0.167 (0.114)	-
Share of self-employed expellees 1950	-	-	-	0.0874 (0.0578)	0.0979* (0.0520)
Federal State dummies	Yes***	Yes***	Yes***	Yes***	Yes***
Industry structure 1925	Yes***	Yes***	Yes***	Yes***	Yes***
Wald χ^2	261.38***	177.48***	294.97***	313.77***	281.22***
R-squared	0.540	0.363	0.582	0.604	0.570

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

Table 4: Results of OLS regressions

<i>Dependent variable: Private-sector employment change 1976–2008</i>	I	II	III	IV	V
Start-up rate 1976	0.318*** (0.119)	0.290*** (0.102)	0.346*** (0.112)	0.363*** (0.115)	0.338*** (0.120)
Employment 1976	0.0540 (0.0527)	-0.0314 (0.0355)	0.0416 (0.0495)	0.0267 (0.0501)	0.0375 (0.0528)
Population density 1974	-0.148** (0.0688)	-	-0.129* (0.0699)	-0.0922 (0.0703)	-0.108 (0.0732)
Market potential 1974	0.237* (0.137)	-	0.246* (0.130)	0.220* (0.129)	0.210 (0.138)
Employment growth 1925–1975	-	-	0.145 (0.148)	0.138 (0.140)	-
Share of self-employed expellees 1950	-	-	-	0.0710 (0.0647)	0.0763 (0.0560)
Federal State dummies	Yes**	Yes***	Yes***	Yes**	Yes**
Industry structure 1925	Yes***	Yes***	Yes**	Yes**	Yes**
F-value	5.10***	5.16***	5.13***	4.98***	4.97***
R-squared	0.606	0.568	0.626	0.637	0.619

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

Table 3 the coefficient estimate for start-up activity in the second stage, which reflects only that part of the variation that can be attributed to entrepreneurial tradition, is positive and statistically significant. As in the first stage, the level of employment at the beginning of the period of analysis is not statistically significant. The coefficient for population density is significantly negative in Model I and weakly significant negative in Model III, reflecting a general employment trend of agglomeration in West Germany during the period under investigation (see, e.g., Suedekum 2006). The effect of the measure of market potential is significantly positive, indicating the economic benefits of a more central location. Excluding both control variables in Model II leads to an increase of the coefficient estimate for start-up activity. Prior employment growth between 1925 and 1975 (Models III and IV), as well as the share of self-employed expellees in 1950 (Models IV and V), have no statistically significant effect and do not affect the impact of historically determined start-up activity.

Comparing the coefficients for the effect of the start-up rate in 1976 estimated with the instrumental variables approach to those from simple OLS estimates (Table 4) shows considerably higher values for the instrumental variables estimation. This suggests that the part of new business formation that can be explained by a regional tradition of entrepreneurship has a stronger effect on employment growth than the overall start-up activity. Altogether, our findings are in line with Hypotheses II and III.

5.4 Robustness Checks

We conducted several tests of the robustness of our results. First, it could be argued that our outcome variable in the first stage (start-up rate) simply reflects regional differences in industry structure. To account for this concern, we employed sector-adjusted start-up rates (for details, see Ashcroft, Love and Malloy 1991; Audretsch and Fritsch 2002) instead of the actual start-up rates. Replicating the first-stage and the instrumental variables regressions with sector-adjusted start-up rates leads to no particular difference with respect to the significance of the coefficient

estimates for the historical self-employment rate (see Tables A4 and A5 in the Appendix).

We also investigated whether the link between employment growth and instrumented start-up rates works for other years in order to dispel concerns that we measured a year-specific effect in our main analysis. In Tables A6 and A7 we provide results showing that the instrumented average start-up rate for different time periods is positively and significantly related to subsequent employment growth.¹³ Moreover, it could be argued that employment in the 1970s is much different than in the 2000s (e.g., the practice of working part time has become more prevalent). To account for this possibility, we reran the analysis using full-time employment equivalents instead of the actual number of employees in the respective years. The results (not reported here) vary very little from those of our original approach.

In other robustness checks, we included the regional share of GDR refugees (based on the census in 1961) as well as a dummy variable indicating whether a region shared a common border with the GDR so as to capture more precisely potential regional differences in the impact of German division and subsequent reunification. Neither approach significantly changed our results (not reported here).

Finally, it could be argued that a tradition of self-employment is mainly created by the historical presence of certain industries. For example, areas with a tradition in mining or heavy industry are commonly characterized as relatively less entrepreneurial due to the industry-specific large scale of operations (Chinitz 1961). In a study designed to test this idea, Glaeser, Kerr and Kerr (2014) use distance to historical mines as an indicator of a regional culture of entrepreneurship. Using the employment share in mining in 1925 instead of the self-employment rate as an instrument for current start-up activity, we find that the share of mining employment explains neither the level of start-up activity in the 1970s and

¹³ Note that the coefficient of the prior employment growth since 1925 is positive and strongly significant in these models, in contrast to the main analysis.

1980s in the first stage nor employment growth in the second stage.¹⁴ We conclude for the case of Germany that although industry-specific conditions may have a considerable effect on the regional level of entrepreneurship, they are only one of several possible sources of a regional entrepreneurship culture. Thus, historical levels of self-employment are a much stronger indicator of a regional culture of entrepreneurship than is the historical presence of specific industries.

6. Indications for East Germany

Discovering whether and, if so, how entrepreneurial tradition is related to economic growth in East Germany is a topic of great interest given that this is a region that experienced four decades under a socialist regime devoted to an anti-entrepreneurial policy and then suffered the radical shock of transitioning to a market economic system at a very rapid pace. Given this background, it is remarkable that there is a significantly positive relationship between the self-employment rate in 1925 and the current levels of new business formation in East Germany (see Fritsch and Wyrwich 2014).¹⁵ In that study, we also found that the regional distribution of the small part of remaining self-employment in East Germany in September 1989, just before the collapse of the socialist regime, is positively correlated with the self-employment rate in 1925. This remnant of entrepreneurship after 40 years of communism is a particularly strong example of the persistence of an entrepreneurial orientation in a local population (for more details, see Wyrwich 2012; Fritsch et al. 2014).

Research at the level of districts, which are smaller than planning regions, finds that areas with a high entrepreneurial residual in 1989 had higher GDP growth after transition (Kawka 2007). Thus, regions with an entrepreneurial culture seem to have mastered the challenges of

¹⁴ There is a weak relationship in the first stage if we control for the overall level of self-employment in 1925. The respective first-stage F-statistics are very low compared to models in which we use the general self-employment rate in 1925 as the instrument. All results of robustness checks can be obtained from the authors upon request.

¹⁵ For a detailed assessment of the reemergence of entrepreneurship in East Germany during the transition period, see Fritsch et al. (2014).

transitioning to a market economy comparatively well. Hence, we would expect a similar result for employment growth at the level of functional economic (planning) regions used in this analysis. However, the small number of planning regions in East Germany (21) does not permit the application of a sophisticated IV estimation approach.

7. Summary and Conclusions

We investigated the effect of a high level of regional self-employment in 1925, which we use as a proxy for an entrepreneurship culture, on subsequent regional performance, particularly employment growth, in West Germany between 1976 and 2008. A detailed analysis of the relationship between the historical level of self-employment and current employment change reveals that the informal institution of a culture of entrepreneurship is persistent and can endure severe shocks to the political-economic framework, including devastating wars and abrupt changes of the political-institutional regime. Accordingly, regions with high levels of self-employment in 1925 tend to continue to experience high levels of new business formation more than 80 years later (Hypothesis I). Our results clearly confirm the positive effect of new business formation and of a culture of entrepreneurship on regional growth (Hypotheses II and III), thus demonstrating that regional entrepreneurship culture is a resource for regional development.

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

back into the past. However, economic history is considerably influenced by political-institutional factors, which may provide lessons for policy today.

Our finding that the effect of new business formation that can be attributed to exogenous variation in entrepreneurial tradition is stronger than the general OLS coefficient estimate of start-up activity is of particular interest. In Section 3 we suggested that the environment in regions having an entrepreneurial tradition is supportive of high-quality start-ups as well as of a “productive” reaction by regional incumbents to challenges posed by newcomers, both of which should stimulate growth. The smaller OLS coefficient reflects that other sources of regional start-up activity might contravene the positive influence of entrepreneurial tradition, for example, policies that encourage an influx of possibly ill-prepared start-ups. We argue that important channels and mechanisms through which culture affects start-up activity and growth relate primarily to opportunity-based entrepreneurship. However, many start-ups are not created to explicitly exploit an entrepreneurial opportunity. The growth effects of such start-ups are presumably much lower than those of opportunity-based new businesses that may be particularly stimulated by an entrepreneurship culture. Too many of the former type of start-ups could reduce the effect of overall start-up activity on growth. This suggests that encouraging new business formation in regions that lack an adequate entrepreneurial culture might not be the most appropriate course of action. It might be more effective to foster a positive entrepreneurial climate first (Kibler, Kautonen and Fink 2014; Westlund, Larsson and Olsson 2014). Furthermore, the formal institutional framework should be designed in an entrepreneurship-friendly way (e.g., bankruptcy laws tuned to the needs of start-ups, low entry barriers, supportive infrastructure). Altogether, an entrepreneurship culture appears to be an important regional factor that drives not only the level of new business formation but also its effect on growth. Therefore, further research should investigate the moderating role of an entrepreneurship culture on the type of emerging new businesses and their effects on development.

References

- Acs, Zoltan J. and Pamela Mueller (2008): Employment effects of business dynamics: Mice, gazelles and elephants. *Small Business Economics*, 30, 85–100.
- Acs, Zoltan J., Pontus Braunerhjelm, David B. Audretsch and Bo Carlsson (2009): The knowledge spillover theory of entrepreneurship. *Small Business Economics*, 32, 15–30.
- Anyadike-Danes, Michael, Mark Hart and Helen Lenihan (2011): New business formation in a rapidly growing economy: the Irish experience. *Small Business Economics*, 36, 503–516.
- Andersson, Martin and Sierdjan Koster (2011): Sources of persistence in regional start-up rates—Evidence from Sweden. *Journal of Economic Geography*, 11, 179–201.
- Andersson, Martin (2012): Start-up rates, Entrepreneurship Culture and the Business Cycle – Swedish patterns from national and regional data. In Pontus Braunerhjelm (Ed.): *Entrepreneurship, norms and the business cycle*, Swedish Economic Forum Report 2012, Stockholm: Entreprenörskapsforum, 91-110.
- Ashcroft, Brian, Jim H. Love and Eleonor Malloy (1991): New firm formation in the British counties with special reference to Scotland. *Regional Studies*, 25, 395–409.
- Audretsch, David B. and Michael Fritsch (1994): On the measurement of entry rates. *Empirica*, 21, 105–13.
- Audretsch, David B. and Michael Fritsch (2002): Growth Regimes over Time and Space. *Regional Studies*, 36, 113-124.
- Aoyama, Yuko (2009): Entrepreneurship and regional culture: The case of Hamamatsu and Kyoto, Japan. *Regional Studies*, 43, 495–512.
- Baten, Jörg, Anna Spadavecchia, Jochen Streb, and Shuxi Ying (2007): What made southwest German firms innovative around 1900? Assessing the importance of intra- and inter-industry externalities. *Oxford Economic Papers*, 59, 105–126.
- Baumol, William J. (1990): Entrepreneurship: Productive, Unproductive, and Destructive. *Journal of Political Economy*, 98, 893-921.
- Bernard, Andrew B. and J. Bradford Jensen (1999): Exceptional Exporter Performance: Cause, Effect, or Both? *Journal of International Economics*, 47, 1–25
- Bernard, Andrew B. and Joachim Wagner (1997): Exports and Success in German Manufacturing. *Weltwirtschaftliches Archiv/Review of World Economics*, 133, 134–157.
- Beugelsdijk, Sjoerd and Niels Noorderhaven (2004): Entrepreneurial attitude and economic growth: A cross-section of 54 regions. *Annals of Regional Science*, 38, 199–218.

- Beugelsdijk, Sjoerd (2007): Entrepreneurial culture, regional innovativeness and economic growth. *Journal of Evolutionary Economics*, 17, 187–210.
- Bosma, Niels, et al. (2012): Entrepreneurship and role models. *Journal of Economic Psychology*, 33, 410–424.
- Bothner, Matthew S. (2005): Relative size and firm growth in the global computer industry. *Industrial and Corporate Change*, 14, 617–638.
- Brezinski, Horst and Michael Fritsch (1995): Transformation: The shocking German way. *Moct-Most*, 5(4), 1–25.
- Census (1950): *Ergebnisse der Volks- und Berufszählung vom 13. September 1950 in den Ländern der Bundesrepublik Deutschland*. Various volumes, Statistical Offices of the Federal States of Germany.
- Chinitz, Benjamin (1961): Contrasts in Agglomeration: New York and Pittsburgh. *American Economic Review, Papers and Proceedings*, 51, 279-289.
- Dahl, Michael S. and Olav Sorenson (2009): The Embedded Entrepreneur. *European Management Review*, 6, 172–181.
- Davidsson, Per (1995): Culture, structure and regional levels of entrepreneurship. *Entrepreneurship and Regional Development*, 7, 41–62.
- Davidsson, Per and Johan Wiklund (1997): Values, beliefs and regional variations in new firm formation rates. *Journal of Economic Psychology*, 18, 179–199.
- Etzioni, Amitai (1987): Entrepreneurship, adaptation and legitimation. *Journal of Economic Behavior and Organization*, 8, 175–199.
- Freytag, Andreas and Roy Thurik (2007): Entrepreneurship and its determinants in a cross-country setting. *Journal of Evolutionary Economics*, 17, 117–131.
- Fritsch, Michael and Oliver Falck (2007): New business formation by industry over space and time: A multi-dimensional analysis. *Regional Studies*, 41, 157–172.
- Fritsch, Michael and Pamela 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.
- Fritsch, Michael (2013): New Business Formation and Regional Development—A Survey and Assessment of the Evidence. *Foundations and Trends in Entrepreneurship*, 9, 249–364.
- Fritsch, Michael and Florian Noseleit (2013): Indirect Employment Effects of New Business Formation across Regions: The Role of Local Market Conditions. *Papers in Regional Science*, 92, 361-382.
- Fritsch, Michael and Michael Wyrwich (2014): The Long Persistence of Regional Levels of Entrepreneurship: Germany 1925 to 2005,

Regional Studies, 48 (forthcoming). DOI:
10.1080/00343404.2013.816414

- Fritsch, Michael, Elisabeth Bublitz, Alina Sorgner and Michael Wyrwich (2014): How Much of a Socialist Legacy? The Reemergence of Entrepreneurship in the East German Transformation to a Market Economy. *Small Business Economics* (forthcoming). DOI 10.1007/s11187-014-9544-x
- Glaeser, Edward L., Sari Pekkala Kerr, William R. Kerr (2014): Entrepreneurship and Urban Growth: An Empirical Assessment with Historical Mines. *Review of Economics and Statistics* (forthcoming).
- Hall, John B. and Udo Ludwig (1995): German Unification and the “market adoption” Hypothesis. *Cambridge Journal of Economics*, 19, 491-507.
- Hannan, Michael T. and John Freeman (1977): The population ecology of organizations. *American Journal of Sociology*, 83, 929–984.
- Hethy, Tanja and Johannes F. Schmieder (2010): Using Worker Flows in the Analysis of Establishment Turnover – Evidence from German Administrative Data. FDZ-Methodenreport 06-2010 EN, Research Data Centre of the Federal Employment Agency (BA) at the Institute for Employment Research (IAB): Nuremberg.
- Hofstede, Geert and Robert R. McCrae (2008): Personality and culture revisited, linking traits and dimensions of culture. *Cross-Cultural Research*, 38, 52 – 87.
- Hunt, Jennifer (2006): Staunching Emigration from East Germany: Age and the Determinants of Migration. *Journal of the European Economic Association*, 4, 1014–1037.
- Kawka, Rupert (2007): Regional disparities in the GDR: Do they still matter? In S. Lentz (ed.): *German Annual of Spatial Research and Policy: Restructuring Eastern Germany*, Berlin: Springer, 111–122.
- Kibler, Ewald, Teemu Kautonen and Matthias Fink (2014): Regional Social Legitimacy of Entrepreneurship: Implications for Entrepreneurial Intention and Start-Up Behaviour. *Regional Studies*, 48 (forthcoming)
- Laspita, Stavroula, Nicola Breugst, Stephan Heblich and Holger Patzelt (2012): Intergenerational transmission of entrepreneurial intentions. *Journal of Business Venturing*, 27, 414-435.
- McClelland, David C. (1961): *The Achieving Society*. Princeton, NJ: Van Nostrand Reinhold.
- Michelacci, Claudio and Olmo Silva (2007): Why so Many Local Entrepreneurs? *Review of Economics and Statistics*, 89, 615-633.
- Minniti, Maria (2005): Entrepreneurship and network externalities. *Journal of Economic Behavior and Organization*, 57, 1–27.
- Mueller, Pamela, André van Stel, and David 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.

- North, Douglass C. (1994): Economic performance through time. *American Economic Review*, 84, 359–368.
- Obschonka, Martin, Eva Schmitt-Rodermund, Samuel D. Gosling and Rainer K. Silbereisen (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*, DOI 10.1037/a0032275.
- Ranger-Moore, James, Robert S. Breckenridge and Daniel L. Jones (1995): Patterns of growth and size localized competition in the New York State Life Insurance Industry, 1860-1985. *Social Forces*, 73, 1027–1049.
- Rauch, Andreas and Michael 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, 353–385.
- Redding, Stephen J. and Daniel M. Sturm (2008): The Costs of Remoteness: Evidence from German Division and Reunification. *American Economic Review*, 95, 1766–1797.
- Rentfrow, Jason P., Samuel D. Gosling, and Jeff Potter (2008): A theory of the emergence, persistence, and expression of geographic variation in psychological characteristics. *Perspectives on Psychological Science*, 3, 339-369.
- Spengler, Anja (2008): The Establishment History Panel. *Schmollers Jahrbuch/Journal of Applied Social Science Studies*, 128, 501–509.
- Stam, Erik (2007): Why Butterflies Don't Leave: Locational Behaviour of Entrepreneurial Firms. *Economic Geography*, 83, 27–50.
- Statistik des Deutschen Reichs (1927): *Volks-, Berufs- und Betriebszählung vom 16. Juni 1925: Die berufliche und soziale Gliederung der Bevölkerung in den Ländern und Landesteilen*. Vol. 403–Vol. 405, Berlin: Reimar Hobbing.
- Sternberg, Rolf (2011): Regional determinants of entrepreneurial activities – theories and empirical evidence. In Michael Fritsch (ed.): *Handbook of Research on Entrepreneurship and Regional Development*, Cheltenham: Elgar, 33-57.
- Stuart, Toby E. and Olav Sorensen (2003): The geography of opportunity: spatial heterogeneity in founding rates and the performance of biotechnology firms. *Research Policy*, 32, 229-253.
- Stuetzer, Michael, et al. (2014): Regional characteristics, opportunity perception and entrepreneurial activities. *Small Business Economics*, 42, 221-244.
- Suedekum, Jens (2006): Concentration and Specialization Trends in Germany since Re-unification, *Regional Studies*, 40, 861-873.

- Suedekum, Jens (2008): Convergence of the Skill Composition across German Regions. *Regional Science and Urban Economics*, 38, 148–159.
- Sutaria, Vinod and Donald A. Hicks (2004): New firm formation: dynamics and determinants. *Annals of Regional Science*, 38, 241–262.
- Tabellini, Guido (2010): Culture and institutions: economic development in the regions of Europe. *Journal of the European Economic Association*, 8, 677-710.
- Tipton, Frank B. (1976): *Regional Variations in the Economic Development of Germany during the Nineteenth Century*. Middletown: Wesleyan University Press.
- van Stel, André and Kashifa Suddle (2008): The impact of new firm formation on regional development in the Netherlands. *Small Business Economics*, 30, 31–47.
- Westlund, Hans and Roger E. Bolton (2003): Local Social Capital and Entrepreneurship. *Small Business Economics*, 21, 77-113.
- Westlund, Hans and Frane Adam (2010): Social Capital and Economic Performance: A Meta-analysis of 65 Studies. *European Planning Studies*, 18, 893-919.
- Westlund H., J.P. Larsson and A.R. Olsson (2014): Startups and Local Social Capital in Swedish Municipalities. *Regional Studies* 48 (forthcoming).
- Williamson, Oliver (2000): The New Institutional Economics: Taking Stock, Looking Ahead. *Journal of Economic Literature*, 38, 595–613.
- Wyrwich, Michael (2012): Regional entrepreneurial heritage in a socialist and a post-socialist economy. *Economic Geography*, 88, 423-445.
- Zhao, Hao and Scott E. Seibert (2006): The Big-Five Personality Dimensions and Entrepreneurial Status: A Meta-Analytical Review. *Journal of Applied Psychology*, 91, 259–271.

Appendix

Table A1: Definition of explanatory variables

<i>Variable</i>	<i>Definition</i>
Self-employment rate 1925	Number of self-employed persons in nonagricultural private sectors divided by all employees ^a
Start-up rate	Number of start-ups in a region over private-sector employment ^b
Employment	Number of private-sector employment ^b
Population density	Number of inhabitants in a region per square kilometer ^c
Market potential	Distance weighted (1/distance) sum of population in all other regions ^c
Employment growth	Change in nonagricultural private-sector employment between 1925 and 1975. ^{ac}
Share of self-employed expellees 1950	Number of self-employed expellees in a region over regional workforce ^d

Source: a) Statistik des Deutschen Reichs (1927); b) Social Insurance Statistics; c) Federal Statistical Office; d) Census 1950 (various volumes). All variables enter the models in log-form.

Table A2: Summary statistics for self-employment rates, start-up rates, and other regional conditions in West Germany

	Mean	Median	Minimum	Maximum	Standard deviation
Employment growth 1976–2008	1.14	1.11	0.8	1.65	0.2
Self-employment rate 1925	0.1	0.098	0.06	0.12	0.01
Start-up rate 1976	5.09	4.92	3.38	9.7	1.14
Employment 1976 (log)	11.96	11.8	10.7	13.71	0.7
Population density 1976 (log)	5.35	5.17	4.24	7.13	0.69
Market potential 1976 (log)	12.4	12.41	11.82	12.96	0.25
Employment growth 1925–1975	1.16	1.12	0.67	3.19	0.34
Share of self-employed expellees 1950	0.01	0.008	0.002	0.017	0.004

Table A3: Correlation of self-employment rates, start-up rates, and other regional conditions in West Germany

	I	II	III	IV	V	VI	VII	VIII
I Employment growth 1976–2008	1							
II Self-employment rate 1925	0.124	1						
III Start-up rate 1976	0.249**	0.212	1					
IV Employment 1976	-0.252**	0.051	-0.221*	1				
V Population density 1976	-0.403***	-0.112	-0.186	0.798***	1			
VI Market potential 1976	-0.225*	-0.23*	-0.365***	0.335***	0.619***	1		
VII Employment growth 1925–1975	0.269**	0.036	-0.087	-0.139	-0.325***	-0.178*	1	
VIII Share of self-employed expellees 1950	0.264**	0.087	0.091	-0.414***	-0.608***	-0.607***	0.206	1

Notes: ***: statistically significant at the 1 percent level; ** statistically significant at the 5 percent level; *: statistically significant at the 10 percent level. All variables are in log-form.

Table A4: Persistence of start-up rates in West Germany

	I	II	III	IV	V	VI	VII
I Start-up rate ($t-30$)	1						
II Start-up rate ($t-25$)	0.907	1					
III Start-up rate ($t-20$)	0.838	0.921	1				
IV Start-up rate ($t-15$)	0.871	0.934	0.938	1			
V Start-up rate ($t-10$)	0.813	0.868	0.894	0.904	1		
VI Start-up rate ($t-5$)	0.759	0.823	0.863	0.867	0.923	1	
VII Start-up rate (t)	0.788	0.816	0.868	0.885	0.907	0.95	1

Notes: All correlation coefficients are statistically significant at the 1 percent level. The year t represents 2008. Therefore, the year $t-32$ represents 1976.

Table A4: First-stage regressions with sector-adjusted start-up rate

<i>Dependent variable: Start-up rate 1976 (sector adjusted)</i>	I	II	III	IV	V
Self-employment rate 1925	0.458*** (0.152)	0.549*** (0.151)	0.488*** (0.144)	0.491*** (0.145)	0.464*** (0.153)
Employment 1976	-0.0832 (0.0582)	-0.127*** (0.0346)	-0.0556 (0.0602)	-0.0503 (0.0628)	-0.0740 (0.0651)
Population density 1974	-0.0788 (0.0654)	-	-0.123* (0.0707)	-0.136* (0.0781)	-0.102 (0.0766)
Market potential 1974	-0.153 (0.108)	-	-0.148 (0.0979)	-0.136 (0.102)	-0.133 (0.113)
Employment growth 1925–1975	-	-	-0.334*** (0.0602)	-0.331*** (0.0626)	-
Share of self-employed expellees 1950	-	-	-	-0.0269 (0.0391)	-0.0440 (0.0528)
Federal State dummies	Yes***	Yes	Yes***	Yes***	Yes***
Industry structure 1925	Yes***	Yes***	Yes***	Yes***	Yes***
First-stage F-statistics	9.09***	13.27***	11.48***	11.44***	9.17***
F-value	81.55***	58.69***	94.31***	88.14***	81.84***
R-squared	0.746	0.711	0.824	0.825	0.749

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

Table A5: Results for instrumental variables regressions

<i>Dependent variable: Private-sector employment growth 1976–2008</i>	I	II	III	IV	V
Start-up rate 1976 (sector adjusted)	0.936*** (0.327)	0.897*** (0.261)	0.863*** (0.235)	0.846*** (0.230)	0.910*** (0.317)
Employment 1976	0.108** (0.0533)	0.103** (0.0519)	0.0714 (0.0440)	0.0584 (0.0418)	0.0891* (0.0505)
Population density 1974	-0.000520 (0.0690)	-	0.0428 (0.0594)	0.0712 (0.0683)	0.0400 (0.0779)
Market potential 1974	0.185 (0.125)	-	0.169* (0.0972)	0.139 (0.0907)	0.144 (0.126)
Employment growth 1925–1975	-	-	0.375*** (0.114)	0.362*** (0.111)	-
Share of self-employed expellees 1950	-	-	-	0.0601 (0.0518)	0.0817 (0.0505)
Federal State dummies	Yes***	Yes***	Yes***	Yes***	Yes***
Industry structure 1925	Yes***	Yes***	Yes***	Yes***	Yes***
Wald chi ²	312.81	263.23***	463.36***	447.95***	344.38***
R-squared	0.519	0.516	0.684	0.694	0.544

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

Table A.6: First-stage regressions for average start-up rates and different time periods

	I	II	III	IV	V
<i>Panel A: Dependent variable: Average start-up rate 1976–1980</i>					
Self-employment rate 1925	0.710*** (0.167)	0.627*** (0.175)	0.718*** (0.167)	0.730*** (0.173)	0.725*** (0.172)
First-stage F-statistics	18.18***	12.89***	18.53***	17.86***	17.69***
F-value	23.59***	19.66***	21.18***	23.72***	27.14***
R-squared	0.636	0.573	0.639	0.655	0.654
<i>Panel B: Dependent variable: Average start-up rate 1981–1985</i>					
Self-employment rate 1925	0.552*** (0.161)	0.437** (0.165)	0.557*** (0.166)	0.563*** (0.171)	0.567*** (0.166)
First-stage F-statistics	11.80***	7.04***	11.22***	10.86***	11.69***
F-value	8.21***	7.43***	7.63***	8.88***	9.58***
R-squared	0.610	0.538	0.611	0.632	0.632
<i>Panel C: Dependent variable: Average start-up rate 1976–1985</i>					
Self-employment rate 1925	0.631*** (0.163)	0.530*** (0.168)	0.635*** (0.165)	0.646*** (0.171)	0.645*** (0.169)
First-stage F-statistics	13.09***	9.98***	14.80***	14.35***	14.61***
F-value	14.99***	11.33***	12.07***	14.37***	15.42***
R-squared	0.626	0.559	0.627	0.646	0.646
<i>Panel D: Dependent variable: Average start-up rate 1981–1990</i>					
Self-employment rate 1925	0.504*** (0.162)	0.385** (0.160)	0.515*** (0.166)	0.519*** (0.169)	0.519*** (0.166)
First-stage F-statistics	9.64***	5.84**	9.66***	9.41***	9.73***
F-value	8.49***	8.63***	7.91***	9.65***	10.38***
R-squared	0.613	0.551	0.614	0.639	0.639

Notes: Robust standard errors in parentheses. Number of observations is 70 planning regions. ***: Statistically significant at the 1 percent level; **: statistically significant at the 5 percent level; *: statistically significant at the 10 percent level. The models use the same set of variables as in the main analysis. Constant and control variables suppressed for brevity. Average population density and market potential in the respective periods. Prior employment growth in Models III and IV refer to the year before the years of which the average is taken.

Table A.7: Results for instrumental variables regressions for average start-up rates and different time periods

	I	II	III	IV	V
<i>Panel A: Dependent variable: Private-sector employment growth 1980–2008</i>					
Average start-up rate 1976–1980	0.475*** (0.159)	0.600*** (0.210)	0.410*** (0.121)	0.409*** (0.119)	0.468*** (0.155)
Wald chi ²	209.74***	143.55***	365.15***	377.65***	230.32***
R-squared	0.542	0.412	0.715	0.715	0.548
<i>Panel B: Dependent variable: Private-sector employment growth 1985–2008</i>					
Average start-up rate 1981–1985	0.442** (0.175)	0.623** (0.281)	0.297** (0.131)	0.299** (0.129)	0.433** (0.170)
Wald chi ²	160.31***	110.12***	453.93***	487.96***	172.15***
R-squared	0.550	0.340	0.736	0.736	0.560
<i>Panel C: Dependent variable: Private-sector employment growth 1985–2008</i>					
Average start-up rate 1976–1985	0.380** (0.156)	0.513** (0.219)	0.325*** (0.122)	0.324*** (0.120)	0.374** (0.153)
Wald chi ²	149.44***	111.37***	283.88***	287.71***	159.12***
R-squared	0.552	0.415	0.695	0.695	0.557
<i>Panel D: Dependent variable: Private-sector employment growth 1990–2008</i>					
Average start-up rate 1981–1990	0.441*** (0.169)	0.606** (0.280)	0.308** (0.129)	0.310** (0.127)	0.436*** (0.163)
Wald chi ²	210.45***	131.31***	455.92***	526.55***	246.04***
R-squared	0.485	0.218	0.707	0.709	0.493
<p><i>Notes:</i> Robust standard errors in parentheses. Number of observations is 70 planning regions. ***: Statistically significant at the 1 percent level; **: statistically significant at the 5 percent level; *: statistically significant at the 10 percent level. The models use the same set of variables as in the main analysis. Constant and control variables suppressed for brevity. Average population density and market potential in the respective periods. Prior employment growth in Models III and IV refer to the year before the years of which the average is taken</p>					