Chapter 4
The Persistence of Regional Entrepreneurship

4.1 Empirical Strategy

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

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

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

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

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M. Fritsch, M. Wyrwich, *Regional Trajectories of Entrepreneurship, Knowledge, and Growth*, International Studies in Entrepreneurship 40,
https://doi.org/10.1007/978-3-319-97782-9_4

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

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

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

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

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

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

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

[1]If available, alternative indicators for new business formation and self-employment from other sources tend to be highly correlated with the data used here.

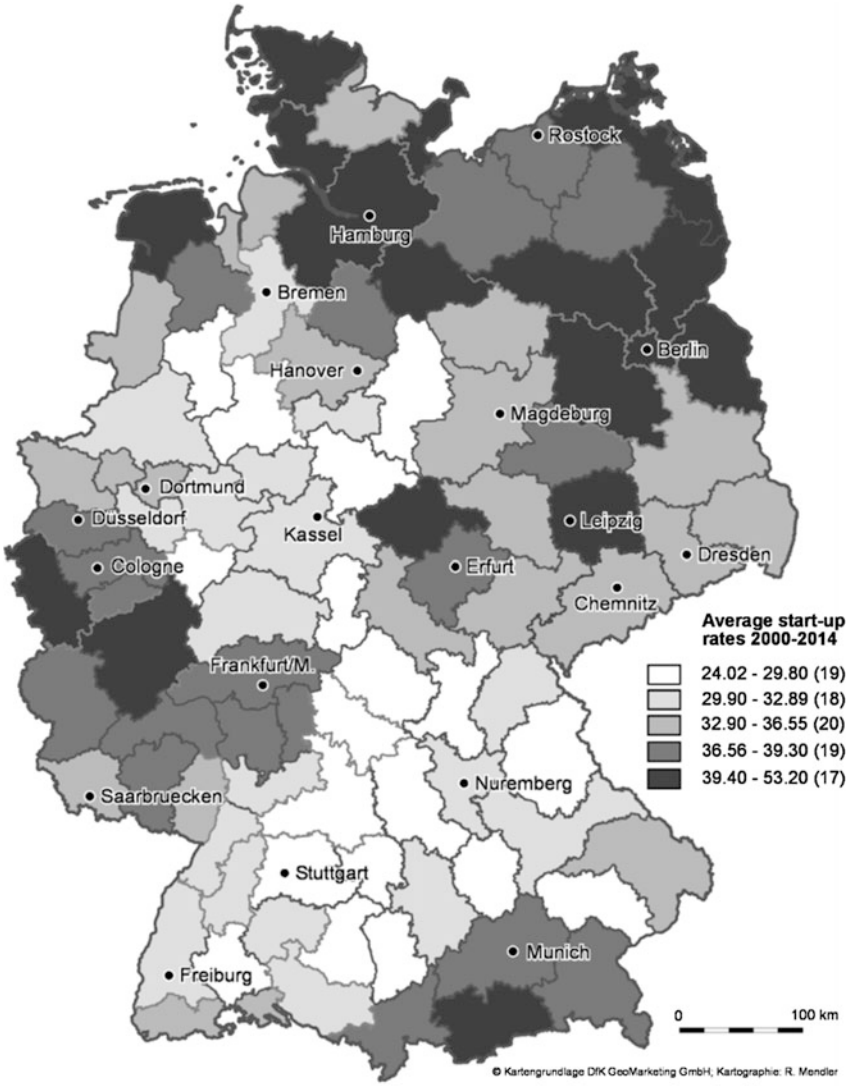

Fig. 4.1 Regional start-up rates across German regions 2010–2014 according to the Employment Statistics

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

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

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

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

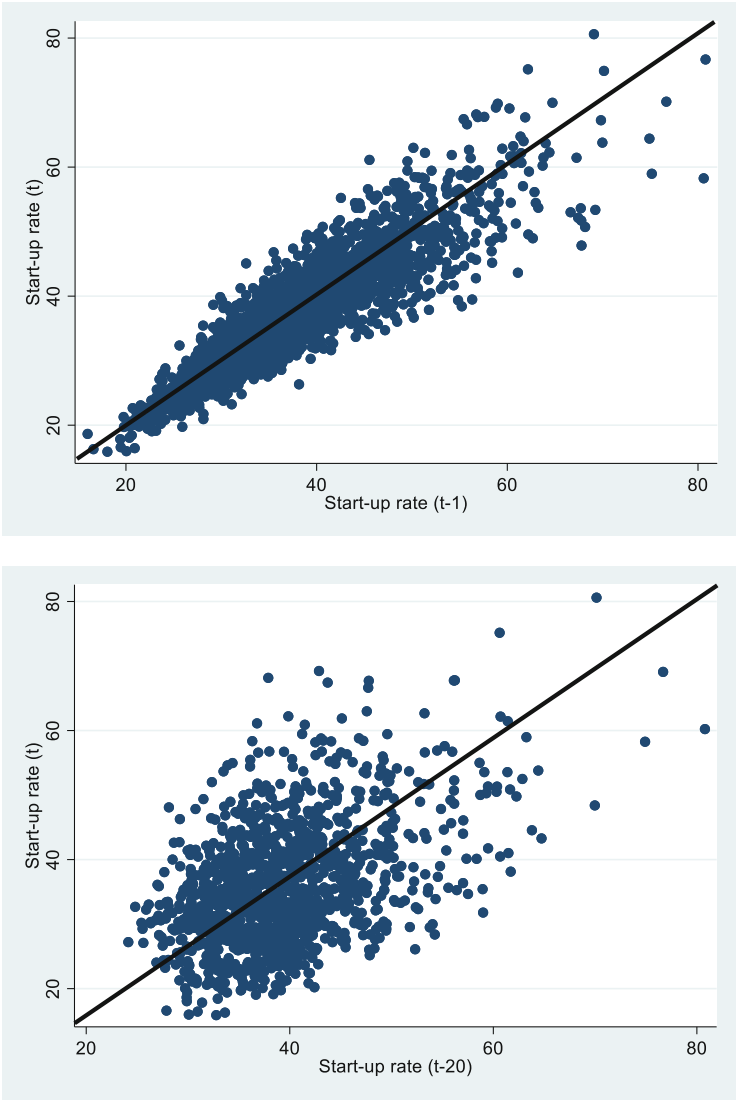

Fig. 4.2 The relationship between start-up rate (per 10,000 individuals) in t and t − 1 (upper plot) and t and t − 20 (lower plot) in West Germany

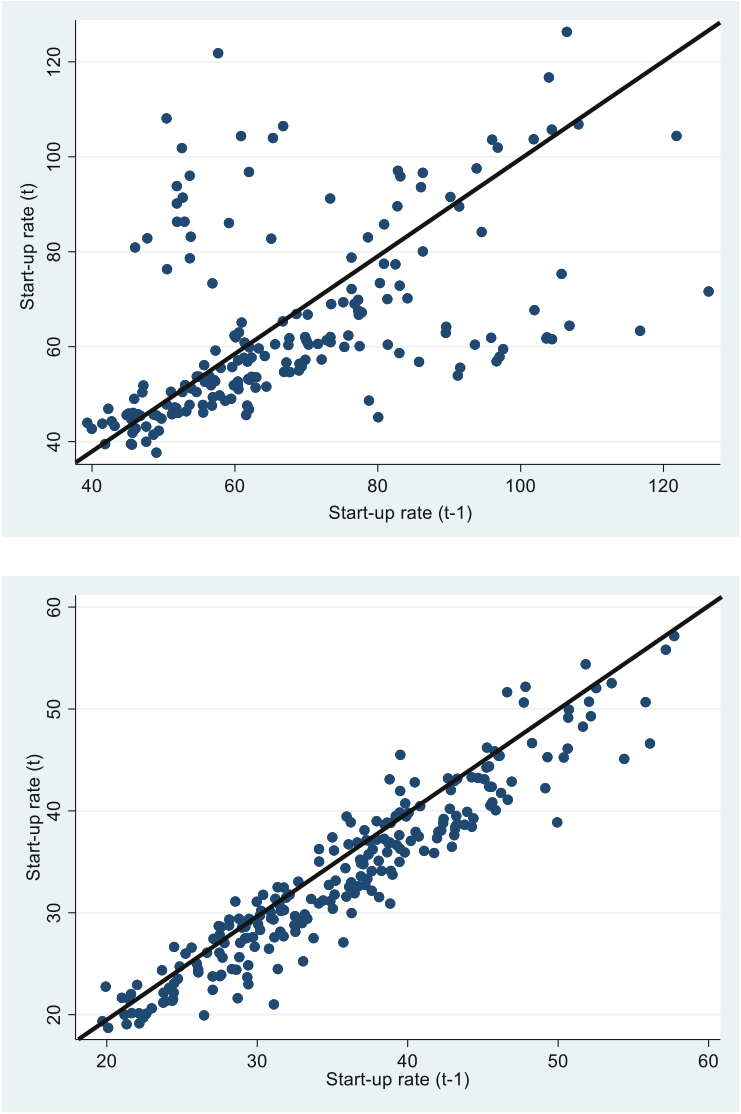

Fig. 4.3 The relationship between start-up rate (per 10,000 individuals) in East German regions in t and t − 1 in the period 1993–2003 (upper plot) and in the period 2004–2014 (lower plot)

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

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

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

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

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

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

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

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

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

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

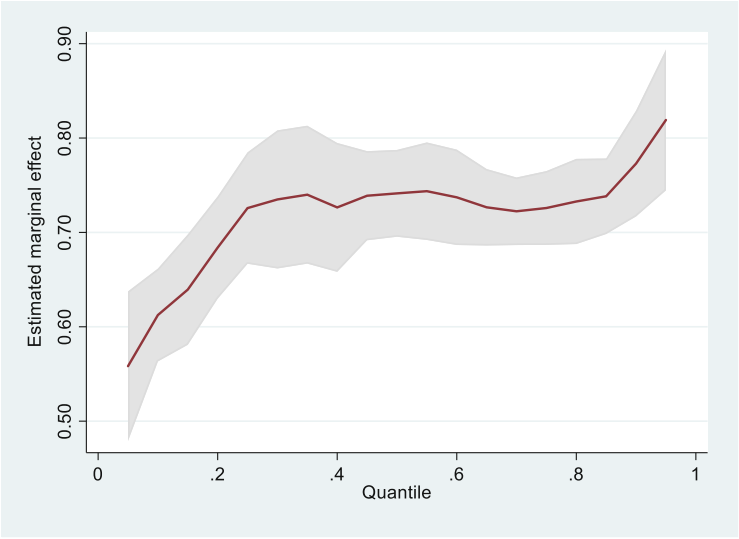

Fig. 4.4 Estimated marginal effect of the start-up rate in t − 3 on the start-up rates in t = 0 in West Germany (shaded areas indicate upper and lower confidence intervals; bootstrapped standard errors with 1000 replications) (The quantile regressions do not include year fixed effects. Including them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

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

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

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

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

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

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

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

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

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

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

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

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

For Scenario II, we again applied quantile regressions. We want to discover how the effect of historical self-employment rates differs across regions with low and high rates of new firm formation (Fig. 4.5). The highest estimated marginal effects can be found for the upper quartiles of the distribution. Thus, persistence is particularly pronounced in regions with high levels of new firm formation. Furthermore, there seems to be a threshold value around the median value with respect to the estimated marginal effect. This may indicate that there is a critical level of self-employment for the self-reinforcing effect of entrepreneurial culture.

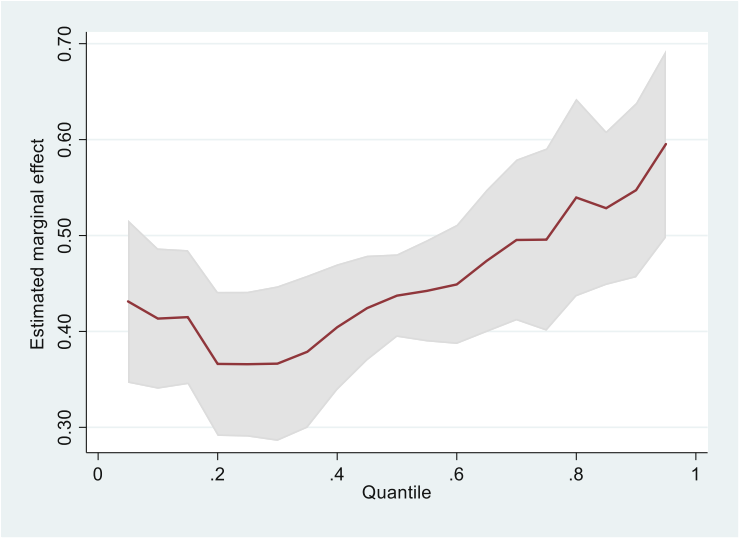

Fig. 4.5 Estimated marginal effect of the self-employment rate in 1925 on the start-up rates in West Germany (shaded areas indicate upper and lower confidence intervals; bootstrapped standard errors with 1000 replications)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Quantile regressions using Model II of Table 4.4 and Model III of Table 4.5 show that the effect of past start-up activity and the historical self-employment rate on current start-up activity is strongest for regions with high levels of new firm formation (Figs. 4.6 and 4.7). The increase of the marginal effect with rising start-up activity is

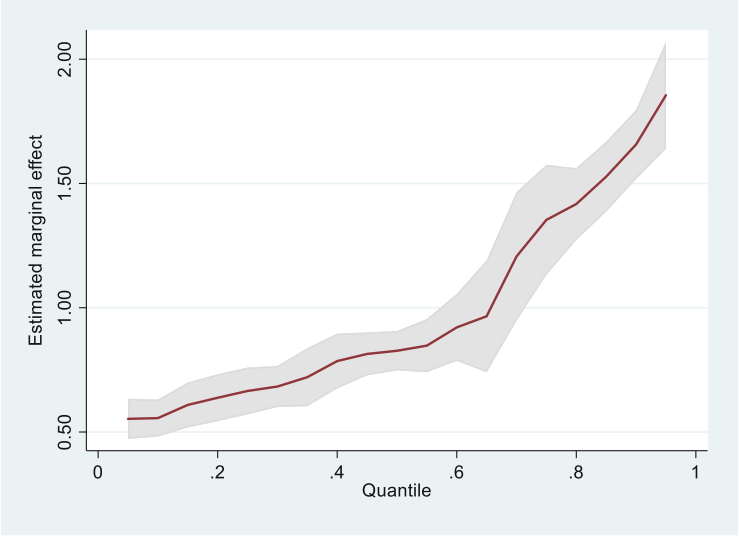

Fig. 4.6 Estimated marginal effect of the start-up rate in t − 3 on the start-up rates in East Germany (shaded areas indicate upper and lower confidence intervals; bootstrapped standard errors with 1000 replications)

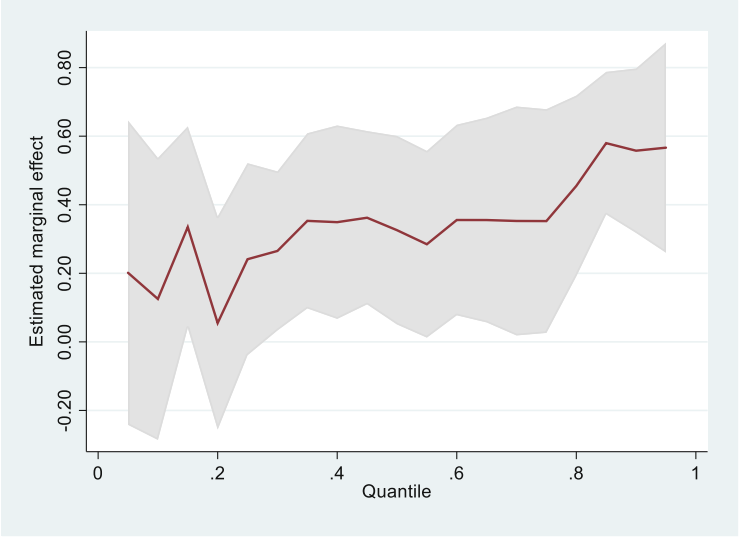

Fig. 4.7 Estimated marginal effect of the self-employment rate in 1925 on the start-up rates in East Germany (shaded areas indicate upper and lower confidence intervals; bootstrapped standard errors with 1000 replications)

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

4.6 Discussion and Conclusions

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

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

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

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

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

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

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

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

Appendix

Table 4.6 Summary statistics

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

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

Table 4.7 Correlation matrix West Germany

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

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

Table 4.8 Correlation matrix East Germany

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

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

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