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The Long Persistence of Regional Entrepreneurship Culture: Germany 1925–2005

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Abstract

We investigate the persistence of levels of self-employment and new business formation in different time periods and under different framework conditions. The analysis shows that high levels of regional self-employment and new business formation tend to be persistent for periods as long as 80 years and that such an entrepreneurial culture can even survive abrupt and drastic changes in the politic-economic environment. We thus conclude that regional entrepreneurship cultures do exist and that they have long-lasting effects.

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1. Introduction[1]

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 start-up rates tend to be relatively persistent and path dependent over periods of one or two decades. Hence, regions that have a relatively high level of entrepreneurship and start-up activity today can be expected to also experience high levels in the future. One main reason for this strong persistence could be that region-specific determinants of entrepreneurship also remain relatively constant over time, or, as stated by Marshall (1920), *natura non facit saltum* (nature does not make jumps). Another explanation could be the existence of a regional entrepreneurship culture, a phenomenon also known as "entrepreneurship capital" (Audretsch and Keilbach, 2004). An entrepreneurial culture should, at least to some degree, be independent of socio-economic conditions and may, therefore, even survive considerable shocks to the socio-economic environment, such as serious economic crises, devastating wars, and drastic changes of political regime.

We analyze the persistence of regional entrepreneurship in three different scenarios, each with a specific degree of change in economic conditions. In contrast to extant work that studies time periods of up to 10–20 years (e.g., Andersson and Koster, 2011), we investigate persistence of regional entrepreneurship for periods as long as 80 years. Moreover, while work to date studies the persistence of entrepreneurship under stable socio-economic conditions, our examples include different kinds of disruptive changes or "jumps" in the conditions for entrepreneurship. Hence, the persistence of regional entrepreneurship that we find under such dramatically changing conditions cannot be caused by persistence of the determinants of

entrepreneurial activity, but must be due to other reasons, such as a regional culture of entrepreneurship.

The *first scenario* presents regional entrepreneurship in West Germany from 1984 to 2005, a period characterized by relatively stable conditions without any major shocks to the socio-economic environment. For the *second scenario*, we extend our period of analysis to cover 80 years and compare regional entrepreneurship in West German regions in 1925 with the level of entrepreneurial activity in the 1984–2005 period. A number of considerable disruptions occurred during this period, including the world economic crisis of the late 1920s, World War II, occupation by the allied powers, massive in-migration, and a new constitutional base and political system, as well as reconstruction of the economy. If we find persistence of regional entrepreneurship in the second scenario, it can be viewed as an indication of an entrepreneurial culture that persists even in the face of severe ruptures with the past. Moreover, since the entire adult population is replaced over such a long period of 80 years, persistence of relatively high or low levels of entrepreneurship would indicate an intergenerational transfer of the attitude towards entrepreneurial behavior. The *third scenario,* East Germany between 1925 and 2005, is characterized by change even more drastic than that experienced in West Germany. While both parts of the country had very similar macroeconomic conditions until the end of World War II in 1945, East Germany then had 40 years under a socialist regime that more or less tried to completely extinguish private firms and entrepreneurship. German Unification in 1990 was another abrupt shock for East Germany, initiating, as it did, a dramatic transformation process to a market economy.

We find long-term persistence in all three scenarios, something that is particularly remarkable in the third one involving East Germany. A high level of self-employment in 1925 has a significant positive effect on start-up activity 80 years later in 2005. Our findings can be regarded as a strong indication for the existence of a regional entrepreneurial culture that can survive even drastic and long-lasting changes to the socio-economic environment.

In the next section we review previous research on the persistence of regional entrepreneurship and discuss the concept of an entrepreneurial culture or entrepreneurship capital. The following sections analyze the persistence of entrepreneurship in the three scenarios described above. The final section (Section 6) discusses the results, draws policy conclusions, and proposes avenues for further research.

2. Persistence in Regional Entrepreneurship: Beyond Stability in Context

Studies of a number of established market economies have found that the regional level of new business formation tends to be rather constant over periods of 10–20 years.[2] One obvious explanation for this phenomenon could be that regional determinants of new business formation and their effects are relatively stable over time. Indeed, variables shown to be conducive to the emergence of new firms, such as qualification of the regional workforce or employment share in small firms (Fritsch and Falck, 2007), do tend to remain fairly constant over successive years. Some authors have claimed, however, that the persistence of start-up rates may indicate the presence of an entrepreneurial culture (Andersson and Koster, 2011), sometimes referred to as "entrepreneurship capital" (Audretsch and Keilbach, 2004).

An entrepreneurial culture is typically understood "as a positive collective programming of the mind" (Beugelsdijk, 2007, 190) or an "aggregate psychological trait" (Freytag and Thurik, 2007, 123) in the regional population oriented toward entrepreneurial values such as individualism, independence, and achievement.[3] Etzioni (1987) argues that one important aspect of entrepreneurial culture is spatial variation in social acceptance of entrepreneurs and their activities. According to him, the degree of societal legitimacy when it comes to entrepreneurship may be

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[2] Acs and Mueller (2008), Andersson and Koster (2011), Fritsch and Mueller (2007), Mueller, van Stel, and Storey (2008), and van Stel and Suddle (2008).

[3] See also Andersson and Koster (2011), Aoyama (2009), Audretsch and Keilbach (2004), Beugelsdijk (2007), Beugelsdijk and Noorderhaven (2004), Davidsson (1995), Davidsson and Wiklund (1997), Fornahl (2003), Minniti (2005), and Lafuente, Vaillant, and Rialp (2007).

higher in some regions than in others. As a consequence, the more entrepreneurship is regarded as legitimate, the higher the demand for it and the more resources dedicated to such activity. This social acceptance of entrepreneurship can be regarded as an informal institution that typically changes only gradually over time (North, 1994).

In an approach inspired by social psychology, Fornahl (2003) conceptualizes how a specific regional attitude toward entrepreneurship may emerge via the presence of positive local examples or role models. The main idea of this approach is that an individual's perception of entrepreneurship—the cognitive representation—is shaped by observing entrepreneurial role models in the social environment. This leads to learning from the role models, increases the social acceptance of entrepreneurial lifestyles, and raises the likelihood of adopting entrepreneurial behavior. With respect to learning, Sorenson and Audia (2000) argue that observing successful entrepreneurs enables potential entrepreneurs to organize the resources and activities required for starting and running one's own venture and increases individual self-confidence, in the sense of "if they can do it, I can, too" (Sorenson and Audia, 2000, 443). Accordingly, having a relatively high number of entrepreneurs in a region is conducive to new business formation probably because it provides opportunities to learn about entrepreneurial tasks and capabilities.[4]

These findings suggest that regional entrepreneurship might become self-reinforcing, as Minniti (2005) puts it. She provides a theoretical model that, based on the above-mentioned regional role model effects, can explain why regions with initially similar characteristics may end up with different levels of entrepreneurial activity. Chance events at the outset of such a process may induce entrepreneurial choice among individuals that leads to different levels of regional entrepreneurship, which may, in turn, attract other actors to the region. The presence of entrepreneurial role models in the

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[4] This is an implication of the highly significantly positive effect of the small business employment share on the regional level of start-ups (see, e.g., Fritsch and Falck, 2007) because such a high share of employment in small businesses indicates the presence of relatively many firms and entrepreneurs.

social environment reduces ambiguity for potential entrepreneurs and may help them acquire necessary information and entrepreneurial skills. In this way, entrepreneurship creates a sort of perceptual non-pecuniary externality that spurs additional start-up activity and makes entrepreneurship self-reinforcing.[5] In Minniti's model, this self-reinforcing effect of entrepreneurship depends critically on the ability of individuals "to observe someone else's behavior and the consequences of it" (Minniti, 2005, 5). Thus, regional social capital, the properties of regional networks, and, particularly, regional entrepreneurial history play a role in the region's level of entrepreneurship. In the same sense, Fornahl (2003) argues that self-augmenting processes may lead to the emergence of cognitive representation in favor of entrepreneurship, which translates into an increasing number of entrepreneurs in the region and a specific regional entrepreneurial attitude. Andersson and Koster (2011), in an empirical analysis of Swedish regions, find that the positive effect of past start-up activities on the present level of new business formation is particularly pronounced in regions with relatively high start-up rates in previous years. This suggests that persistence and self-augmentation of a regional entrepreneurship culture may require a certain 'threshold-level.'

A regional culture of entrepreneurship, however, may need more than societal legitimacy of entrepreneurship, individuals able and willing to start firms, role models, networks, and peer effects. An infrastructure of supporting services, particularly the availability of competent consulting as well as financial institutions able and willing to invest (Audretsch and Keilbach, 2004), may also be necessary. In short, there are many aspects of the

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[5] "[I]n addition to economic circumstances, the local amount of entrepreneurial activity is itself an important variable in determining individual decisions whether to act upon a recognized opportunity. In other words, I argue that entrepreneurship creates a 'culture' of itself that influences individual behavior in its favor" (Minniti, 2005, 3).

regional environment that may be, to different degrees, conducive to new business formation (Dubini, 1989).[6]

There is considerable empirical evidence that points towards a long-term persistence of informal institutions in general. Becker et al. (2010), for instance, compare Eastern European regions that had been affiliated with the Habsburg Empire with regions that had not. They show that having been part of the Habsburg Empire in the past increases current trust and reduces corruption of police and courts compared to other regions with the same formal institutions but no past association with the Habsburg Empire. A very long persistence of regional informal institutions is vividly illustrated by Voigtlaender and Voth (2011). The authors show that German regions that experienced anti-Semitic violence in the 14th century also had higher levels of violence against Jews in the 1920s and 1930s. If such attitudes can survive for centuries, it seems possible that other attitudes, such as those toward entrepreneurship, might also be long-term characteristics of a region, persisting even such disruptive events like world wars or institutional upheavals like the transition from communism to a market economy in East Germany, which involved a rapid change of the norms and values that underlie economic activity (Newman, 2000). But also the forty years of a socialist regime in the regions of East Germany might have left considerable traces. An indication for such longer term effects is a study by Alesina and Fuchs-Schuendeln (2007) who find that East German citizens who were exposed to the socialist regime are much more in favor of redistribution and state intervention than their West German counterparts.

The reasons for such a long-term persistence of values in a region are largely unclear. A main mechanism that may explain regional persistence of

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[6] Dubini (1989) distinguishes between munificent and sparse entrepreneurial environments. A munificent entrepreneurial environment is characterized by a large number of entrepreneurial role models, an efficient infrastructure, well-established capital markets, and the availability of opportunities and incentives for starting entrepreneurial ventures. A sparse entrepreneurial environment lacks not only the values, culture, and tradition of entrepreneurship, but also the necessary infrastructure, well-functioning capital markets, and current innovation activities that may generate entrepreneurial opportunities, as well as government incentives. Hence, incentives for starting firms in such an environment are rather low.

entrepreneurial values and attitudes may be their transmission from parents or grandparents to their children that has been found to be a significant effect in several empirical studies (e.g., Chlosta, et al., 2012; Dohmen, et al., 2012; Dunn and Holtz-Eakin, 2000; Laspita, et al. 2012).

To summarize the literature, a regional entrepreneurial culture may exist and persist for mainly three reasons:

- the presence of peer effects and the intergenerational transmission of entrepreneurial role models and values,

- social acceptance of entrepreneurship, and

- the existence of entrepreneurial supporting services and institutions (e.g., financing and advice).

These factors may lead to and support a certain "aggregate psychological trait" (Freytag and Thurik, 2007, 123) in the regional population that has a pronounced positive effect on the level of entrepreneurial activity. Because these factors change only gradually over time as well as due to the self-reinforcing effects mentioned above, a regional culture of entrepreneurship should not only take a considerable time to develop, but should also be long-lasting, so that it may be regarded as a certain kind of "capital." Moreover, even if supportive institutional infrastructure for entrepreneurship has been destroyed by a rigorous anti-entrepreneurship policy, as was the case in East Germany under its socialist regime, the regional population's positive attitude towards entrepreneurship might continue to prevail for some time.

3. Scenario I: Persistence of Regional Entrepreneurship in a Stable Environment—West Germany 1984–2005

We begin our analysis of the persistence of regional entrepreneurship by looking at the rather stable environment of West Germany, which has already been investigated by Fritsch and Mueller (2007). We use the same data source as that paper, but slightly extend the period of analysis (1984-2005) to more than 20 years. Moreover, we not only investigate the correlation of regional start-up rates over time but also analyze the effect of the regional

self-employment rate on the level of start-ups in order to make the analysis compatible with scenarios II and III. The analysis is at the level of 71 Planning Regions,[7] which represent functional spatial units. 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 (Fritsch and Brixy, 2004). 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 employees in the private sector plus registered unemployed persons.[8] The regional self-employment rate is the number of establishments in a region's non-agricultural private-sector industries divided by the regional workforce (including registered unemployed persons). Figure 1 shows the regional start-up rates in Germany today.

There are considerable regional differences in the levels of new business formation in Germany at the end of the observation period, the year 2005.[9] Figure 1 reveals that start-up rates tend to be higher in West Germany compared to East Germany.[10] 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).

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[7] There are actually 74 West 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 has been merged with the region of Schleswig-Holstein South and Hamburg-Umland-South. Bremen has been merged with Bremen-Umland. Thus, the number of regions in our sample is 71.

[8] Start-ups in agriculture are not considered in the analysis.

[9] The highest regional start-up rates (over 20 start-ups per 1,000 workforces) are more than five times larger than the lowest start-up rates (about 4 start-ups per 1,000 workforce).

[10] According to a different data base—the German Micro Census—that measures the number of founders instead of the number of start-ups and that also comprises new businesses without employees, the East German start-up rate has reached the West German level in the year 2004 and was slightly above the value for West Germany since 2005 (Fritsch, Kritikos and Rusakova, 2012). This clearly indicates a higher share of start-ups without any employee in East Germany, many of them probably founded out of necessity due to relatively high unemployment rates in this part of the country.
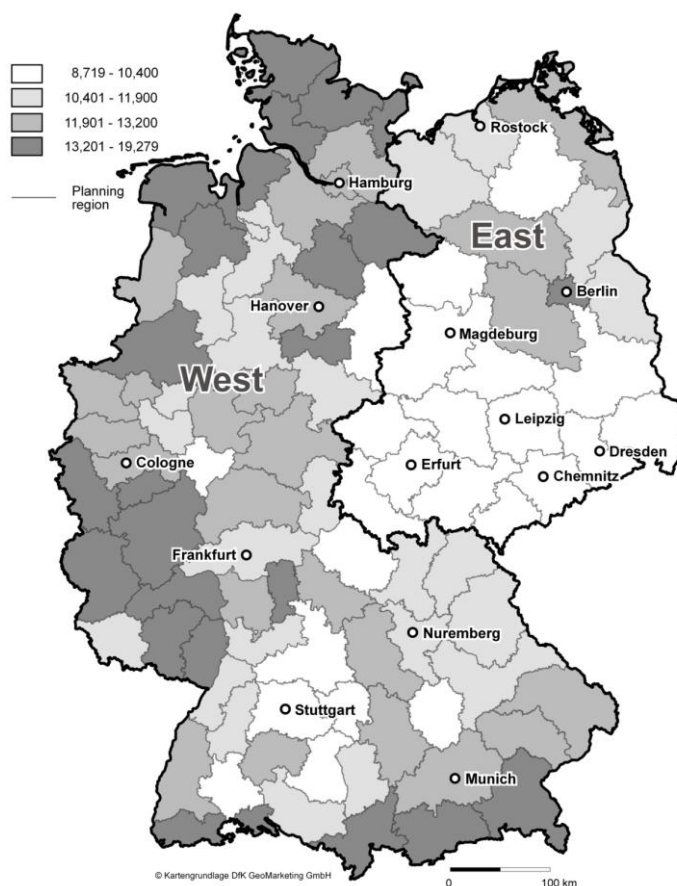
Figure 1: Start-up rates in German Planning Regions 2005

Regional start-up rates and self-employment rates are highly correlated over time (Table 1; see Table A1 and A2 in the Appendix for descriptive statistics). The self-employment rate is defined as the number of non-agricultural private sector establishments divided by the respective total employment. This variable reflects the stock of entrepreneurs, whereas the start-up rate indicates new entries. The relationship is not as close for years that are farther apart, but even over a 20-year period, the value of the correlation coefficient always remains above 0.85 for the self-employment rate and 0.7 for the start-up rate. That this correlation is stronger for the self-employment rate presumably is due to its stock character. Figures 2 and 3 illustrate the high degrees of variation across regions, as well as the high

persistence of regional levels of new business formation and self-employment over time.
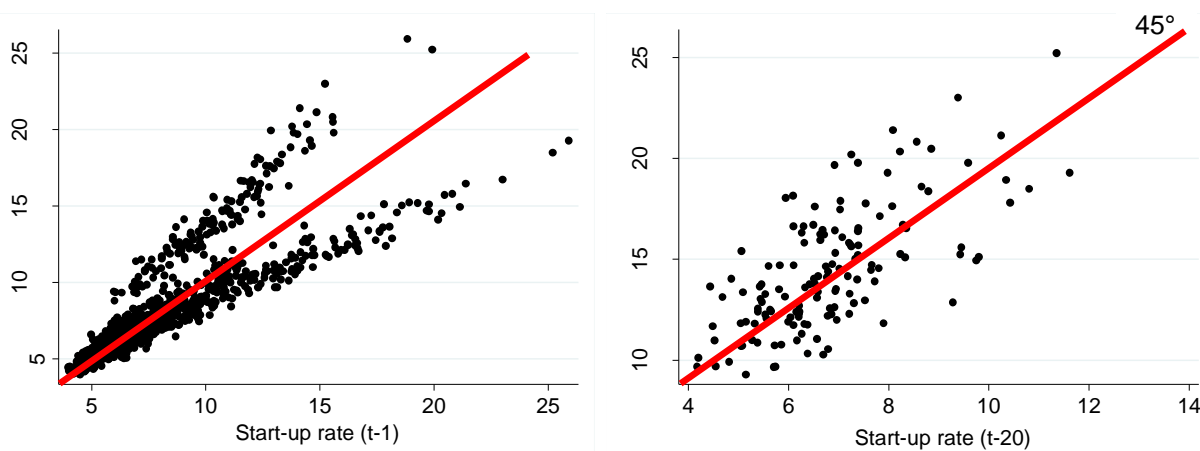
Figure 2: Relationship between start-up rate (per 1,000 individuals) in t and t-1 (left) and t and t-20 (right)[11]
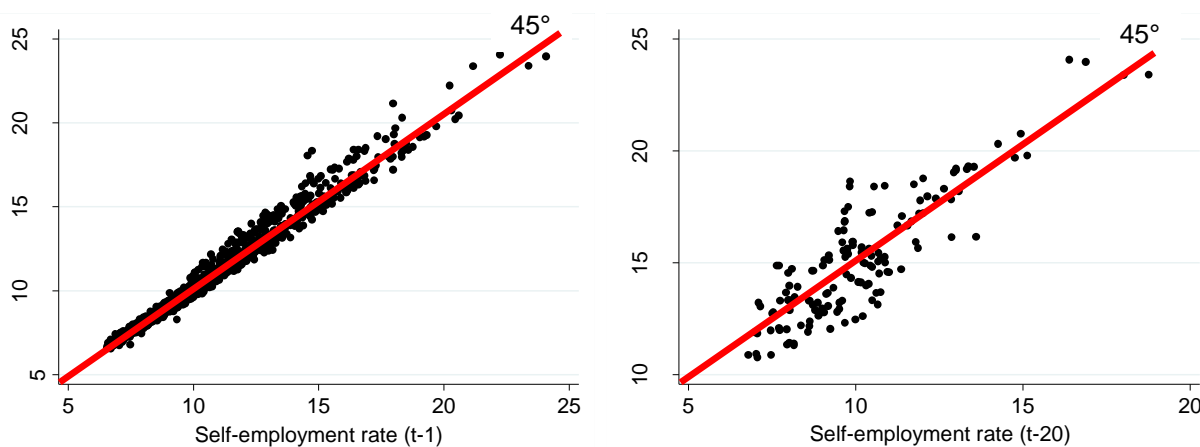
Figure 3: Relationship between self-employment rate (in %) in t and in t-1 (left) and t and in t-20 (right)

[11] The 'split' in the upper part in the left panel results from observations of the period 2003-2005. For these years the Social Insurance Statistics reports higher number of start-ups due to changes in the reporting system. The number of observations in the figure on the right side is considerably lower because the data contains only two years with information about the lagged start-up rates for t-20 (2004 and 2005).

Table 1: Correlation of self-employment rates and start-up rates over time— West Germany, 1984–2005

	t-1	t-5	t-10	t-15	t-20
Self-employment rate t=0	0.995***	0.97***	0.93***	0.86***	0.87***
Start-up rate t=0	0.95***	0.90***	0.85***	0.76***	0.72***
Note: ***: statistically significant at the 1 percent level.					

For a more in-depth analysis, we regress the current regional start-up rate on its lagged values and on some other variables intended to control for relevant characteristics of the regional environment (Table 2). In order to compare the effects of past start-up activities, we standardized all variables to a mean of zero and a standard deviation of one.[12] These control variables include regional population density, which 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, and the local unemployment rate (for a discussion of these variables, see Fritsch and Mueller, 2007). Federal State dummies were included to capture effects of different political conditions and spatial autocorrelation. Robust standard errors are employed to account for heteroskedasticity (White, 1980). We run the model for the 1984–2005 period but also show the results of a model restricted to the years 2000 to 2005 for reasons of comparability with the analysis that we perform for East Germany in Section 5.

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[12] This procedure has also been applied for the analyses of the second and the third scenario.

Table 2: The effect of past start-up rates on the current start-up rate in West Germany, 1984–2005[13]

	I	II	III
	1984-2005		2000-2005
Start-up rate (t-1)	0.432***	-	0.656***
	(0.0234)		(0.0494)
Start-up rate (t-2)	0.0972***	-	-
	(0.0129)		
Start-up rate (t-3)	0.113***	0.243***	-
	(0.0147)	(0.0247)	
Population density (log) (t-1)	-0.0408*	-0.107***	-0.154***
	(0.0211)	(0.0303)	(0.0544)
Share of R&D personnel (t-1)	0.0425**	0.129***	0.128***
	(0.0194)	(0.0252)	(0.0371)
Unemployment rate (t-1)	0.0276*	0.0660***	0.170***
	(0.0145)	(0.0215)	(0.0574)
Federal State dummies	***	***	***
Constant	-0.238***	-0.264***	-0.0396
	(0.0590)	(0.0900)	(0.163)
Number of observations	1,349	1,349	355
F-Value	252.16***	111.20***	22.72***
$R^{2adj.}$	0.793	0.592	0.459

Notes: Dependent variable: Regional start-up rate in t0. Pooled OLS regressions. Robust standard errors in parentheses. ***: statistically significant at the 1 percent level; ** statistically significant at the 5 percent level. There is a jump in the number of start-ups in 1999, which is controlled for by employing a dummy.

The results indicate a highly significant positive effect of new business formation during previous periods on current start-up rates (Table 2). 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 the problem of multicollinearity. In order to rule out this issue and to demonstrate

[13] Lagrange-Multiplier-tests indicate some remaining spatial autocorrelation in some of the models of the first and the second scenario even when the Federal State dummies are included. The results are, however, robust when running spatial lag and spatial error models. We present the results with Federal State dummies here because this model is also used for the quantile regressions (Figure 4). Performing the analysis with different control variables suggests that the spatial autocorrelation does not pertain to the start-up or the self-employment rates but is caused by some of these control variables. Accordingly, the Lagrange-Multiplier test does not indicate any spatial autocorrelation if the model is run without any of the control variables.

that the previous level of new business formation has not only a short-term effect, we include the start-up rate of the period t-3 in model II. This lagged start-up rate is highly significant as well. As in the previous analysis of regional persistence of entrepreneurship in Germany by Fritsch and Mueller (2007), we find that the share of R&D personnel has a significant positive effect on the level of regional new business formation, whereas the effect of population density is significantly negative in two of the three models.[14] The local unemployment rate has a significant positive effect on start-up activity when the analysis is restricted to the 2000-2005 period and when assessing only the lagged start-up rate in t-3.[15] Altogether, the results show the same persistency pattern of start-up activity as found by Fritsch and Mueller (2007) for a slightly extended period of analysis. Looking at the over-time variation in the determinants of new business formation we also find a high degree of stability (see Table A3 in the Appendix). This indicates that the persistence of regional start-up rates in West Germany in the 1984–2005 period may be well explained by rather stable framework conditions.

Since the historical data that are used in the analyses of scenarios II and III provide only information about self-employment but not on start-up rates, we also perform the regressions for the past self-employment rate (Table 3) in order to be compatible with these scenarios. 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 particularly pronounced for the self-employment rate lagged by one year. While population density is not statistically significant we again find a strong relationship between the start-up rate and the regional level of R&D employment. Also the unemployment rate proofs to be statistically significant.

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[14] Population density and the share of R&D personnel are highly correlated. Excluding the latter variable makes the effect of population density insignificant. This suggests that density does not have a negative effect per se.

[15] Fritsch and Mueller (2007) found a negative effect of the local unemployment rate. Restricting the period to the years analyzed by Fritsch and Mueller (2007) makes the unemployment rate significantly negative in model I and insignificant in model II. The pronounced positive effect of the unemployment rate on start-up activity in the 2000–2005 period may be due to the introduction in 2002 of programs aimed at promoting start-ups by unemployed persons.

Table 3: The effect of past self-employment rates on the current start-up rate in West Germany, 1984–2005

	I	II	III
	1984-2005		2000-2005
Self-employment rate (t-1)	1.118*** (0.0782)	-	0.606*** (0.0441)
Self-employment rate (t-2)	-0.811*** (0.0881)	-	-
Self-employment rate (t-3)	0.251*** (0.0581)	0.539*** (0.0334)	-
Population density (log) (t-1)	-0.0126 (0.0362)	-0.0274 (0.0387)	-0.0511 (0.0482)
Share of R&D personnel (t-1)	0.220*** (0.0338)	0.300*** (0.0329)	0.182*** (0.0352)
Unemployment rate (t-1)	0.206*** (0.0300)	0.273*** (0.0315)	0.360*** (0.0513)
Federal State dummies	***	***	***
Constant	-0.107 (0.121)	-0.175 (0.131)	-0.0298 (0.141)
Number of observations	1,349	1,349	355
F-Value	120.57***	64.70***	30.31***
R2adj.	0.381	0.296	0.560

Notes: Dependent variable: Regional start-up rate in t0. Pooled OLS regressions. Robust standard errors in parentheses. ***: statistically significant at the 1 percent level; ** statistically significant at the 5 percent level. There is a jump in the number of start-ups in the year 1999, which is controlled for by employing a dummy.
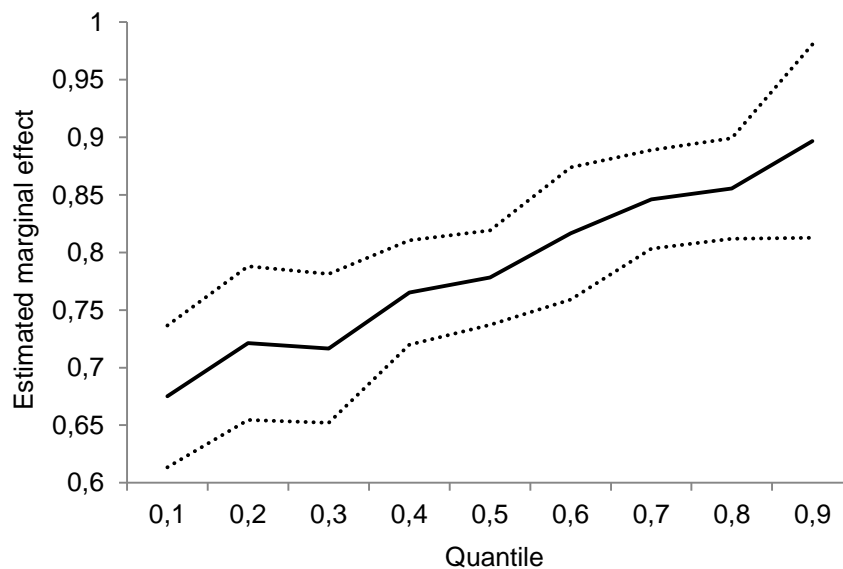

Figure 4: Estimated marginal effect of the start-up rate in t-3 on the start-up rates in t0 in West Germany (dotted lines indicate upper and lower confidence intervals; bootstrapped standard errors with 1,000 replications)
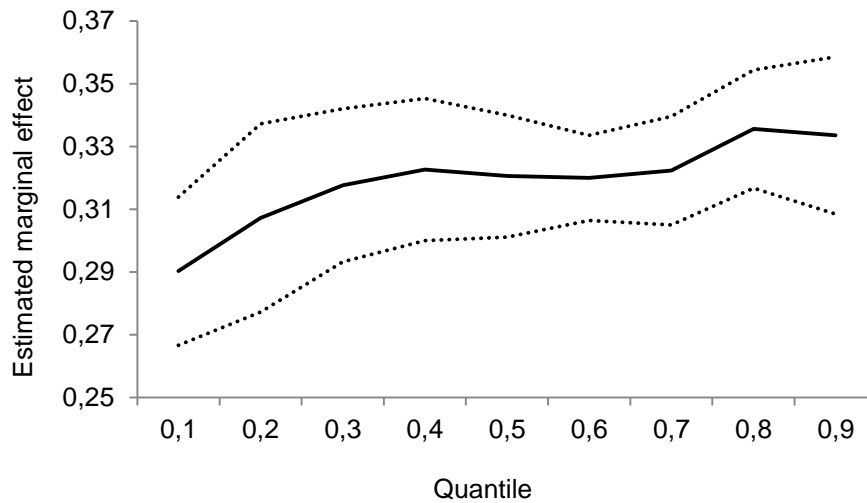
Figure 5: Estimated marginal effect of the self-employment rate in t-3 on the start-up rates in t0 in West Germany (dotted lines indicate upper and lower confidence intervals; bootstrapped standard errors with 1,000 replications)

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 persistent 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 Tables 2 and 3.[16] We do indeed find that the estimated marginal effect of previous levels of new business formation tends to be the stronger the higher the past level of new business formation (Figure 4) and self-employment (Figure 5) is. This relationship is considerably more pronounced if the start-up rate is used as indicator for the past level of entrepreneurial activity (Figure 4). All in all, the results indicate that persistence of start-up activity is especially reinforced in those regions that have experienced high levels of self-employment and new business

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[16] Running the model with the start-up rate in t-1, t-2, or t-4 does not lead to any significant changes of the results. The same pattern emerges if the model is run without the control variables that are included in the models presented in Table 2.

formation in the past.[17] 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 scenarios.

4. Scenario II: Persistence of Regional Entrepreneurship in the Face of a World War Followed by Massive In-Migration—West Germany 1925–2005

The second scenario is characterized by considerable disruptions: the world economic crisis of 1929, the advent of the Nazi regime in 1933, devastating 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. The indicator for the presence of regional entrepreneurship prior to the shock events is the self-employment rate in 1925. This is the number of self-employed persons in non-agricultural private sectors divided by all employees. The historical data are based on a comprehensive survey conducted in 1925 (Statistik des Deutschen Reichs, 1927). The definition of administrative districts at this time has been much different from what is defined as a district today. Nevertheless, it is possible to assign the historical districts to the current Planning Regions. The self-employment rate in 1925 measures the share of role models within the total regional employment, thereby reflecting how widespread self-employment was across regions prior to the disruptive shock events.[18]

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[17] The quantile regressions have been restricted to the period 1984–1998 because including the years 1999–2005 leads to somewhat fuzzy results that are obviously caused by a abrupt increase of the recorded level of start-up activity between the years 1998 and 1999. This jump in the data is probably due to some post-1998 changes in the reporting system of the. Social Insurance Statistics.

[18] Unfortunately, the historical data do not contain information about the number of start-ups.
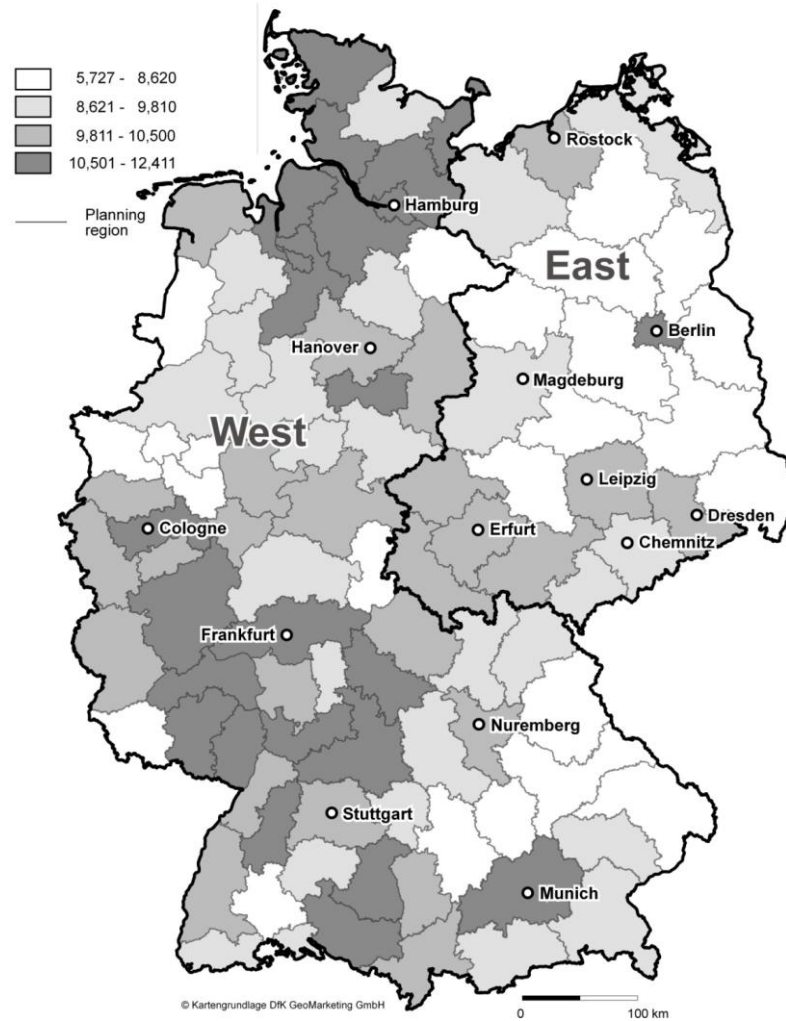
Figure 6:   Share of self-employed persons in non-agricultural sectors in total employment in German regions 1925

Figure 6 shows the distribution of 1925 self-employment rates across the regions of Germany. A first observation is that these self-employment rates were, on average, higher in regions that became West Germany after World War II. Regions with relatively high self-employment rates are especially to be found around the urban centers of Hamburg, Frankfurt, Cologne, Munich, and Nuremberg. Also, the southwestern part of Germany, which is known for its innovative spirit and entrepreneurial culture (e.g., Baten et al., 2007), had high levels of self-employment in 1925. Regions with

relatively low self-employment rates in West Germany include the Ruhr area north of Cologne, which is characterized by 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.

Table 4: Correlation of self-employment rate in 1925 with self-employment rates and start-up rates over time—West Germany, 1984–2005

		I	II	III
I	Self-employment rate 1984–2005	1		
II	Start-up rate 1984–2005	0.853***	1	
III	Self-employment rate 1925	0.153***	0.085***	1
Note: ***: statistically significant at the 1 percent level.				

Correlation coefficients between the self-employment rate in 1925 and self-employment as well as start-up rates for the 1984–2005 period show a highly significant positive relationship (Table 4; see Tables A4 and A5 in the Appendix for descriptive statistics). Regressing the start-up rates for the years 1984–2005 on the self-employment rate in 1925 reveals a significant positive effect (Table 5). Controlling for the industry structure in 1925 does not change this pattern.[19] The effect of the employment share of R&D personnel is significantly positive, like in the analysis of Scenario I, whereas population density is now insignificant. One contrasting result is the significantly negative effect of the unemployment rate. This result is in line with the analysis of Fritsch and Mueller (2007) for 1984–2002. The significant effect of the self-employment rate strongly indicates persistence of regional differences in start-up activity over longer time periods that include several disruptive shocks to environmental conditions.

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[19] The employment shares of three large economic sectors—construction, manufacturing, and other industries—in 1925 have been used to control for the economic structure of the regional economy.

Table 5: The effect of the self-employment rate 1925 on regional start-up rates in West Germany 1984–2005

	I	II	III
		Start-up rate	
Self-employment rate 1925	0.0286** (0.0142)	0.0619*** (0.0148)	0.0362** (0.0153)
Population density (log) (t-1)	-	-	0.00537 (0.0224)
Share R&D personell (t-1)	-	-	0.0608*** (0.0188)
Unemployment rate (t-1)	-	-	-0.0564*** (0.0170)
Industry structure 1925	-	***	***
Federal State dummies	***	***	***
Constant	-0.430*** (0.0590)	-0.513*** (0.0624)	-0.482*** (0.0617)
Number of observations	1,349	1,349	1,349
F-Value	209.35***	210.89***	186.20***
$R^{2adj.}$	0.782	0.802	0.806

Notes: Dependent variable: Regional start-up rate in t0. Pooled OLS regressions. Robust standard errors in parentheses. ***: statistically significant at the 1 percent level; ** statistically significant at the 5 percent level; *: statistically significant at the 10 percent level. There are jumps in the number of start-ups for years after 1998, which are controlled for by employing respective year dummies.
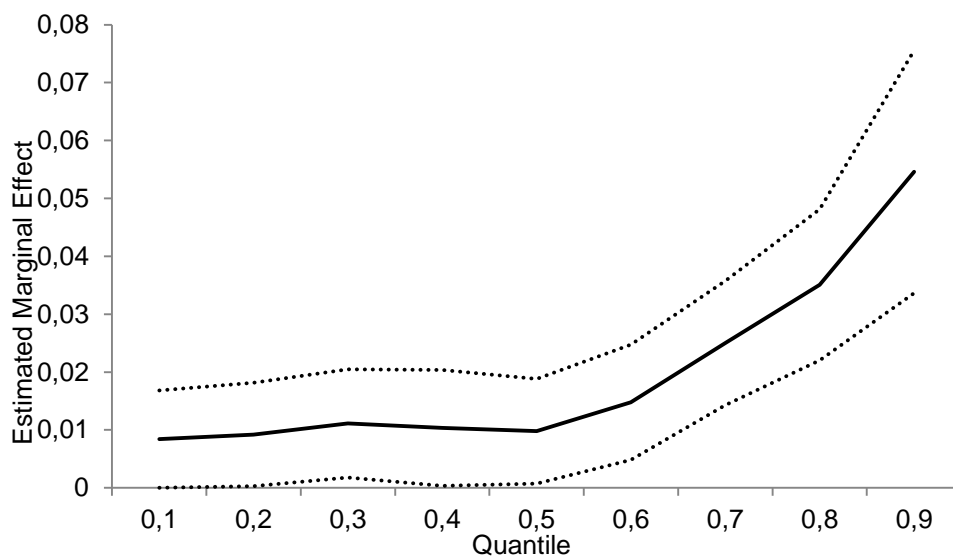

Figure 7: Estimated marginal effect of the self-employment rate in 1925 on the start-up rates in West Germany (dotted lines indicate upper and lower confidence intervals; bootstrapped standard errors with 1,000 replications)

For Scenario II, we again applied quantile regressions. We want to discover how the effect of historical self-employment rates differs across quantiles (Figure 7). The highest marginal effect can be found for the upper quartiles of the distribution. Thus, persistence is particularly pronounced in those regions that had high levels of self-employment prior to the disruptive historical shocks that characterized this Scenario. 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 value for the self-reinforcing effect of entrepreneurial culture.

5. Scenario III: Persistence of Regional Entrepreneurship in the Face of a World War, 40 Years of Socialist Regime, a Shocking Transformation Process, and Massive Out-Migration—East Germany 1925–2005

In the final scenario, we investigate persistence of regional entrepreneurship in East Germany from 1925 to 2005. After the end of World War II, East Germany experienced considerably more severe shocks than did West Germany. By the end of the war, this part of the country has been occupied by the Soviet army. In contrast to West Germany where the western allies soon began to assist in the reconstruction of the economy, the Soviets for some time dismanteled existing machinery and transferred it for productive use in the USSR. Moreover, they quickly installed a socialist regime with a centrally planned economic system. In the year 1949, an East German state, the German Democratic Republic (GDR), was founded that was part of the Soviet bloc. As a consequence of political pressure and severe economic problems, there has been massive outmigration of East Germans into the West until the closing of the East German border in 1961. Throughout the GDR period, a reshaping of regional structures was enforced by different industrialization policy campaigns (Berentsen, 1992). The socialist East German state collapsed in late 1989 and East and West Germany have been reunified in 1990. The following transformation process of the East German economy to a market economic system was a kind of "shock treatment" where the ready-made formal institutional framework of West Germany was

adopted practically overnight (e.g., Brezinski and Fritsch, 1995; Hall and Ludwig, 1995). This development rapidly induced massive structural change accompanied by a rather complete replacement of the incumbent firms. Between 1989 and 1991, the share of manufacturing employment East Germany dropped from 48.7 percent to 16.0 percent (Hall and Ludwig, 1995) and unemployment rose from virtually zero in 1989 to more than 15 percent in 1992 (Burda and Hunt, 2001). In the course of the transformation process, the regions experienced again massive out-migration, especially of young and qualified workers (Hunt, 2006). Even now, more than 20 years after this transformation process began, nearly all East German regions lag considerably behind their West German counterparts.

East Germany's 40 years of socialist regime after World War II are of particular interest for our analysis because, during this period, the region was host to a great deal of policy intended to eradicate entrepreneurship. During the socialist regime, collectivist values were strongly favored and entrepreneurship was perceived as a bourgeois anachronism (e.g., Pickel, 1992; Thomas, 1996). Hence, a rigorous anti-entrepreneurship policy strategy was adopted that included massive socialization of private enterprises and the suppression of any remaining private-sector activity (for details, see Brezinski, 1987; Pickel, 1992). This policy was operated with a particular focus on those regions that could be regarded strongholds of entrepreneurship characterized by high levels of self-employment (Ebbinghaus, 2003, 75-89). As a result, the self-employment rate at the end of the GDR regime in 1989 was only about 1.8 percent compared to 10.5 percent 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 equally effective 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)[20]. Thus, regional variation in private-sector activity in 1989 must be regarded as mainly a result of variation in private initiative or of different levels of resistance to political attempts to abolish private firms.

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. Despite the now similar levels of self-employment, however, characteristics of the new businesses in terms of industry affiliation, survival, and number of employees are quite different between the two regions. Start-ups in East Germany since 1990 have been much more concentrated in sectors characterized by a small minimum efficient size, particularly construction, tourism, and consumer services. They have lower survival rates (Fritsch, Noseleit, and Schindele, 2012) 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 is 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 1990s. Therefore, we restrict this analysis to start-up rates for 2000–2005 and include only the start-up rate of the previous period (t-1) so as not to lose too many observations. The spatial framework consists of the 22 East German Planning Regions. The region of Berlin is excluded since the data do not allowt to distinguish between the eastern and western part of the city, the latter of which was not under socialist regime. We use information on

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[20] This may be regarded as an indication that the attempts of the socialist GDR regime to battle entrepreneurship particularly in regions with high levels of self-employment has been of rather limited success.

the self-employment rate in 1925, the self-employment rate at the end of the socialist period in 1989,[21] and the start-up rates during the 2000-2005 period.

Table 6: Correlation between self-employment rates in 1925, 1989, and 2000–2005 and start-up rates in 2000–2005 in East German regions

		I	II	III
I	Self-employment rates 2000–2005	1		
II	Start-up rates 2000–2005	0.486***	1	
III	Self-employment rate 1925	0.290***	-0.105	1
IV	Self-employment rate 1989	0.391***	-0.235***	0.308***

Note: ***: statistically significant at the 1 percent level.

A first result is that there is a significant positive relationship between the regional self-employment rates for 1925, 1989, and 2000–2005, indicating high levels of persistence of entrepreneurship despite a number of severe shocks (Table 6). The significantly positive correlation of self-employment in 1925 with that in 1989, which marks the demise of the GDR regime, is particularly remarkable. This statistical relationship indicates 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 resistance to anti-entrepreneurship policies that are reflective of strong entrepreneurial intentions and the 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 (Figure 8; for a more detailed description, see Wyrwich, 2012). One way how entrepreneurial culture may have survived is intergenerational transmission via parental or grand parental role models in self-employment (e.g., Chlosta et al., 2012; Dohmen, et al., 2012; Laspita et

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[21] The information on self-employment in 1989 was obtained from the GDR Statistical Office and has been adjusted to the actual definition of spatial units (for details, see Kawka, 2007). The self-employment rate in 1989 is the number of self-employed divided by the number of all employees. Unfortunately, the available data do not provide an information about the economic sectors of the businesses.

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.
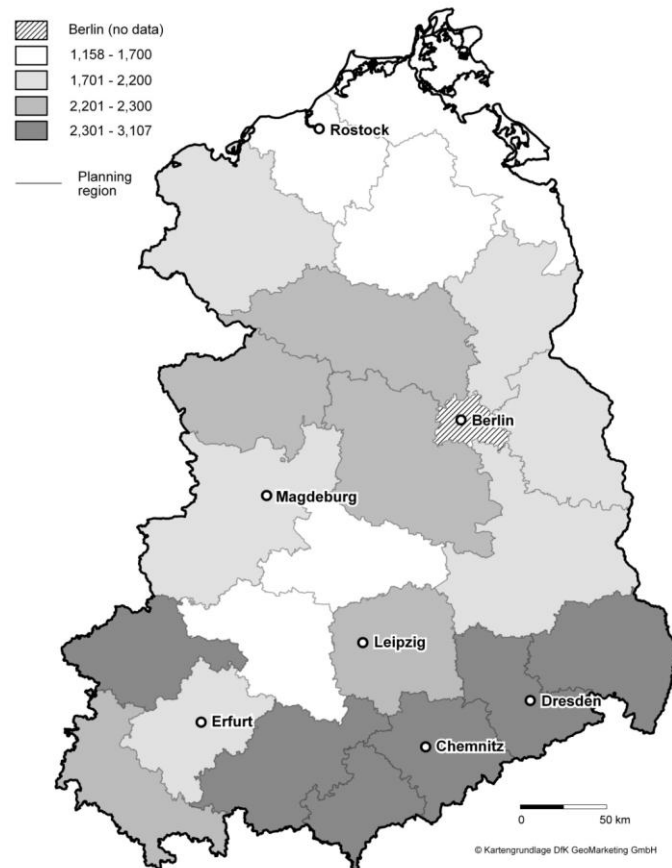
Figure 8: Self-employment rates in East German regions 1989

During the 2000–2005 period, the correlation coefficient between the start-up rate in year t and in t-1 in East German regions is 0.846, indicating a high level of persistence. However, the relationship between the self-employment rate of 1989 and the start-up rates of the 2000–2005 period is significantly negative (Table 6). 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 job opportunities available. This interpretation is consistent with the significantly negative correlation between the unemployment rate with the self-employment rates in 1925 and 1989 (see Table A5 in the Appendix). This indicates that regions with high remnants of entrepreneurial culture

Table 7: The effect of self-employment rates in 1925 and 1989 on current levels of new business formation in East Germany in the period 2000 to 2005 (Scenario III)[22]

	I	II	III	IV	V
			Start-up rate		
Start-up rate (t-1)	0.365*** (0.0789)	-	-	-	-
Self-employment rate 1925	-	0.145** (0.0600)	0.147** (0.0624)	0.260*** (0.0856)	-
Self-employment rate 1989	-	-	-	-	0.247** (0.0953)
Population density (log) (t-1)	-0.157** (0.0728)	-	-	-0.111 (0.111)	0.134 (0.104)
Share R&D personell (t-1)	0.264*** (0.0846)	-	-	0.117 (0.108)	0.0627 (0.100)
Unemployment rate (t-1)	0.0818* (0.0456)	-	-	0.134** (0.0590)	0.107** (0.0537)
Industry structure 1925	-	-	***	***	***
Federal State dummies	***	***	***	***	***
Constant	-0.441*** (0.0953)	-0.652*** (0.100)	-0.712*** (0.148)	-0.844*** (0.174)	-0.764*** (0.199)
F-Value	9.16***	9.44***	9.00***	7.47***	6.67***
Number of observations	110	110	110	110	110
$R^{2adj.}$	0.433	0.341	0.404	0.444	0.420

Notes: Dependent variable: Regional start-up rate in t0. Pooled OLS regressions. Robust standard errors in parentheses. ***: statistically significant at the 1 percent level; ** statistically significant at the 5 percent level; *: statistically significant at the 10 percent level.

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[22] Lagrange-Multiplier-tests reveal that there is no spatial autocorrelation in the models of Scenario III. The opening of the West Berlin economy may have had a special impact on start-up activity in the adjacent regions that comprise the Planning Regions of the Federal State of Brandenburg. Such an effect is controlled for in the regression by the respective Federal State dummy.

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 a positive effect of the historical self-employment rate on start-up activity. Accordingly, we find a significantly positive effect of the historical self-employment rates when controlling for local unemployment in a multivariate framework (Table 7).
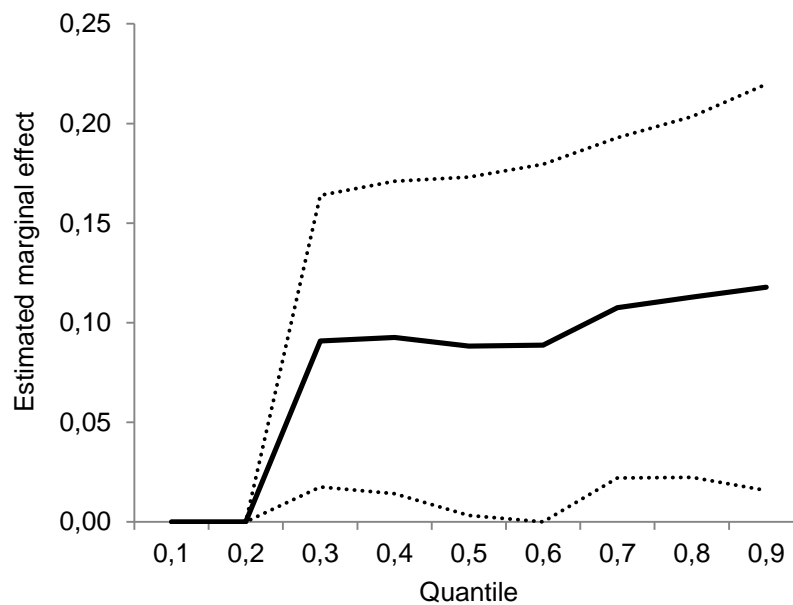

Figure 9: Estimated marginal effect of the self-employment rate in 1925 on the start-up rates in East Germany (dotted lines indicate upper and lower confidence intervals; bootstrapped standard errors with 1,000 replications)

The regression analysis for East Germany shows a considerable persistence of regional start-up rates in the 2000–2005 period (Model I in Table 7). Also, the share of R&D personnel, population density, and the unemployment rate are statistically significant with the expected signs. Models II, III, and IV also show a significant positive effect of the self-employment rate of 1925 and the self-employment rate of 1989 also proves to have a highly significant positive effect (Model V). The results strongly indicate persistence of regional entrepreneurship. Interestingly, the coefficient for the standardized self-employment rate in the year 1925 in

model IV is not smaller but even slightly higher than the coefficient for the self-employment rate in 1989 employed in model V. This can be regarded a further indication for the strong long-term influence of entrepreneurial culture. Quantile regressions using Model IV show that the effect of the self-employment rate in 1925 on current start-up activity is strongest for those regions with the highest levels of self-employment 80 years earlier (Figure 9). Remarkably, the increase of the marginal effect with rising historical self-employment rates is not as straightforward as in scenario II. This might be explained by the much more intensive stronger disruptive shocks in East Germany that may have damaged the entrepreneurial culture particularly in the traditional high self-employment regions.

The findings for Scenario III demonstrate that there is significant persistence of a regional entrepreneurship culture over long periods of time and has even survived four decades of socialism characterized by a massive anti-entrepreneurship policy. That regional entrepreneurship has sustained under these hostile circumstances suggests that a regional entrepreneurship culture, once established, may be rather robust.

6. Discussion and Conclusions

Our empirical investigation revealed 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 persistence of a regional culture 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 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 finding 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. History matters!

The high level of persistence of regional entrepreneurship that we found implies not only long-term benefits once an entrepreneurial culture has developed; the stability of regional levels of self-employment and new business formation also strongly suggests that the establishment of an entrepreneurial culture may require long periods of time and considerable political effort. Hence, trying to build a regional entrepreneurial culture can be regarded as an investment in a kind of capital stock that may have a main effect only in the long run, but which will be a long-lasting one.

These results give rise to at least two important questions. First, what are the sources of a regional entrepreneurship culture? Analyses of historical examples of the emergence of an entrepreneurship culture may be particularly helpful for answering the second question, which is: "What can policy do to stimulate the development of a regional entrepreneurship culture"? Our knowledge about the emergence of high levels of regional entrepreneurship is currently rather limited, leaving much room for speculation. 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 reasons, 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 an often-heard explanation for the emergence of an economic structure characterized by relatively many 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.

Another question we have not touched on here but leave for further analysis is the effect of a regional culture of entrepreneurship on regional development. Analyzing long-term growth trajectories should be particularly helpful in discovering whether new business formation is the source of growth or, instead, one of its symptoms (see Anyadike-Danes, Hart, and Lenihan, 2011).

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Appendix

Table A1: Descriptive statistics West Germany

	Mean	Median	Minimum	Maximum	Standard deviation
Self-employment rate (1984–2005)	0.091	0.086	0.055	0.205	0.021
Start-up rate (per 1,000 individuals) 1984–2005	7.932	6.838	3.981	25.901	3.096
Self-employment rate 1925	0.097	0.098	0.057	0.124	0.012
Population density (log) 1987–2005	5.426	5.288	4.279	7.125	0.662
Share R&D personnel 1987–2005	0.027	0.024	0.007	0.078	0.012
Unemployment rate 1987–2005	0.087	0.083	0.030	0.177	0.028

Table A2:   Correlation matrix West Germany

		I	II	III	IV	V
I	Self-employment rate 1987–2005	1				
II	Start-up rate 1984–2005	0.838***	1			
III	Self-employment rate 1925	0.150***	0.081***	1		
IV	Population density (log) 1987-2005	-0.359***	-0.056*	-0.097***	1	
V	Share R&D personnel 1987-2005	-0.202***	-0.022	0.214***	0.539***	1
VI	Unemployment rate 1987–2005	-0.048*	0.157***	-0.151***	0.183***	-0.107***

Notes: ***: statistically significant at the 1 percent level; ** statistically significant at the 5 percent level; *: statistically significant at the 10 percent level.

Table A3: Persistence of determinants of new business formation in East and West Germany

	t-1	t-5	t-10	t-15	t-20
West Germany (1984–2005)					
Population density					
t=0	1.000***	0.9995***	0.999***	0.998***	0.996***
Share of R&D personnel					
t=0	0.998***	0.980***	0.955***	0.941***	0.907***
Unemployment rate					
t=0	0.985***	0.924***	0.866***	0.842***	0.745***
East Germany (2001–2005)					
Population density					
t=0	1.000***	0.999***	-	-	-
Share of R&D personnel					
t=0	0.893***	0.955***	-	-	-
Unemployment rate					
t=0	0.949***	0.889***	-	-	-

Note: ***: statistically significant at the 1 percent level.

Table A4: Descriptive statistics East Germany

	Mean	Median	Minimum	Maximum	Standard deviation
Self-employment rate 2000–2005	0.092	0.092	0.077	0.105	0.006
Start-up rate (per 1,000 individuals) 2000–2005	10.516	10.382	7.918	14.525	1.397
Self-employment rate 1925	0.090	0.089	0.078	0.102	0.008
Self-employment rate 1989	0.021	0.022	0.012	0.031	0.005
Population density (log) 2001–2005	4.795	4.776	3.876	5.704	0.517
Share R&D personnel 2001–2005	0.025	0.024	0.010	0.051	0.008
Unemployment rate 2001–2005	0.197	0.197	0.128	0.260	0.026

Table A5: Correlation matrix East Germany

		I	II	III	IV	V	VI
I	Self-employment rate 2000–2005	1					
II	Start-up rate 2000–2005	0.489***	1				
III	Self-employment rate 1925	0.293***	-0.150	1			
IV	Self-employment rate 1989	0.391***	-0.268***	0.308***	1		
V	Population density (log) 2001–2005	0.087	-0.330***	0.536***	0.569***	1	
VI	Share R&D personnel 2001–2005	-0.148	-0.209**	0.233**	0.247***	0.589***	1
VII	Unemployment rate 2001–2005	-0.375***	0.123	-0.491***	-0.454***	-0.366***	-0.339***

Notes: ***: statistically significant at the 1 percent level; ** statistically significant at the 5 percent level.