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The Long Persistence of Regional Levels of Entrepreneurship: Germany, 1925–2005

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FRITSCH M. and WYRWICH M. The long persistence of regional levels of entrepreneurship: Germany, 1925–2005, *Regional Studies*. This paper investigates the persistent levels of self-employment and new business formation in different time periods and under different framework conditions. The analysis shows that regional differences regarding the level of self-employment and new business formation tend to be persistent for periods as long as eighty years, despite abrupt and drastic changes in the political–economic environment. This pronounced persistence demonstrates the existence of regional entrepreneurship culture that tends to have long-lasting effects.

Entrepreneurship Self-employment New business formation Persistence Culture

FRITSCH M. and WYRWICH M. 长期存在的区域层级创业精神：德国，1925年至2005年，*区域研究*。本文探讨在不同时程阶段、不同架构条件之下，自雇与新兴企业形成的续存程度。研究分析显示，自雇以及新兴企业形成程度的区域差异，倾向持续存在长达八年之久，儘管政治经济环境时有突发性与剧烈的改变。此一深厚的持续性，证明了区域创业精神文化的存在，该文化倾向拥有长期的影响。

创业精神 自雇 新兴企业形成 持续性 文化

FRITSCH M. et WYRWICH M. La persistance de longue durée des niveaux régionaux de l'esprit d'entreprise: l'Allemagne de 1925 jusqu'à 2005, *Regional Studies*. Cet article examine les niveaux de travail indépendant et la création de nouvelles entreprises à des périodes différentes et dans des conditions-cadres différentes. L'analyse montre que les différences régionales pour ce qui est du niveau de travail indépendant et de la création de nouvelles entreprises ont tendance à persister pendant des périodes aussi longues que quatre-vingts années, en dépit des changements inattendus du milieu politico-économique. Cette persistance marquée démontre la présence d'une culture entrepreneuriale qui a tendance à avoir des effets à long terme.

Esprit d'entreprise Travail indépendant Création de nouvelles entreprises Persistance Culture

FRITSCH M. und WYRWICH M. Die Persistenz regionalen Unternehmertums: Deutschland, 1925–2005, *Regional Studies*. Wir analysieren die Persistenz von unternehmerischer Selbständigkeit und des regionalen Gründungsgeschehens in verschiedenen Zeiträumen und unter unterschiedlichen Rahmenbedingungen. Es zeigt sich, dass regionale Unterschiede im Niveau unternehmerischer Selbständigkeit und des Gründungsgeschehens Zeiträume von bis zu 80 Jahren überdauern, auch wenn es zu plötzlichen und tiefgreifenden Veränderungen des politisch-ökonomischen Umfeldes kommt. Diese ausgeprägte Persistenz belegt die Existenz einer regionalen Kultur unternehmerischer Selbständigkeit, die über lange Zeiträume fortwirkt.

Entrepreneurship Selbständigkeit Unternehmensgründungen Persistenz Kultur

FRITSCH M. y WYRWICH M. La larga persistencia del empresariado regional: Alemania, 1925–2005, *Regional Studies*. En este artículo investigamos el nivel persistente del empleo autónomo y la formación de nuevas empresas en diferentes periodos de tiempo y bajo diferentes condiciones estructurales. El análisis muestra que, pese a los cambios bruscos y drásticos en el entorno político y económico, las diferencias regionales con respecto al nivel de empleo autónomo y la formación de nuevas empresas tienden a ser persistentes durante periodos de hasta ochenta años. Esta persistencia pronunciada demuestra la existencia de una cultura empresarial de ámbito regional que suele tener efectos de larga duración.

Espíritu empresarial Empleo autónomo Formación de nuevas empresas Persistencia Cultura

JEL classifications: L26, R11, O11

INTRODUCTION

Studies of established market economies such as West Germany (FRITSCH and MUELLER, 2007), the Netherlands (VAN STEL and SUDDLE, 2008), Sweden (ANDERSSON and KOSTER, 2011), the United Kingdom (MUELLER *et al.*, 2008), 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 also to experience high levels in 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 which is reflected, for instance, by informal institutions, that is, norms, values and codes of conduct in a society (NORTH, 1994) that are in favour of entrepreneurship. An entrepreneurial culture should, at least to some degree, be independent of socio-economic conditions and may, therefore, even survive considerable shocks to the socio-economic environment, such as serious economic crises, devastating wars and drastic changes of political regimes (NORTH, 1994; WILLIAMSON, 2000).

The persistence of regional entrepreneurship is analysed 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 ten to twenty years (for example, ANDERSSON and KOSTER, 2011), the present paper investigates persistence of regional entrepreneurship for periods as long as eighty years. Moreover, while work to date has studied the persistence of entrepreneurship under stable socio-economic conditions, the examples include different kinds of disruptive changes or 'jumps' in the conditions for entrepreneurship. Hence, the persistence of regional entrepreneurship found 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. This is particularly remarkable in the third scenario involving East Germany, a region that has been under a socialist regime for forty years that more or less tried to extinguish private firms and entrepreneurship completely. The findings can be regarded as a strong indication for the existence of a regional entrepreneurial culture that survived even drastic and long-lasting changes to the socio-economic environment.

The next section reviews the previous research on the persistence of regional entrepreneurship and discusses the concept of an entrepreneurial culture or entrepreneurship capital. The third section explains the empirical strategy in more detail and gives an overview on the three scenarios used for the analysis. The

following sections then analyse the persistence of entrepreneurship in these scenarios. The final (sixth) section discusses the results, draws policy conclusions and proposes avenues for further research.

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 ten to twenty years (ACS and MUELLER, 2008; ANDERSSON and KOSTER, 2011; FRITSCH and MUELLER, 2007; MUELLER *et al.*, 2008; VAN STEL and SUDDLE, 2008). 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 that have been shown to be conducive to the emergence of new firms, such as qualification of the regional workforce or employment share in small firms (FRITSCH and FALCK, 2007), do tend to remain fairly constant over successive years. 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, p. 190) or an 'aggregate psychological trait' (FREYTAG and THURIK, 2007, p. 123) in the regional population oriented toward entrepreneurial values such as individualism, independence and motivation for achievement (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; LAFUENTE *et al.*, 2007). ETZIONI (1987) argues that one important aspect of entrepreneurial culture is spatial variation in social acceptance of entrepreneurs and their activities. According to Etzioni, the degree of societal legitimacy when it comes to entrepreneurship may be 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 are dedicated to such activity. This social acceptance of entrepreneurship can be regarded as an informal institution, which is defined as codes of conduct as well as norms and values within a society (NORTH, 1994), issues that can be well subsumed under the notion of 'culture'. According to WILLIAMSON (2000), it belongs to the level of social structure that is deeply embedded in a population and that tends to change very slowly over long periods of time. Formal institutions, governance structures and

resource allocation undergo much more frequent changes and can be regarded as being embedded in the informal institutional framework.¹

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, increasing the social acceptance of entrepreneurial lifestyles and raising 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' (p. 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.²

These findings suggest that regional entrepreneurship might become self-reinforcing, as MINNITI (2005) puts it. Minniti 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. The presence of entrepreneurial role models in the social environment reduces ambiguity for potential entrepreneurs and may help them acquire necessary information and entrepreneurial skills. In this way, entrepreneurship creates a sort of perceptual non-pecuniary externality that spurs additional start-up activity and makes entrepreneurship self-reinforcing.³ 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' (p. 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 favour of entrepreneurship, which translates into an increasing number of entrepreneurs in the region and a specific regional entrepreneurial attitude. Therefore, according to the findings of WAGNER and STERNBERG (2004) and BOSMA and SCHUTJENS (2011), spatial variation with respect to entrepreneurial attitudes should be expected. Further, 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 investing financial institutions (AUDRETSCH and KEILBACH, 2004), may also be necessary. Similarly, there are regional differences with respect to the prevalence of entrepreneurship-facilitating social capital represented, for instance, by networks aiming at stimulating new firms, and a vital local culture of venture capital financing (WESTLUND and BOLTON, 2003). In short, there are many aspects of the regional environment that may be, to different degrees, conducive to new business formation (DUBINI, 1989).⁴

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 that existed until 1918 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 with 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 (2012), who show that German regions that experienced anti-Semitic violence in the fourteenth 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 such as 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 the study by ALESINA and FUCHS-SCHUENDELN (2007) who find that East German citizens who were exposed to the socialist regime are much more in favour 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 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 (for example, CHLOSTA *et al.*, 2012; DOHMEN *et al.*, 2012; 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 (for example, financing and advice). These factors have 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 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.

EMPIRICAL STRATEGY

The persistence of regional entrepreneurship is analysed in three scenarios that relate to different time periods and regions. Particularly, the three scenarios are characterized by rather different degrees of stability in the political-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 (Scenario I) 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 (Scenario II) the period of analysis is extended to cover eighty years and regional entrepreneurship in West German regions in 1925 is compared with the level of entrepreneurial activity in the period 1984–2005. A number of considerable disruptions occurred during this period, including the world economic crisis of the late 1920s, the Second World War, occupation by the Allied powers, massive in-migration, the introduction of a new constitutional base and political system, as well as reconstruction of the economy. If persistence of regional entrepreneurship in the second scenario is found, it can be viewed as an indication that this must have reasons other than persisting structural characteristics that are effective even in the face of severe ruptures in the past. Moreover, since the entire adult population is replaced over a long period of eighty years, the persistence of relatively high or low levels of entrepreneurship would indicate an intergenerational transfer of the attitude towards entrepreneurial behavior.

The final scenario (Scenario III) investigates the persistence of regional entrepreneurship in East Germany from 1925 to 2005. After the end of the Second World War, East 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. In contrast to West Germany where the Western Allies soon began to assist in the reconstruction of the economy, the Soviets dismantled existing machinery and transferred it for productive use in the USSR. Moreover, they quickly installed a socialist regime with a centrally planned economic system. In 1949, an East German state – the German Democratic Republic (GDR) – was founded which was part of the Soviet Bloc. As a consequence of political pressure and severe economic problems, there was massive out-migration 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 were reunified in 1990. The following transformation process of the East German economy to a market economic system was a 'shock treatment' where the ready-made formal institutional framework of West Germany was adopted practically overnight (for example, 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 in East Germany dropped from 48.7% to 16.0% (HALL and LUDWIG, 1995) and unemployment rose from virtually zero in 1989 to more than 15% in 1992 (BURDA and HUNT, 2001). In the course of the transformation process, the regions again experienced massive out-migration, especially that of young and qualified workers (HUNT, 2006). Even now, more than twenty years after this transformation process began, nearly all East German regions lag considerably behind their West German counterparts.

East Germany's forty years of socialist regime after the Second World War are of particular interest for the analysis because during this period the region was host to a great deal of policies intended to eradicate entrepreneurship. In the socialist regime, collectivist values were strongly favoured and entrepreneurship was perceived as a bourgeois anachronism (for example, PICKEL, 1992; THOMAS, 1996). Hence, the adoption of a rigorous anti-entrepreneurship policy strategy 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 as strongholds of entrepreneurship characterized by high levels of self-employment (EBBINGHAUS, 2003, pp. 75–89).

The massive migration from former German territories at the end of the Second World War as well as the out-migration of East Germany during and after the socialist regime might have shaped regional cultures. This can be expected because migration tends to be selective with regards to age, qualification (for example, HUNT, 2006), and certain personality characteristics that could be regarded as pro-entrepreneurial (for example, BONEVA and FRIEZE, 2001; JOKELA, 2009). Unfortunately, there is not sufficient information available that would allow for such effects to be controlled. It can, however, be said that immigration from former German territories at the end of the war has been hardly selective since almost the entire German population was forced to leave. Moreover, these expellees had limited choice in where they were settled by authorities. Empirical evidence suggests that the placement of expellees was mainly determined by the availability of food and housing, that is, they were settled in more rural locations with less wartime destruction (BURCHARDI and HASSAN, 2013). Given the limited locational choice of expellees after the war, 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 people due to the anti-entrepreneurial pressure of the socialist GDR regime should have weakened the remaining regional culture of entrepreneurship. Therefore, if persistence after the breakdown of the socialist regime is still found, this can be regarded a relatively strong indication for the long-term effect of entrepreneurial culture.

The analyses 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 available at a regional basis for relatively long time periods.⁵

SCENARIO I: PERSISTENCE OF REGIONAL ENTREPRENEURSHIP IN A STABLE ENVIRONMENT – WEST GERMANY, 1984–2005

The analysis of the persistence of regional entrepreneurship begins by looking at the rather stable environment of West Germany, which has already been investigated by FRITSCH and MUELLER (2007). The same data source as that paper is used, but the period of analysis (1984–2005) is slightly extended to more than twenty years. Moreover, not only does this paper investigate the correlation of regional start-up rates over time, but also it analyses 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 seventy-one planning

regions,⁶ 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 (SPENGLER, 2008). The start-up rate is measured in accordance with the labour 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.⁷ 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). Fig. 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 2005.⁸ Fig. 1 reveals that start-up rates tend to be higher in West Germany compared with East Germany.⁹ The lower level of 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 forty years. Due to this legacy, East Germany can be regarded as a distinct regional growth regime (FRITSCH, 2004).

Regional start-up rates and self-employment rates are highly correlated over time (Table 1; for descriptive statistics, see Tables A1 and A2 in Appendix A). The self-employment rate 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 twenty-year period, the value of the correlation coefficient always remains above 0.85 for the self-employment rate and 0.70 for the start-up rate. This correlation is presumably stronger for the self-employment rate because it is mainly determined by the already existent stock of self-employed and to a low degree by start-up activity in one year. Figs 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.

For a more in-depth analysis, the current regional start-up rate is regressed 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, all variables are standardized to a mean of zero and a standard deviation (SD) of 1.¹⁰ The control variables include regional population density, which represents a 'catch-all' variable of regional characteristics, the employment share of research and development (R&D) personnel,¹¹ 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,

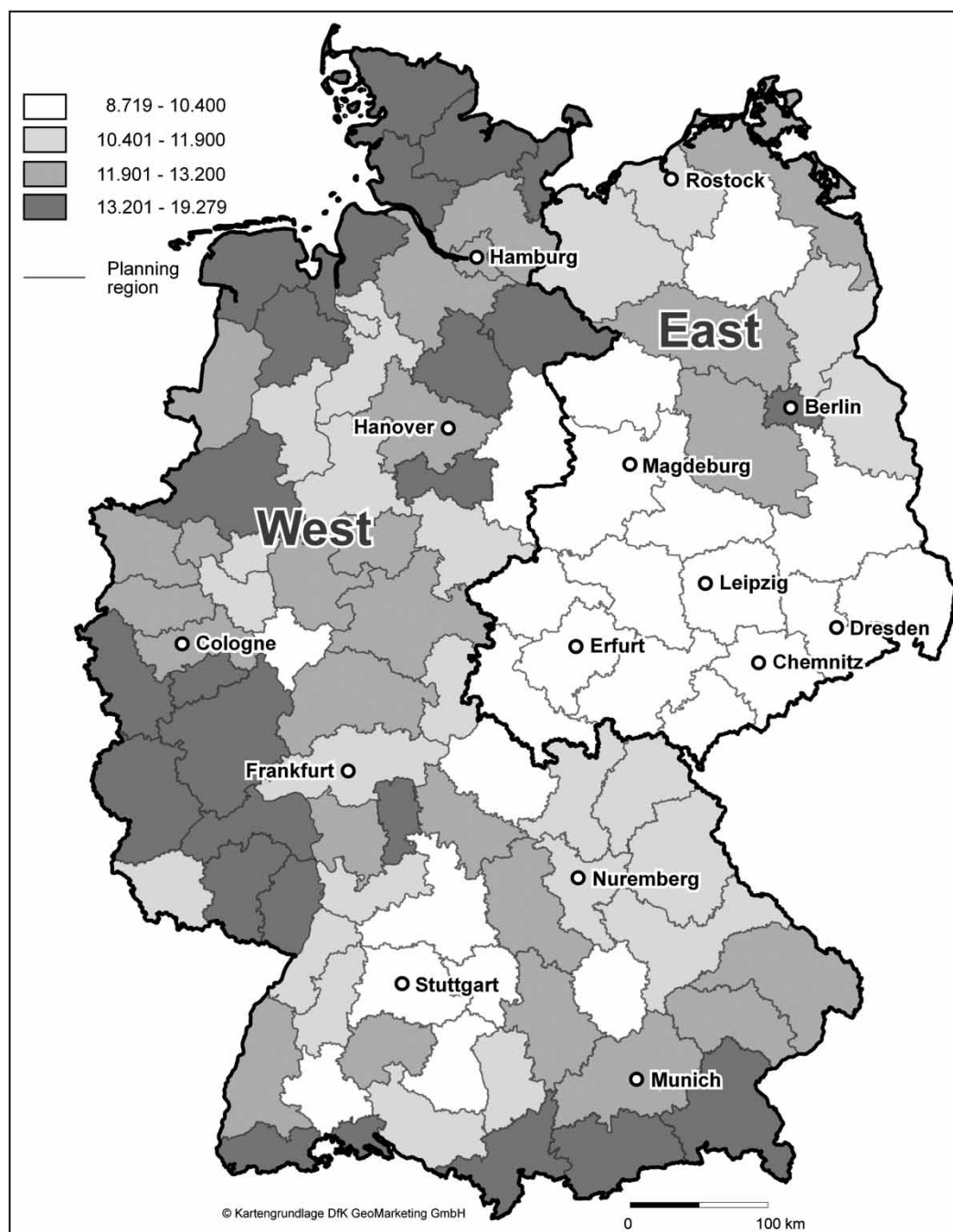


Fig. 1. Start-up rates in German planning regions, 2005

2007). Federal state dummies were included to capture the effects of different political conditions and spatial autocorrelation.¹² Robust standard errors are employed to account for heteroskedasticity (WHITE, 1980). The

model is run for the period 1984–2005, but also the results of a model restricted to the years 2000–2005 are shown for reasons of comparability with the analysis performed for East Germany in the fifth section.

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% level.

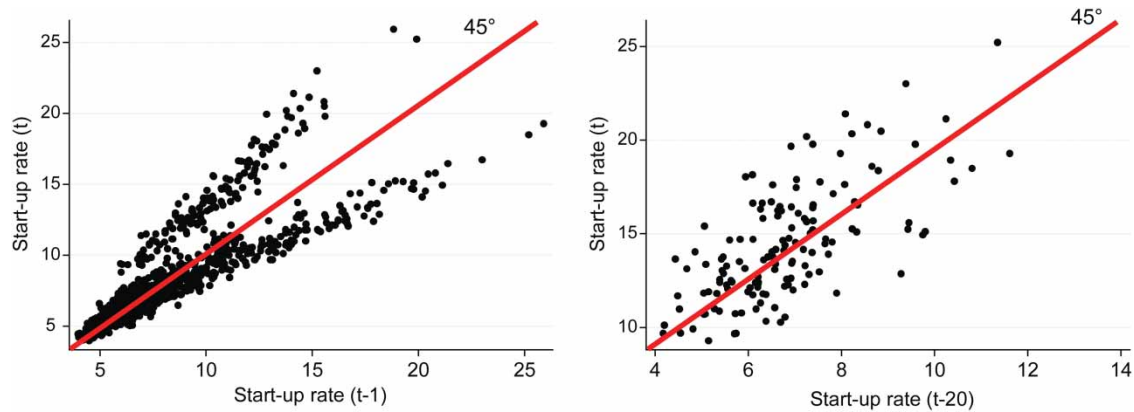


Fig. 2. Relationship between start-up rate (per 1000 individuals) in t and $t - 1$ (left) and t and $t - 20$ (right)

Note: 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 a higher number of start-ups due to changes in the reporting system. The number of observations on the right side is considerably lower because the data contain only two years with information about the lagged start-up rates for $t - 20$ (2004 and 2005). The restriction to the years 2004 and 2005 in the right panel results in a different scaling of the x - and y -axes because observations after the change in the reporting system are compared with data points before this change occurred. The persistence suggested by the figures in the right-hand panel indicates that the 'jump' in the recorded number of start-ups was not region specific

The results indicate a highly significant positive effect of new business formation in 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 that the previous level of new business formation has not only a short-term effect, the start-up rate of the period $t - 3$ is included 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), it is found 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.¹³ The effect of the local unemployment

rate varies considerably with the period under inspection. This variation can be explained with intensified policy programmes after 2002 for promoting start-ups by unemployed people. These programmes obviously had the effect that the statistical relationship between the regional unemployment rate and new business formation is significantly positive when this period is included, while it tends to be negative in other periods.¹⁴ 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, a high degree of stability is also found (see Table A3 in Appendix A). 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.

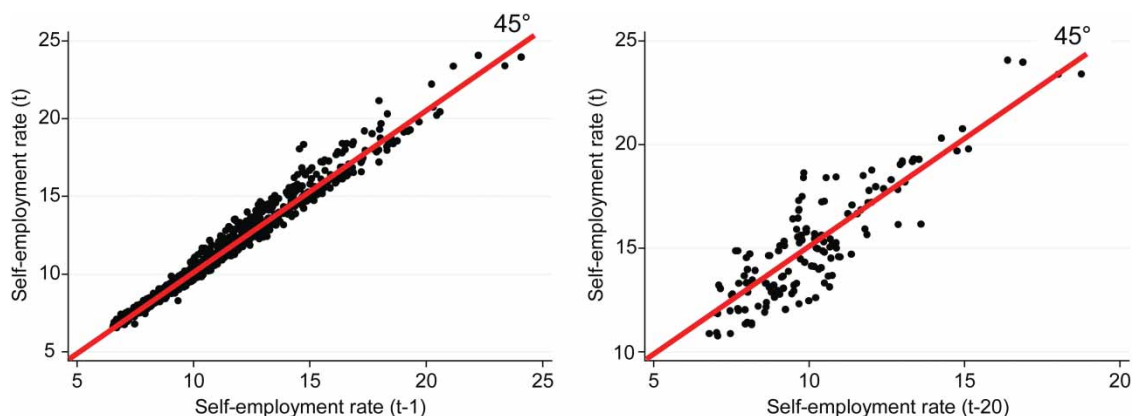


Fig. 3. Relationship between self-employment rate (%) in t and in $t - 1$ (left) and in t and in $t - 20$ (right)

Table 2. Effect of past start-up rates on the current start-up rate in West Germany, 1984–2005^a

	I	II	III
	1984–2005		2000–2005
Start-up rate ($t-1$)	0.432*** (0.0213)	–	0.656*** (0.0461)
Start-up rate ($t-2$)	0.0972*** (0.00774)	–	–
Start-up rate ($t-3$)	0.113*** (0.00992)	0.243*** (0.0236)	–
Population density (log) ($t-1$)	–0.0408* (0.0222)	–0.107*** (0.0382)	–0.154*** (0.0394)
Share of R&D personnel ($t-1$)	0.0425** (0.0197)	0.129*** (0.0285)	0.128*** (0.0281)
Unemployment rate ($t-1$)	0.0276* (0.0154)	0.0660** (0.0286)	0.170*** (0.0474)
Federal state dummies	**	**	**
Constant	–0.238*** (0.0601)	–0.264** (0.110)	–0.0396 (0.118)
Number of observations	1349	1349	355
F-value	274.38***	114.32***	38.97***
Adjusted R^2	0.793	0.592	0.459

Notes: Dependent variable: regional start-up rate in t_0 . Pooled ordinary least squares (OLS) regressions. Newey–West standard errors are given in parentheses. ***Statistically significant at the 1% level; and **statistically significant at the 5% level. Newey–West standard errors were used to control for potential autocorrelation of the lagged dependent values with the residuals. A lag of 3 was specified. Running the models with the Huber–Sandwich–White procedure leads only to rather small changes of the standard errors. Potential effects of changes in the reporting system in the years 1999 and 2003 are controlled for by year dummies. Running models I and II only for the 1984–1998 period does not qualitatively change the effect of lagged start-up rates.

^aLagrange Multiplier tests indicate some remaining spatial autocorrelation in some of the models of the first and second scenarios even when the federal state dummies are included. The results are, however, robust when running spatial lag and spatial error models. The results are presented with federal state dummies because this model is also used for the quantile regressions (see Fig. 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 the control variables. Accordingly, the Lagrange Multiplier test does not indicate any spatial autocorrelation if the model is run without the control variables. In alternative specifications, the stock of start-ups in past years was used and average start-up rates were lagged as independent variables. Both indicators significantly affect start-up activity.

Since the historical data used in the analyses of Scenarios II and III provide only information about self-employment but not on start-up rates, the regressions for the past self-employment rate (Table 3) are also performed in order to be compatible with these scenarios. As could have been expected, it is found 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,

Table 3. 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*** (0.0815)	–	0.606*** (0.0413)
Self-employment rate ($t-2$)	–0.811*** (0.0772)	–	–
Self-employment rate ($t-3$)	0.251*** (0.0520)	0.539*** (0.0339)	–
Population density (log) ($t-1$)	–0.0126 (0.0327)	–0.0274 (0.0430)	–0.0511 (0.0444)
Share of R&D personnel ($t-1$)	0.220*** (0.0272)	0.300*** (0.0324)	0.182*** (0.0321)
Unemployment rate ($t-1$)	0.206*** (0.0294)	0.273*** (0.0349)	0.360*** (0.0521)
Federal state dummies	n.s.	n.s.	n.s.
Constant	–0.107 (0.115)	–0.175 (0.149)	–0.0298 (0.113)
Number of observations	1349	1349	355
F-value	112.01***	55.31***	35.76***
Adjusted R^2	0.381	0.296	0.560

Note: Dependent variable: regional start-up rate in t_0 . Pooled ordinary least squares (OLS) regressions. Newey–West standard errors are given in parentheses. ***Statistically significant at the 1% level; and **statistically significant at the 5% level. Newey–West standard errors were used to control for potential autocorrelation of the lagged dependent values with the residuals. A lag of 3 was specified. Running the models in accordance with the Huber–Sandwich–White procedure leads only to rather small changes of the standard errors. Potential effects of change in the reporting system in the years 1999 and 2003 are controlled for by year dummies. Running models I and II only for the 1984–1998 period does not qualitatively change the effect of lagged self-employment rates.

a strong relationship between the start-up rate and the regional level of R&D employment is again found. Also, the unemployment rate proves to be statistically significant.

In a further step, the work of ANDERSSON and KOSTER (2011) is followed and quantile regressions are run. 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, the model is restricted to the start-up rate in $t-3$ and the control variables (Tables 2 and 3).¹⁵ It is indeed found that the estimated marginal effect of previous levels of new business formation tends to be the stronger the higher is the past level of new business formation (Fig. 4) and self-employment (Fig. 5). This relationship is considerably more pronounced if the start-up rate is used as indicator for the past level of entrepreneurial activity (Fig. 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 formation in the past.¹⁶ Whether this

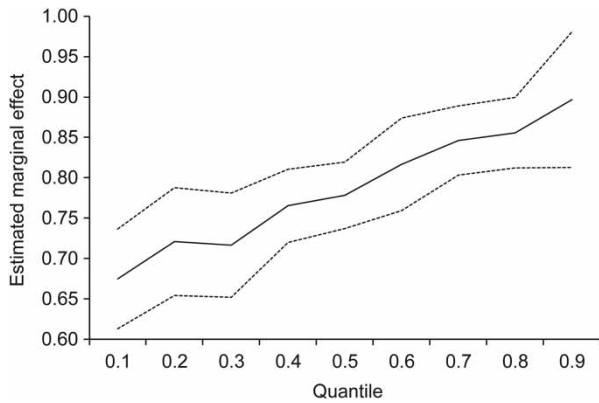


Fig. 4. Estimated marginal effect of the start-up rate in $t - 3$ on the start-up rates in t_0 in West Germany (dotted lines indicate upper and lower confidence intervals; bootstrapped standard errors with 1000 replications)

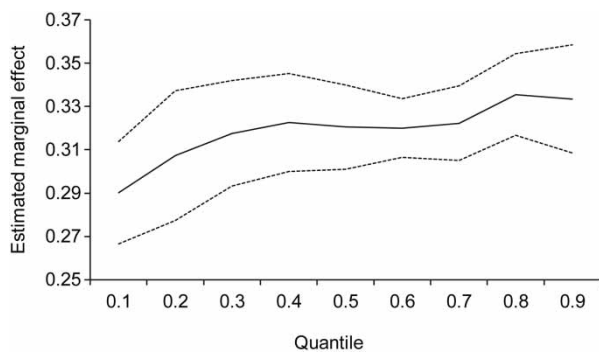


Fig. 5. Estimated marginal effect of the self-employment rate in $t - 3$ on the start-up rates in t_0 in West Germany (dotted lines indicate upper and lower confidence intervals; bootstrapped standard errors with 1000 replications)

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.

SCENARIO II: PERSISTENCE OF REGIONAL ENTREPRENEURSHIP IN THE FACE OF A WORLD WAR FOLLOWED BY MASSIVE IMMIGRATION – 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, the devastating Second World War, 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 is 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.¹⁷

Fig. 6 shows the distribution of self-employment rates across the regions of Germany in 1925. A first observation is that these self-employment rates were, on average, higher in regions that became West Germany after the war. Regions with relatively high self-employment rates are especially to be found around the urban centres of Hamburg, Frankfurt, Cologne, Munich and Nuremberg. Also, the south-western part of Germany, which is known for its innovative spirit and entrepreneurial culture (for example, 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 south-east.

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; for descriptive statistics, see Tables A4 and A5 in Appendix A). 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.¹⁸ 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. A difference to the results for Scenario I is the significantly negative effect of the unemployment rate that is in line with the analysis of FRITSCH and MUELLER (2007) for the 1984–2002 period.¹⁹ The significant effect of the self-employment rate strongly indicates the persistence of regional differences in start-up activity over longer time periods which include several disruptive shocks to environmental conditions.

For Scenario II, quantile regressions were again applied. The aim is to discover how the effect of historical self-employment rates differs across quantiles

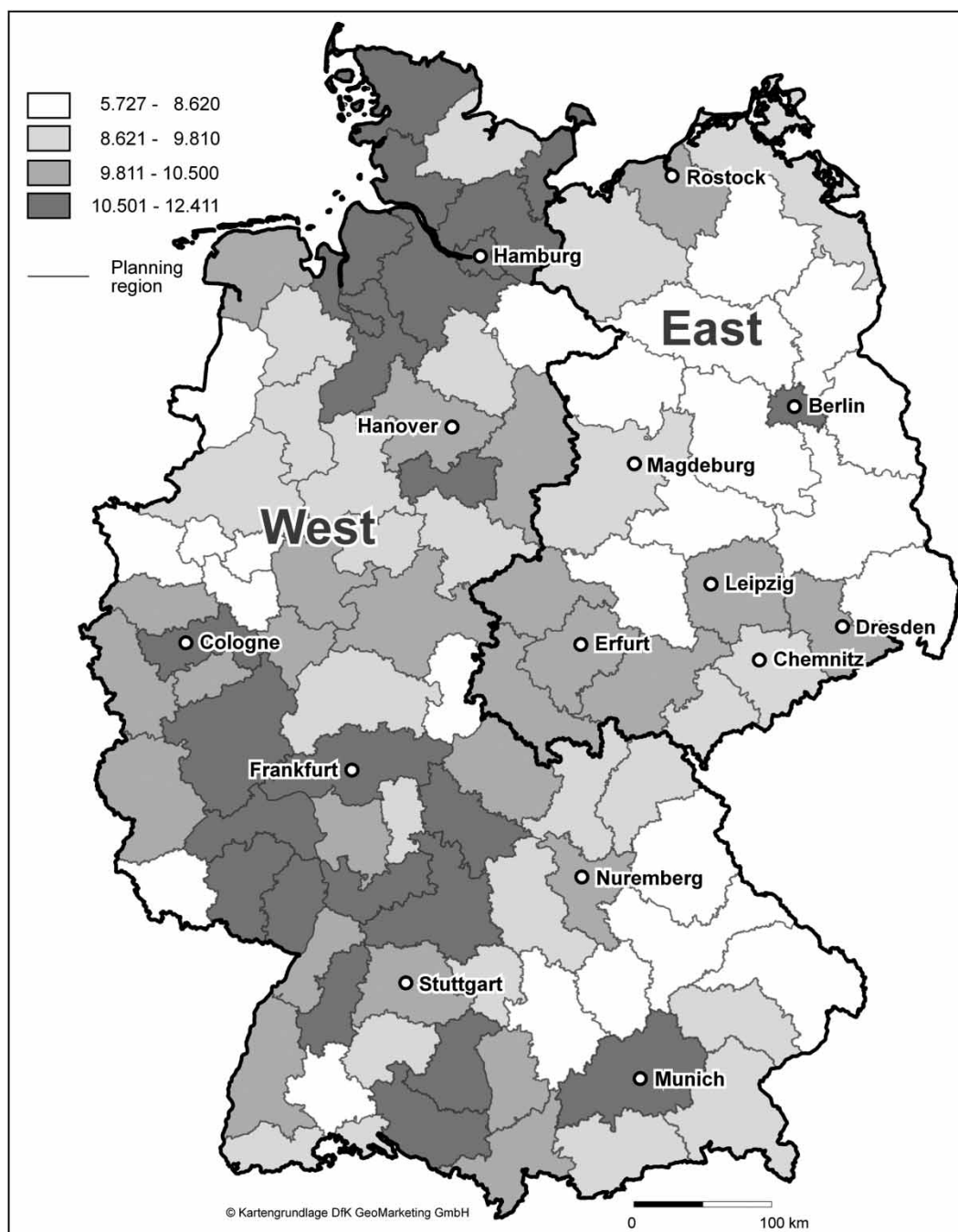


Fig. 6. Share of self-employed persons in non-agricultural sectors in total employment in German regions, 1925

(Fig. 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 with respect to the estimated marginal effect. This may indicate that there is a critical value for the self-reinforcing effect of entrepreneurial culture.

SCENARIO III: PERSISTENCE OF REGIONAL ENTREPRENEURSHIP IN THE FACE OF A WORLD WAR, FORTY YEARS OF A SOCIALIST REGIME, A SHOCKING TRANSFORMATION PROCESS AND MASSIVE OUT-MIGRATION – EAST GERMANY, 1925–2005

As a result of the massive anti-entrepreneurship policy of the socialist period in East Germany, the self-employment rate

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% level.

Table 5. Effect of the self-employment rate in 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 personnel ($t-1$)	–	–	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	1349	1349	1349
F-value	209.35***	210.89***	186.20***
Adjusted R ²	0.782	0.802	0.806

Note: Dependent variable: Regional start-up rate in t_0 . Pooled ordinary least squares (OLS) regressions. Robust standard errors are given in parentheses. ***Statistically significant at the 1% level; **statistically significant at the 5% level; and *statistically significant at the 10% level. There are jumps in the number of start-ups and changes in the reporting system for years after 1998, which are controlled for by employing year dummies. Running the models only for the 1984–1998 period does not lead to any significant change of the effect of the historical self-employment rate.

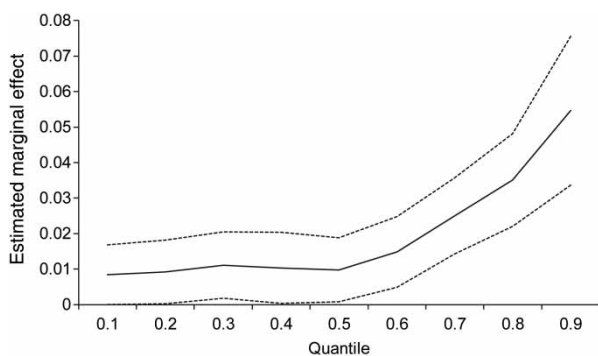


Fig. 7. Estimated marginal effect of the self-employment rate in 1925 on the start-up rates in West Germany (dotted lines indicate upper and lower confidence intervals; bootstrapped standard errors with 1000 replications)

at the end of the GDR regime in 1989 was only about 1.8% compared with 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 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 (WYRICH, 2012).²⁰ Thus, regional variation in private-sector activity in 1989 can be regarded as mainly a result of variation in private initiative or of different levels of resistance to political attempts to abolish private firms. This persistence of regional entrepreneurial cultures during forty years of a socialist regime is particularly remarkable because the anti-entrepreneurial policy should have created relatively high incentives for people with an entrepreneurial mindset to leave the GDR which, in turn, certainly led to an entrepreneurial blood-letting 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 – fifteen 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 *et al.*, 2013) 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).

Analysing 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, this analysis is restricted 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 twenty-two East German planning regions. The region of Berlin is excluded since the data do not allow one to distinguish between the eastern and western part of the city, the latter of which was not under socialist regime. Information on 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 is used.

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 the Second World

War. 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 the war, such as Chemnitz and Dresden (Fig. 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 (for

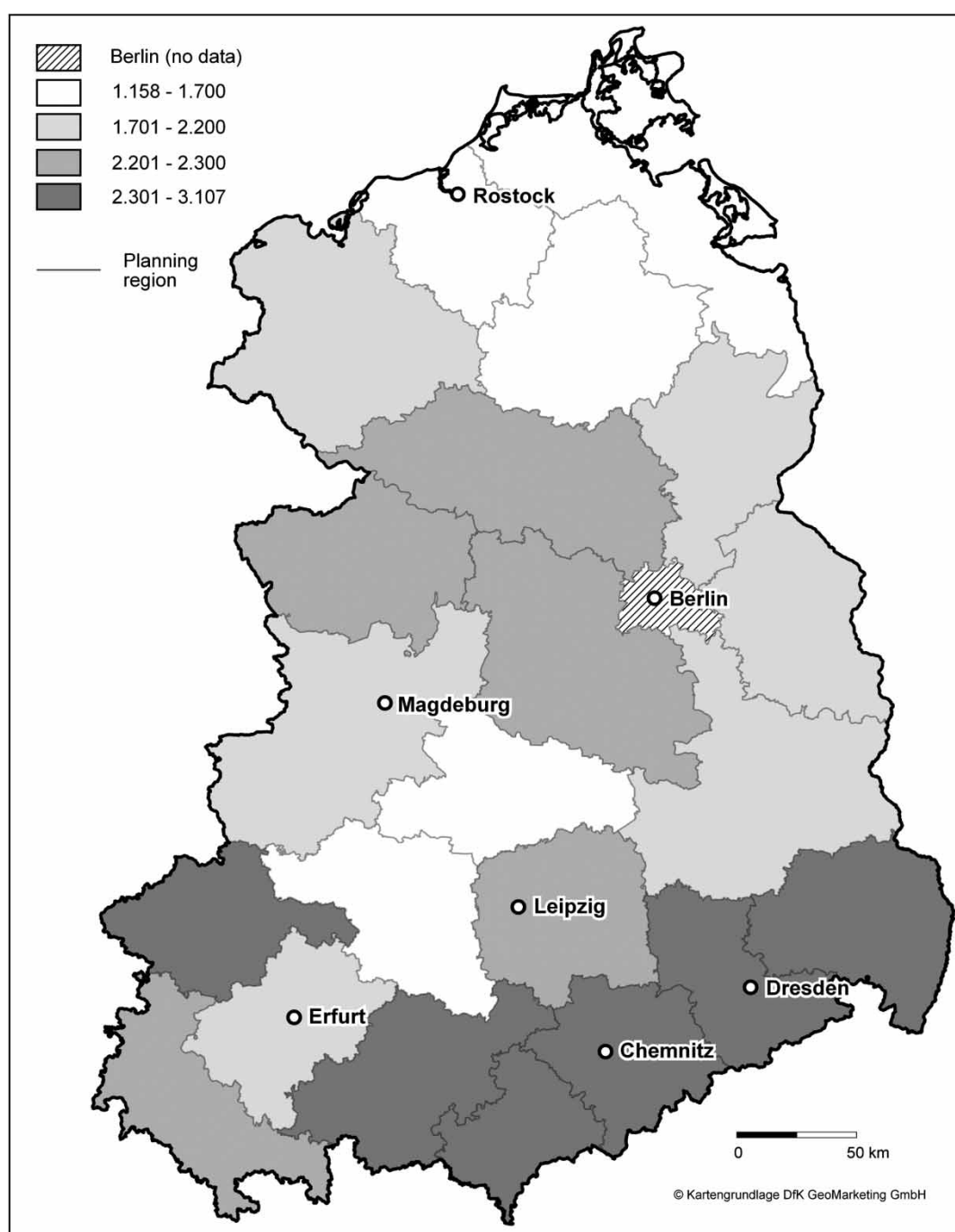


Fig. 8. Self-employment rates in East German regions, 1989

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% level.

example, CHLOSTA *et al.*, 2012; DOHMEN *et al.*, 2012; LASPITA *et al.*, 2012). Furthermore, there might have been a favourable collective memory about the merits of entrepreneurship in areas where it played an important role for economic prosperity in the past.

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 Appendix A). This indicates that regions with high remnants of entrepreneurial culture experienced a comparatively positive labour 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, a significantly positive effect of the historical self-employment rates is found when controlling for local unemployment in a multivariate framework (Table 7).

Table 7. Effect of self-employment rates in 1925 and 1989 on current levels of new business formation in East Germany, 2000–2005 (Scenario III)^a

	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 personnel ($t-1$)	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)
Number of observations	110	110	110	110	110
F-value	9.16***	9.44***	9.00***	7.47***	6.67***
Adjusted R ²	0.433	0.341	0.404	0.444	0.420

Notes: Dependent variable: regional start-up rate in t_0 . Pooled ordinary least squares (OLS) regressions. Robust standard errors are given in parentheses. ***Statistically significant at the 1% level; **statistically significant at the 5% level; and *statistically significant at the 10% level. Newey–West standard errors for Model I were alternatively employed since the lagged start-up rate was used in this specification. The resulting standard errors are hardly different.

^aLagrange 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. There is an additional dummy control variable indicating planning regions that are adjacent to West Berlin because the effect of regional integration might be more pronounced there. Abstaining from this distinction only slightly changes the results. Since East Germany (excluding Berlin for reasons explained in the text) consists of five federal states, the regressions for East Germany include four dummies for federal states (plus a reference category and the dummy indicating co-location with West Berlin).

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–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 1925 in Model IV is not smaller but even slightly (but not statistically significant) 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 eighty years earlier (Fig. 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 disruptive shocks in East Germany that might have damaged the entrepreneurial culture.

The findings for Scenario III demonstrate that there is significant persistence of regional differences in entrepreneurship over long periods of time and they have 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.

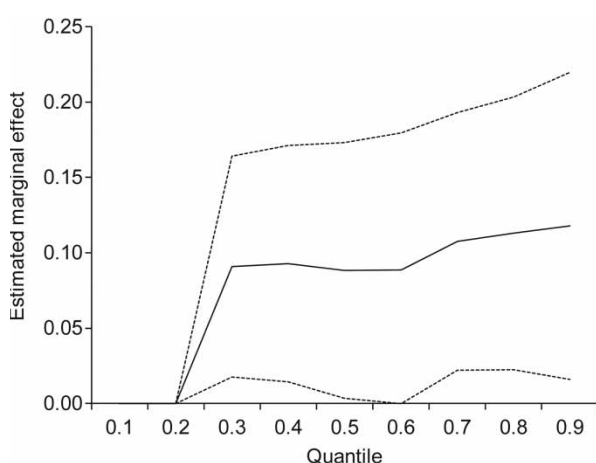


Fig. 9. Estimated marginal effect of the self-employment rate in 1925 on the start-up rates in East Germany (dotted lines indicate upper and lower confidence intervals; bootstrapped standard errors with 1000 replications)

DISCUSSION AND CONCLUSIONS

This empirical investigation has 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, the Second World War and forty years of a socialist regime (Scenario III), shows that 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 supportive infrastructure, as was the case in East Germany during forty years of its 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 the Second World War. 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). History matters!

The high level of persistence of regional entrepreneurship found implies not only long-term effects once an entrepreneurial culture has developed, but also the stability of regional levels of self-employment and new business formation 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.

The 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. 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. Perhaps the type of agriculture that prevailed in a region, for example,

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, perhaps 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.

A second important question is how a culture of entrepreneurship, once established, is transmitted across generations and can persist through severe changes in 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 is compelling evidence that high levels of regional new business formation can be an important source of growth (for an overview, see FRITSCH, 2013). There may, however, be further factors that are important for the persistence that should be subject to further research.²²

A third question not touched on in this paper but which is left for further analysis 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, it should be expected 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 entrepreneurial culture.

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APPENDIX A

Table A1. Descriptive statistics for West Germany

	Mean	Median	Minimum	Maximum	SD
Self-employment rate, 1984–2005	0.091	0.086	0.055	0.205	0.021
Start-up rate (per 1000 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 of research and development (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

Note: SD, standard deviation.

Table A2. Correlation matrix for 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 of research and development (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***

Note: ***Statistically significant at the 1% level; **statistically significant at the 5% level; and *statistically significant at the 10% level.

Table A3. Correlations for the persistence of potential determinants of new business formation in East and West Germany over time

	$t - 1$	$t - 5$	$t - 10$	$t - 15$	$t - 20$
<i>West Germany, 1984–2005</i>					
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***
<i>East Germany, 2001–2005</i>					
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***	–	–	–

Notes: ***Statistically significant at the 1% level.
R&D, research and development.

Table A4. Descriptive statistics for East Germany

	Mean	Median	Minimum	Maximum	SD
Self-employment rate, 2000–2005	0.092	0.092	0.077	0.105	0.006
Start-up rate (per 1000 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 of research and development (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

Note: SD, standard deviation.

Table A5. Correlation matrix for East Germany

	I	II	III	IV	V	VI
I Self-employment rate, 2000–2005	1.000***					
II Start-up rate, 2000–2005	0.489***	1.000***				
III Self-employment rate, 1925	0.293***	–0.150	1.000***			
IV Self-employment rate, 1989	0.391***	–0.268***	0.308***	1.000***		
V Population density (log), 2001–2005	0.087	–0.330***	0.536***	0.569***	1.000***	
VI Share of research and development (R&D) personnel, 2001–2005	–0.148	–0.209**	0.233**	0.247***	0.589***	1.000***
VII Unemployment rate, 2001–2005	–0.375***	0.123	–0.491***	–0.454***	–0.366***	–0.339***

Note: ***Statistically significant at the 1% level; and **statistically significant at the 5% level.

NOTES

1. Although formal and informal institutions are related, other factors may play a rather significant role. This is evidenced by the observation that the extent of an entrepreneurship culture can strongly vary across regions within a country that are characterized by the same framework of formal institutions (for example, ANDERSSON, 2012; BEUGELSDIJK, 2007; DAVIDSSON, 1995; DAVIDSSON and WIKLUND, 1997; ETZIONI, 1987; WESTLUND and BOLTON, 2003).
2. This is an implication of the highly significantly positive effect of the small business employment share on the regional level of start-ups (for example, FRITSCH and FALCK, 2007) because such a high share of employment in small businesses indicates the presence of relatively many firms and entrepreneurs.
3. '[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, p. 3).

4. 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 innovation activities that may generate entrepreneurial opportunities, as well as government incentives. Hence, incentives for starting firms in such an environment are rather low.

5. If available, alternative indicators for new business formation and self-employment from other sources tend to be highly correlated with the data used here.
6. There are actually seventy-four 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, the official definition of planning regions was adjusted by merging these two cities with adjacent planning regions. Therefore, Hamburg was merged with the region of Schleswig-Holstein South and Hamburg-Umland South. Bremen was merged with Bremen-Umland. Thus, the number of regions in the sample was seventy-one.
7. Start-ups in agriculture were not considered in the analysis because self-employment in this sector must be regarded a special case and shaped by factors rather different from those relevant in other parts of the economy. Further, this sector is characterized by a high employment contribution of helping family members who are not captured in the Social Insurance Statistics.
8. The highest regional start-up rates (over twenty start-ups per 1000 workforces) are more than five times larger than the lowest start-up rates (about four start-ups per 1000 workforce).
9. According to a different database – the German Micro Census – that measures the number of founders instead of the number of start-ups and which also comprises new businesses without employees, the East German start-up rate reached the West German level in 2004 and has been slightly above the value for West Germany since 2005 (FRITSCH *et al.*, 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.
10. This procedure was also applied for the analyses of the second and third scenarios.
11. R&D employees over total employment. R&D employees are defined as those with tertiary degrees working as engineers or natural scientists (source: German Social Insurance Statistics).
12. The German federal states (*Laender*) are an important level of policy-making. Germany consists of sixteen federal states: West Germany comprises ten federal states and East Germany consists of six federal states (including Berlin). As mentioned above, the planning regions for the cities of Hamburg and Bremen, each representing a federal state, were merged with surrounding planning regions that belong to other federal states. Since these two newly created regions do not represent their own political units, they were used as a reference category when including dummy variables for federal states.
13. Population density (as well as alternative measures such as employment density or market size in terms of population) and the share of R&D personnel are highly correlated ($r = 0.54$). The correlation between population density and employment density is 0.98. The correlation between the number of population and population density is 0.68. Excluding the share of R&D personnel makes the effect of population density insignificant. This suggests that density as such does not have a significant effect.
14. FRITSCH and MUELLER (2007) found a negative effect of the local unemployment rate. Restricting the period to the years analysed by Fritsch and Mueller makes the unemployment rate significantly negative in Model I and insignificant in Model II.
15. Running the model with the start-up rate in $t-1$, $t-2$ or $t-4$ does not lead to any significant changes in 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.
16. The quantile regressions were restricted to the period 1984–1998 because including the years 1999–2005 leads to somewhat fuzzy results that are obviously caused by an abrupt increase of the recorded level of start-up activity between 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.
17. Unfortunately, the historical data do not contain information about the number of start-ups. Furthermore, there is only limited information on the planning region that comprises the federal state of Saarland since parts of this area did not belong to Germany in 1925. The information on the remaining districts is used. Excluding these areas (which equals omitting one observation per year) does not change the results.
18. The employment shares of three large economic sectors – construction, manufacturing and other industries – in 1925 were used to control for the economic structure of the regional economy. This will avoid the fact that the self-employment rate mainly reflects the industry structure in that year.
19. As mentioned in the fourth section, the positive effect for the regional unemployment rate found in the framework of Scenario I (Tables 2 and 3) is presumably shaped by programmes for promoting start-ups by unemployed people that have been introduced after 2002. If the years 2003–2005 are excluded, the coefficient for the unemployment rate is always negative.
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.
21. The information on self-employment in 1989 was obtained from the GDR Statistical Office and 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 information about the economic sectors of the businesses.
22. Another factor that can contribute to persistence is path dependency. If new business formation has a positive effect on regional development, then high levels of growth may lead to high start-up rates in future periods making new business formation not only a source, but also a symptom of growth (ANYADIKE-DANES *et al.*, 2011). However, given the severe external shocks that German regions have experienced in the period under inspection in this paper, particularly the destruction of the country in the Second World War, such an explanation can be hardly regarded as plausible for the German example that has been analysed herein.

REFERENCES

- ACS Z. and MUELLER P. (2008) Employment effects of business dynamics: mice, gazelles and elephants, *Small Business Economics* **30**, 85–100.
- ALESINA A. and FUCHS-SCHUENDEL N. (2007) Good-bye Lenin (or not?): the effect of communism on people's preferences, *American Economic Review* **97**, 1507–1528.
- ANDERSSON M. (2012) Start-up rates, entrepreneurship culture and the business cycle – Swedish patterns from national and regional data, in BRAUNERHJELM P. (Ed.) *Entrepreneurship, Norms and the Business Cycle – Swedish Economic Forum Report 2012*, pp. 91–110. Entreprenörskapsforum, Stockholm.
- ANDERSSON M. and KOSTER S. (2011) Sources of persistence in regional start-up rates – evidence from Sweden, *Journal of Economic Geography* **11**, 179–201.
- ANYADIKE-DANES M., HART M. and LENIHAN H. (2011) New business formation in a rapidly growing economy: the Irish experience, *Small Business Economics* **36**, 503–516.
- AOYAMA Y. (2009) Entrepreneurship and regional culture: the case of Hamamatsu and Kyoto, Japan, *Regional Studies* **43**, 495–512.
- AUDRETSCH D. B. and FRITSCH M. (1994) On the measurement of entry rates, *Empirica* **21**, 105–113.
- AUDRETSCH D. B. and KEILBACH M. (2004) Entrepreneurship capital and economic performance, *Regional Studies* **38**, 949–959.
- BATEN J., SPADAVECCHIA A., STREB J. and YING S. (2007) What made southwest German firms innovative around 1900? Assessing the importance of intra- and inter-industry externalities, *Oxford Economic Papers* **59**, 105–126.
- BECKER S. O., BOECKH K., HAINZ C. and WOESSMANN L. (2010) *The Empire is Dead, Long Live the Empire! Long-Run Persistence of Trust and Corruption in Bureaucracy*. CEPR Discussion Paper Number 8288. Centre for Economic Policy Research (CEPR), London.
- BERENTSEN W. H. (1992) The socialist face of the GDR: Eastern Germany's landscape – past, present, and future, *Landscape and Urban Planning* **22**, 137–151.
- BEUGELSDIJK S. (2007) Entrepreneurial culture, regional innovativeness and economic growth, *Journal of Evolutionary Economics* **17**, 187–210.
- BEUGELSDIJK S. and NOORDERHAVEN N. (2004) Entrepreneurial attitude and economic growth: a cross-section of 54 regions, *Annals of Regional Science* **38**, 199–218.
- BONEVA B. S. and FRIEZE I. H. (2001) Toward a concept of a migrant personality, *Journal of Social Issues* **57**, 477–491.
- BOSMA N., HESSELS J., SCHUTJENS V., VAN PRAAG M. and VERHEUL I. (2012) Entrepreneurship and role models, *Journal of Economic Psychology* **33**, 410–424.
- BOSMA N. and SCHUTJENS V. (2011) Understanding regional variation in entrepreneurial activity and entrepreneurial attitude in Europe, *Annals of Regional Science* **47**, 711–742.
- BREZINSKI H. (1987) The second economy in the GDR – pragmatism is gaining ground, *Studies in Comparative Communism* **20**, 85–101.
- BREZINSKI H. and FRITSCH M. (1995) Transformation: the shocking German way, *Moot-Most* **5**(4), 1–25.
- BURCHARDI K. B. and HASSAN T. A. (2013) The economic impact of social ties: evidence from German reunification, *Quarterly Journal of Economics* **128**(3), 1219–1271.
- BURDA M. C. and HUNT J. (2001) From reunification to economic integration: productivity and the labor market in Eastern Germany, *Brookings Papers on Economic Activity* **2**, 1–92.
- CHLOSTA S., PATZELT H., KLEIN S. B. and DORMANN C. (2012) Parental role models and the decision to become self-employed: the moderating effect of personality, *Small Business Economics* **38**, 121–138.
- DAVIDSSON P. (1995) Culture, structure and regional levels of entrepreneurship, *Entrepreneurship and Regional Development* **7**, 41–62.
- DAVIDSSON P. and WIKLUND J. (1997) Values, beliefs and regional variations in new firm formation rates, *Journal of Economic Psychology* **18**, 179–199.
- DOHMEN T., FALK A., HUFFMAN D. and SUNDE U. (2012) The intergenerational transmission of risk and trust attitudes, *Review of Economic Studies* **79**, 645–677.
- DUBINI P. (1989) The influence of motivations and environments on business start-ups: some hints for public policy, *Journal of Business Venturing* **4**, 11–26.
- EBBINGHAUS F. (2003) *Ausnutzung und Verdrängung: Steuerungsprobleme der SED-Mittelstandspolitik 1955–1972*. Duncker & Humblot, Berlin.
- ETZIONI A. (1987) Entrepreneurship, adaptation and legitimation, *Journal of Economic Behavior and Organization* **8**, 175–199.
- FORNAHL D. (2003) Entrepreneurial activities in a regional context, in FORNAHL D. and BRENNER T. (Eds) *Cooperation, Networks, and Institutions in Regional Innovation Systems*, pp. 38–57. Edward Elgar, Cheltenham.
- FREYTAG A. and THURIK R. (2007) Entrepreneurship and its determinants in a cross-country setting, *Journal of Evolutionary Economics* **17**, 117–131.
- FRITSCH M. (2004) Entrepreneurship, entry and performance of new businesses compared in two growth regimes: East and West Germany, *Journal of Evolutionary Economics* **14**, 525–542.
- FRITSCH M. (2013) New business formation and regional development – a survey and assessment of the evidence, *Foundations and Trends in Entrepreneurship* **9**, 249–364.
- FRITSCH M. and FALCK O. (2007) New business formation by industry over space and time: a multi-dimensional analysis, *Regional Studies* **41**, 157–172.

- FRITSCH M., KRITIKOS A. and RUSAKOVA A. (2012) *Who Starts a Business and Who is Self-Employed in Germany?* Jena Economic Research Papers Number 001-2012. Friedrich Schiller University and Max Planck Institute of Economics, Jena.
- FRITSCH M. and MUELLER P. (2007) The persistence of regional new business formation-activity over time – assessing the potential of policy promotion programs, *Journal of Evolutionary Economics* **17**, 299–315.
- FRITSCH M., NOSELEIT F. and SCHINDELE Y. (2013) *Surviving Against the Tide: The Role of Region and Industry Performance for New Business Survival*. Mimeo, Jena and Groningen.
- HALL J. B. and LUDWIG U. (1995) German unification and the ‘market adoption’ hypothesis, *Cambridge Journal of Economics* **19**, 491–507.
- HUNT J. (2006) Staunching emigration from East Germany: age and the determinants of migration, *Journal of the European Economic Association* **4**, 1014–1037.
- JOKELA M. (2009) Personality predicts migration within and between U.S. states, *Journal of Personality Research* **43**, 79–83.
- KAWKA R. (2007) Regional disparities in the GDR: do they still matter?, in LENTZ S. (Ed.) *German Annual of Spatial Research and Policy: Restructuring Eastern Germany*, pp. 111–122. Springer, Berlin.
- LAFUENTE E., VAILLANT Y. and RIALP J. (2007) Regional differences in the influence of role models: comparing the entrepreneurial process of rural Catalonia, *Regional Studies* **41**, 779–795.
- LASPITA S., BREUGST N., HEBLICH S. and PATZELT H. (2012) Intergenerational transmission of entrepreneurial intentions, *Journal of Business Venturing* **27**, 414–435.
- MARSHALL A. (1920) *Principles of Economics*, 8th Edn. Macmillan, London.
- MINNITI M. (2005) Entrepreneurship and network externalities, *Journal of Economic Behavior and Organization* **57**, 1–27.
- MUELLER P., VAN STEL A. and STOREY D. J. (2008) The effect of new firm formation on regional development over time: the case of Great Britain, *Small Business Economics* **30**, 59–71.
- NEWMAN K. L. (2000) Organizational transformation during institutional upheaval, *Academy of Management Review* **25**, 602–619.
- NORTH D. C. (1994) Economic performance through time, *American Economic Review* **84**, 359–368.
- PICKEL A. (1992) *Radical Transitions: The Survival and Revival of Entrepreneurship in the GDR*. Westview, Boulder, CO.
- SORENSEN O. and AUDIA P. G. (2000) The social structure of entrepreneurial activity: geographic concentration of footwear production in the United States, 1940–1989, *American Journal of Sociology* **106**, 424–462.
- SPENGLER A. (2008) The establishment history panel, *Schmollers Jahrbuch/Journal of Applied Social Science Studies* **128**, 501–509.
- STATISTIK DES DEUTSCHEN REICHS (1927) *Volks-, Berufs- und Betriebszählung vom 16. Juni 1925: Die berufliche und soziale Gliederung der Bevölkerung in den Ländern und Landesteilen. Band*, pp. 403–405. Reimar Hobbing, Berlin.
- THOMAS M. (1996) How to become an entrepreneur in East Germany: conditions, steps and effects of the constitution of new entrepreneurs, in BREZINSKI H. and FRITSCH M. (Eds) *The Economic Impact of New Firms in Post-Socialist Countries – Bottom Up Transformation in Eastern Europe*, pp. 227–232. Edward Elgar, Cheltenham.
- VAN STEL A. and SUDDLE K. (2008) The impact of new firm formation on regional development in the Netherlands, *Small Business Economics* **30**, 31–47.
- VOIGTLAENDER N. and VOTH H.-J. (2012) Persecution perpetuated: the medieval origins of anti-Semitic violence in Nazi Germany, *Quarterly Journal of Economics* **127**, 1339–1392.
- WAGNER J. and STERNBERG R. (2004) Start-up activities, individual characteristics, and the regional milieu: lessons for entrepreneurship support policies from German micro data, *Annals of Regional Science* **38**, 219–40.
- WESTLUND H. and BOLTON R. (2003) Local social capital and entrepreneurship, *Small Business Economics* **21**, 77–113.
- WHITE H. (1980) A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity, *Econometrica* **48**, 817–838.
- WILLIAMSON O. (2000) The new institutional economics: taking stock, looking ahead, *Journal of Economic Literature* **38**, 595–613.
- WYRWICH M. (2012) Regional entrepreneurial heritage in a socialist and a post-socialist economy, *Economic Geography* **88**, 423–445.