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Abstract

We investigate how major historical shocks affect regional trajectories of economic activity. To this end, we conduct a comparative analysis of the development of entrepreneurship in East and West Germany after World War II. The introduction of an anti-entrepreneurial socialist economy in East Germany in 1949, and the subsequent transformation to a market economy four decades later were major historical shocks to the economy in general, and to entrepreneurship specifically. Our comparative analysis of East and West Germany assesses how these shocks affected the level of entrepreneurship at the regional level. Surprisingly, our results show that socialism does not have a long-run negative effect on the prevalence of self-employment in East Germany, despite the severe anti-entrepreneurial policies prevalent in Soviet-style socialism. Quite to the contrary, there is actually a positive treatment effect of German separation and reunification. Further analyses suggest that current structural differences in regional levels of self-employment in Germany are not predominantly due to the socialist legacy of the East, but mainly a result of the shock transformation that occurred with reunification.

JEL classification: L26, R11, N94, P25

Keywords: Entrepreneurship, self-employment, transition, socialism, regional development, GDR,

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1. Introduction[1]

There is a growing literature on the effect of historical shocks on the geographic distribution of economic activity on regional development, and on whether these shocks can disrupt historical trends. While some studies find that significant historical disruptions do not seriously affect existing long-run development trajectories (Davis and Weinstein 2002; Brakman et al. 2004), there is also evidence that significant ruptures imply persistent changes in regional development and regional structures of economic activities (Redding and Sturm 2008; Redding et al. 2011; Schumann 2014; Wyrwich 2020).

While these studies focus on potential changes in population levels and economic structures, there is no assessment on how historical shocks affect the organization of economic activity. For example, whether shocks alter the prevalence of small and new firms across regions. Studies that analyze the role of historical levels of small firm activity and entrepreneurship in settings with massive historical shocks suggest that the historical levels of entrepreneurship have a positive effect on current levels of new firm formation and self-employment (Fritsch and Wyrwich 2014; Fritsch et al. 2019; Fritsch, Pylak and Wyrwich 2019). While this evidence pertains to *persistence of regional differences* in entrepreneurial levels, it remains unclear how historical shocks affect the development in the *absolute* level of entrepreneurship across regions that were exposed to the shock, as compared to regions that were not.

This paper uses the case of Germany to analyze whether historical shocks can substantially change or even interrupt development trajectories. We compare East and West Germany to investigate whether East Germany's exposure to four decades of socialism and the rapid transition to a market economy over the course of the country's reunification changed the absolute level of entrepreneurship measured by

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self-employment rates across eastern regions. We then compare these rates to western regions that did not experience the same shocks.[2] Our analysis is among the first to show how historical shocks affect long-term trends vis-a-vis the organization of economic activity in small and new firms.

We also contribute to the literature on the long-run effect of socialism and transition (Roland 2012; Becker et al. 2020; Fuchs-Schuendeln and Schuendeln 2020). To this end, we identify the effect of the East-specific historical shocks on entrepreneurship based on a difference-in-difference (DiD) estimation approach at the level of East and West German regions that considers pre-separation and post-reunification data on self-employment.

Our analysis shows a significantly negative DiD coefficient for the first years after German unification. This indicates that exposure to a socialist regime had a negative effect on the level of self-employment in the first transition years. Interestingly, this negative "GDR effect" begins to fade out in the late 1990s, about ten years after the transition began. After this first decade of transition, we find a positive long-run treatment effect on the level of self-employment in post-reunification East Germany. This pattern indicates "second round" effects of the transition of East German regions to a market economy. To be more precise, the positive long-run treatment effect seen in the higher share of self-employed individuals is likely to be an outcome of the transformation strategy and privatization policies in East Germany, which apparently induced the emergence of many small firms (Brezinski and Fritsch 1995). At the same time, we can rule out that the positive treatment effect on self-employment is driven by higher start-up dynamics today.

The empirical regularities that we find in our paper have several implications. First, if socialism truly has a long-term negative effect on the willingness to be a business owner, as suggested in the literature (e.g.

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[2] Although 'entrepreneurship' denotes the process of creating new ventures rather than simply running a business (Davidsson 2016), we are using the term to include self-employment. Such a broad definition of the term may be justified since high shares of small firms and self-employed people indicate high levels of start-up activities, so that new business formation and self-employment can be assumed to be closely related.

Bauernschuster et al. 2012), then this potential effect on self-employment is more than compensated for by other factors, such as the transformation strategy and privatization policies adopted after 1990. This casts doubt on the argument that the level of self-employment in East Germany today mirrors a socialist legacy. Rather, it seems to represent a legacy of the transition process. Furthermore, our results suggest that the importance of deeply rooted historical development trajectories might be relatively low in certain contexts. If the impact of four decades of socialism on the structure and organization of economic activity (particularly collectivization and low levels of self-employment) had affected regional trajectories, one should not observe comparatively high self-employment rates in East Germany so soon after the dismantling of the socialist regime.

It is also interesting that the current level of self-employment in East Germany (relative to West Germany) does not follow the trajectory or path prevalent prior to the socialist experiment. Quite to the contrary, the level of self-employment in East Germany before World War II and the subsequent political division of Germany was significantly lower. This quite surprising pattern may have encouraging policy implications, namely that it is possible to reverse historical trends and trajectories in a relatively short period of time. It should, however, be mentioned that the small firms that were created in East Germany after 1990 are on average not very successful, which may signify a relatively underdeveloped skill set among the entrepreneurs managing these firms. Moreover, the currently high levels of self-employment in East Germany go together with relatively low levels of new business formation, indicating low levels of business dynamics.

The paper is organized as follows: First, we review related literature with a special focus on the potential effects of socialism on entrepreneurship and the role of long-term development trajectories (Section 2). We then present the empirical strategy (Section 3) and the results (Section 4). Section 5 discusses the results of the empirical analysis and concludes.

2. Historical shocks and regional trajectories of entrepreneurship: The case of the grand socialist experiment in the 20th century

2.1 Previous research

Several empirical studies have documented long-run persistence of entrepreneurship at the regional level (Fritsch and Wyrwich 2014; Fotopoulos and Storey 2017; Fritsch et al. 2019). Germany provides an impressive example for the persistence of entrepreneurship despite severe historical shocks. The empirical evidence suggests that start-up activity today is significantly affected by historical levels of self-employment that existed prior to the disruptive events that occurred in Germany during the 20th century, e.g., two World Wars, and four decades of socialism in the eastern part of the country (Fritsch and Wyrwich 2014; 2019). When the evidence is more finely tuned, it reveals that there is a *persistence of regional differences* in entrepreneurial activities. Similar evidence is found for the Russian region of Kaliningrad (Fritsch et al. 2019) and for Poland (Fritsch, Pylak and Wyrwich 2019), two regions that saw a re-emergence of entrepreneurship along historical lines after an even longer period of economic development subject to Soviet-style socialism.

One likely candidate explaining this long-run effect despite significant structural changes is the stability of informal institutions over longer periods of time, such as regional cultures (North 1994; Williamson 2000). Hence, persistence in regional differences of entrepreneurship may indicate the endurance of a local “culture” of entrepreneurship (e.g., Andersson and Koster 2011; Kibler et al. 2014; Fritsch and Wyrwich 2014; Fotopolos and Storey 2017).

The endurance of a culture that favors entrepreneurship is driven by feedback mechanisms in the form of externalities (e.g., learning by example) that harness a self-perpetuation of the existing modes of economic exchange. One can think of entrepreneurial role models that provide opportunities to learn about entrepreneurship and facilitate social acceptance and legitimacy of entrepreneurship via peer effects. This mechanism spurs a self-reinforcing process of high (or low) levels of new

business formation in a region. The regional context is important here because these externalities are likely to decay with distance. Hence, entrepreneurship can be regarded a “regional event” (Feldman 2001) that is heavily affected by region-specific factors and marked by huge geographic variations (e.g., Sternberg 2009).

While we know a lot about persistence of regional differences in entrepreneurship and their historical roots in settings where significant historical ruptures took place, no assessment has yet been offered on how historical shocks affect the *absolute* level of entrepreneurship across regions exposed to the shock as compared to non-affected regions.

2.2 The negative effect of socialism on entrepreneurship

Socialism is regarded as one of the most entrepreneurship-inhibiting economic system in human history (Earle and Sakova 2000). Socialist countries typically experienced a rigorous collectivization of most industries soon after the introduction of the regime. In some countries (e.g., Russia), private sector firms were completely illegal. Other socialist systems allow for certain types of small-scale private ventures, with the caveat of implementing strict controls and placing high financial burdens on running a private firm (Aslund 1985; Pickel 1992). In the case of East Germany, the socialist policies induced many entrepreneurs and firms to migrate to West Germany (e.g., Falck et al. 2013), leading to a massive loss of entrepreneurial capacity and talent.

Apart from collectivization campaigns, massive socialist indoctrination attempted to crowd out value priorities for autonomy and mastery (Sztompka 1996; Schwartz and Bardi 1997), both of which can be regarded crucial antecedents for developing entrepreneurial intentions (Wyrwich 2015; Ryan and Deci 2017). In addition to the direct effects of socialism on entrepreneurship during a socialist regime’s tenure, there is also abundant evidence on legacy effects that eventually inhibit entrepreneurship after a regime switch. These negative effects of socialism on the valuation of entrepreneurship in people’s mindset are

well-documented.[3] There is also evidence that the type of human capital acquired under socialism inhibits involvement in entrepreneurial activities after the regime switch (e.g., Bird et al. 1994; Gathmann 2005; Wyrwich 2013). In any case, during forty years of socialism East Germans had less incentives and fewer opportunities to acquire entrepreneurial skills and to become familiar with a market economic system. Another reality prevalent after the regime switch that worked against East German entrepreneurs is that people in the socialist system had relatively few incentives and opportunities to accumulate financial capital, so that they had, on average, far fewer financial resources than their West German counterparts.

Legacy effects of socialism can also be found in terms of institutional deficiencies that hindered the development of entrepreneurship and entrepreneurship-facilitating conditions at the national and the regional level (Smallbone and Welter 2001; Aidis et al. 2008; Kshetri 2009). It has been shown that post-socialist countries in Europe lag behind other European countries with respect to the state of their entrepreneurial ecosystem (Ács et al. 2018; Szerb, Komlosi and Pager 2017).

Altogether, the collectivization of small and medium-sized enterprises, as well as other anti-entrepreneurial policies of the socialist regime in East Germany (similar to other socialist countries in Central and Eastern Europe), aimed at the destruction of entrepreneurial initiative. Being exposed to socialism shaped an anti-entrepreneurial mindset among the population and induced massive out-migration of firms and entrepreneurial talent. This massive entrepreneurial bloodletting is likely to have left a scar on entrepreneurial activity that may affect the levels of self-employment and new business formation even today.

2.3 Economic transition as a driver of entrepreneurship

Notwithstanding the legacy effects of socialism, there was a massive surge in start-up activity in the former German Democratic Republic (GDR)

[3] Blanchflower and Freeman (1997), Smallbone and Welter (2001), Runst (2013), Fritsch and Rusakova (2012), Wyrwich (2013), Cieslik (2019).

after the introduction of a market economy in the 1990s, described by Piaseceki and Rogut (1993) an “explosion of entrepreneurship.” McMillan and Woodruff (2002) vividly describe the central role played by entrepreneurs in mastering the restructuring and renewal of post-socialist economies by dubbing them ‘agents of change’.

There are several explanations for the positive impact of transition on start-up activities. One of these explanations is the enormous backlog of demand for high-quality products and services that were in short supply under the socialist planned economy. It was, therefore, relatively easy for individuals to find a market niche (Smallbone and Welter 2001; Fritsch 2004). In East Germany, for example, the low number of suppliers in the first year of the transition created a ‘window of opportunity‘ for starting a firm, which was also reflected in relatively high survival chances and growth rates of firms that were founded in the early 1990s (e.g., Almus 2002, Brixy and Kohaut 1999; Fritsch 2004).

Another explanation for the upsurge of start-up activity is that self-employment became an attractive alternative to becoming a member of the rapidly rising number of unemployed (Lechner and Pfeiffer 1993). While unemployment was absent in socialist regimes, the restructuring and privatization of state-owned enterprises after transition implied massive numbers of lay-offs (Gruenert and Lutz 1995; Brezinski and Fritsch 1995; Johnson and Loveman 1995). Therefore, many start-ups may have been driven by necessity that was induced by transition policies. Another result of the industrial restructuring policy is that firm size structures changed dramatically.

While many of the state-owned firms in socialism were huge vertically integrated conglomerates, privatization efforts often implied that these firms were split up into smaller parts and sold separately to private investors (for an overview, see Megginson and Netter 2001). Thus, privatization led to a strong reduction of average firm size. East Germany is a case in point for this type of restructuring. While under the socialist regime production was mostly concentrated in about 260 large industrial conglomerates (*Kombinate*), a few years later the average size of East

German firms was considerably smaller than that found in West Germany (Bauer et al. 2008). Small and medium-sized enterprises emerging from privatization processes were often sold via management buyouts (MBO) to (East German) employees of the privatized establishment (Menth 1997). This had an immediate effect on the number of self-employed in the economy. There are similar patterns in other Eastern European countries (Sondhof and Stahl 1992; Wright et al. 1995).

Finally, in his seminal contribution, Baumol (1990) argues that there were entrepreneurs in the socialist system despite anti-entrepreneurial propaganda, but they did not express their entrepreneurial talent through self-employment because there was no reward for this behavior in the socialist system (see Fritsch et al. 2014, for the detailed argument). Rather, they may have used their entrepreneurial talent in the shadow economy (Aidis and van Praag 2007). They also may have taken (entrepreneurial) initiative within state-owned enterprises or even within socialist mass organizations. There is indeed evidence indicating that former members of prominent socialist organizations have been very active in entrepreneurship after transition (Ronas-Tas 1994). The introduction of a market economy made it more rewarding and productive for them to use their entrepreneurial talent by starting a business, which is in line with the main argument of Baumol (1990).

Although there was a relatively large number of start-ups in East Germany in the first decade of the transformation process, the new firms were, on average, smaller (for details, see IWH 2010) and less successful when compared to their West German counterparts (Brixy and Grotz 2004; Fritsch 2004). This result may indicate lower entrepreneurial abilities of East German founders and less experience with a market economy. The lower level of available resources among East Germans may be a main explanation why a relatively high share of the newly emerging businesses in the East were in industries such as retailing, hospitality and catering, which are characterized by low entry barriers in terms of financial resources and required qualifications.

In sum, a window of opportunity created by backlog demand, necessity entrepreneurship caused by sky-rocketing unemployment rates, privatization processes that stimulated the establishment of many small and medium-sized enterprises, and the productive shift of entrepreneurial talent towards starting entrepreneurial ventures are the main factors that positively affected the revival of entrepreneurship and self-employment in post-socialist countries over economic transition. The empirical evidence suggests that East German founders in the first year of the transition period suffered not only from less available resources, but also from lower entrepreneurial abilities.

2.4 Disentangling and measuring the effect of socialism and transition on entrepreneurship: The intriguing case of Eastern Germany

Transition and institutional change evolve endogenously and simultaneously, but the socialist past also affects how transition processes are implemented. This implies that the effects of both socialism and transition are intertwined. While disentangling these two effects is empirically challenging, it is also challenging to simply measure the effects of socialism and transition. This requires a counterfactual that shows how the country would have developed without the socialist treatment and the subsequent transformation to a market economy.

Fortunately, in the case of East Germany, both issues can be solved at the same time. First, the reunification with West Germany was exogenous and occurred as a “natural experiment” where the ready-made institutional framework of the West was transferred to the East virtually overnight (e.g., Brezinski and Fritsch 1995). Hence, the mode of transition and privatization processes in East Germany did not evolve endogenously. Second, since both parts of Germany have a common history, and share the same post-reunification institutional framework, the western part of the country provides a counterfactual for the eastern regions. Therefore, it is possible to determine the effects of socialism and transition by comparing entrepreneurial development in East and West Germany.

Socialism's direct effect on entrepreneurship can be measured by comparing historical data reflecting regional levels of entrepreneurship in East and West Germany prior to separation with data for both parts of the country that are specific to the time when the country was reunified. Post-reunification data can be used to measure the transition effect and the indirect effect of a socialist legacy. Both cannot be disentangled, but in contrast to other post-socialist countries we can control for developments that are not a result of socialism and the transition process.

3. Empirical strategy

3.1 Data and measurement

For our empirical analysis, we use pre- and post-separation data on self-employment. The pre-separation data is based on population censuses that were conducted in the years 1925 and 1939, only a few months before World War II. The 1939 census contains the last available information on self-employment before the separation of Germany, and the initiation of a socialist regime in the eastern part of the country in 1945. Including the 1925 census in our analysis allows us to determine if there are any pre-separation trends in the development of self-employment in East and West Germany.

Post-separation data on self-employment is obtained from the Federal German Statistical Office (*Arbeitskreis Erwerbstätigenrechnung*), and is available for the years 1991 to 2015. This allows us to test long-run treatment effects of German separation and socialism. We also include information for the year 1989, just before reunification and transition. This allows us to estimate the direct impact of socialism on self-employment. Self-employment data for the GDR stems from GDR Statistical Offices (see Rudolph 1990, for details).[4]

Our main outcome variable of interest is self-employment rate (SER). We define the regional self-employment rate as the number of self-

[4] The employment data is not likely to have been manipulated as was the case with the official productivity statistics (Kawka 2007). Unfortunately, there is no data for regional self-employment in West Germany in the year 1989. Therefore, we extrapolate data from 1989 to 1991.

employed persons divided by the regional workforce. Our measure across all years completely excludes self-employment in agriculture because self-employment in this sector is rather specific (for details, see Fritsch and Wyrwich 2018).[5]

In order to work with consistent spatial units, it was necessary to overlay digitized maps of regions in 1925 and 1939 with a map including the boundaries of current regions using Geographical Information Systems software (ArcGIS). The historical regions are split into parts along the border lines of current regions and assigned to planning regions (*Raumordnungsregionen*). Planning regions represent functionally integrated spatial units that consist of at least one core city.[6,7]

3.2 Methodology

Our study measures the treatment effect on self-employment rates (SER) by using a Difference-in-Difference (DiD) approach with the following structure:

$$SER_{rt} = \alpha + \beta\, East_r + \gamma\, Year_r + \delta_{1925}(East * Year)_{r1925} + \sum_{t=1989}^{2015} \delta_t (East * Year)_{rt} + X_{rt} + \theta_r + \varepsilon_{rt},$$

where SER_{rt} is a self-employment rate in region r in year t. Year *t* refers either to the pre-separation period (1925 and 1939), or the last GDR year (1989), or the post-reunification period (1991 to 2015).

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[5] The definition of self-employment in the pre-separation censuses slightly deviates from the definition in post-separation years. We harmonize these deviations to the highest possible degree (see Table A1, for details).

[6] After WWI, a part of Germany, the *Saarland*, was administered by the League of Nations. As a result, we do not have any census statistics for the year 1925 for this region and have to exclude the planning region that corresponds to the state of Saarland. Moreover, the statistics for the time after unification do not allow us to distinguish between West and East parts in the formerly divided city of Berlin and therefore Berlin is also excluded from our sample. Since the cities of Hamburg and Bremen are defined as planning regions even though they are not functional economic units, we merged these cities with adjacent planning regions in order to avoid distortions. Thus, 91 planning regions are used for the analysis. Among the 91 planning regions, 20 regions were exposed to the socialist treatment, whereas the remaining 71 remained untreated.

[7] Planning regions are somewhat larger than what is usually defined as labor-market areas.

$East_r$ indicates a location in East Germany (dummy, yes = 1), $Year_r$ is a year dummy variable, δ_t is a vector of the estimated DiD coefficients of interest. When using the DiD approach, it is important to test an assumption that there was a common trend among treated and non-treated regions prior to the imposed treatment. To address this issue, we interact the East dummy with a 1925 year dummy. Formally, the term $\delta_{1925}(East * Year)_{r1925}$ of the equation tests whether there was a common pre-separation trend. X_{rt} is a vector of control variables and θ_r are time-invariant fixed effects for Federal States (*Bundesländer*) that are an important level of policy making in Germany. To account for heteroskedasticity and arbitrary correlation of the error terms ε_{ry} of the planning regions within one federal state and year, we cluster standard errors at the federal state-by-time levels.

Several general regional and labor market characteristics are included in the vector of control variables. These characteristics may determine regional self-employment rates that are rooted in industry structure, local knowledge, and agglomeration externalities (for an extensive literature review, see for example Sternberg 2009). Since entry conditions differ across industries, we include the local employment share in manufacturing.

Agglomeration economies and diseconomies may also affect entrepreneurial opportunities and self-employment rates. While diversity and availability of specialized inputs as well as access to larger markets may have a positive effect on entrepreneurship, fierce competition for scarce resources that imply relatively high input prices can have a negative impact. We include a measure for population density to capture such effects. The local knowledge base can also play an important role in entrepreneurial development (Acs et al. 2009). Since differences in local knowledge stocks tend to be highly persistent (Fritsch and Wyrwich 2018), we account for such effects and capture historical differences in the

regional knowledge stock by including the distance to a technical university (*Technische Hochschule*) that already existed in the year 1900.[8]

Technical universities in Germany began to emerge in the mid-19th century. In contrast to classical universities, they had a focus on natural sciences and engineering, and were much more oriented towards the commercial application of knowledge (Drucker 1998, 21). Previous research shows that this variable has a long-run effect on entrepreneurship. Technical universities founded before 1900 were located in the capital cities of the Federal States (for details see König 2006, and Manegold 1989), and there is no indication that they were strategically placed primarily in regions with high levels of self-employment (Fritsch and Wyrwich 2018).

3.3 The impact of socialism and transition on entrepreneurship in Germany: Three possible scenarios

There are three alternative outcomes for the values of the estimated DiD coefficient for the effect of socialism and the transition process on the levels of self-employment in East Germany. A *significantly negative value of the DiD coefficient* would mean that the introduction of the socialist regime and the transition process to market economy in East Germany four decades later had a negative effect on current levels of self-employment. Such a result would be in line with studies that show a lasting negative effect of socialist regimes on start-up intentions and pro-market attitudes in East Germany (Alesina and Fuchs-Schuendeln 2007; Bauernschuster et al. 2012). It would also imply that negative direct and indirect effects of socialism and transition on entrepreneurship overrule any positive impacts of the transition process on self-employment. If such a negative effect is persistent over the post-reunification period, this would indicate that the anti-entrepreneurial policies in place during the socialist

[8] The idea behind the distance measure is that knowledge spillovers are found to be highly localized and sticky (Anselin et al. 1997; Fritsch and Aamoucke 2017). Thus, the spillover effects of technical universities should decay with increasing geographic distance.

era disrupted the historical pre-shock trajectory of entrepreneurial development in East Germany.

A *non-significant DiD coefficient* would indicate that the negative impact of the socialist regime in East Germany and any positive effects of the subsequent shock transition to a market economy on entrepreneurship cancel each other out. It would also imply that East German regions returned to their historical regional development trajectories despite four decades of socialism and over two decades of transitional processes. Such a result would be in line with studies that show long-run persistence of population levels and economic structures after strategic bombing during WWII (e.g., Davis and Weinstein 2002; Brakman et al. 2004). These studies do not, however, explore the organization of economic activities as reflected in the development of new firms, small or large.

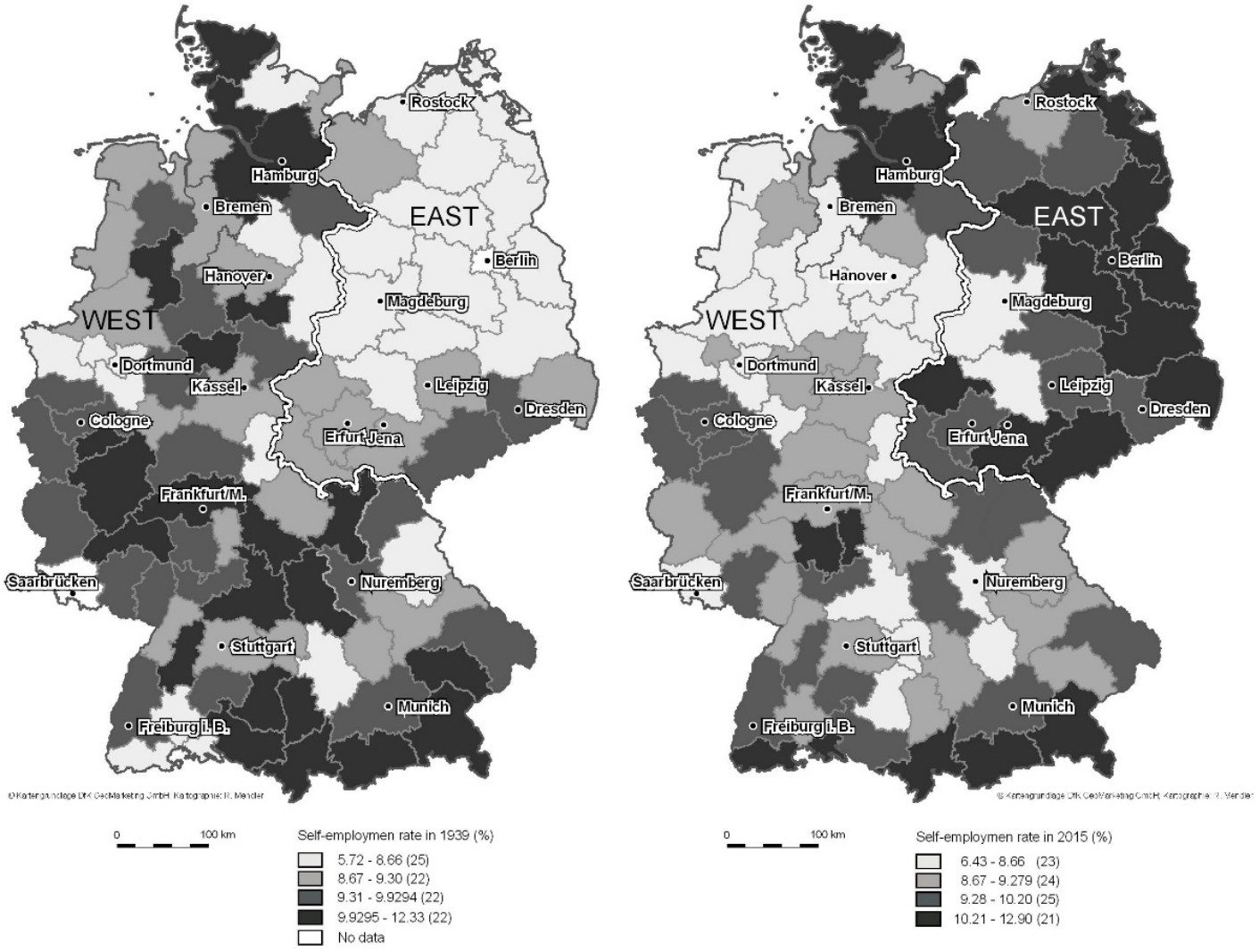
A *significantly positive DiD coefficient* would mean that the positive effects of the shock transition on entrepreneurship experienced in East Germany dominates the negative effects of four decades of socialist anti-entrepreneurship policies. If this effect is persistent, then there is evidence that the pre-WWII trajectory of entrepreneurial development in East Germany has been disrupted in a way that challenges the conclusions found in the literature on the socialist legacy in East Germany (Alesina and Fuchs-Schuendeln 2007; Bauernschuster et al. 2012). It would also mean that a shock transition of a few years has a stronger effect on entrepreneurship than four decades of socialism. Hence, a relatively sudden shock event could break a pre-shock development trajectory.

4. Results

4.1 Descriptive and historical insights

Figure 1 shows the regional self-employment rates in Germany before separation (1939) and in 2015.[9] In 1939, the planning regions around Jena (9.3%), Southern Saxony (9.4%) and Dresden (9.4%) (all located in the

[9] Descriptive statistics for all variables are presented in Tables A2 (for East Germany) and A3 (for West Germany) in the Appendix.



Notes: Berlin and Saarland are excluded from the sample in 1939.

Figure 1: Regional self-employment rates (in %) in Germany 1939 (left) and 2015 (right)

eastern 'industrialization belt') ranked highest in terms of self-employment in East Germany. However, their levels were below the leading West German regions: Rheinhessen-Nahe (11%), Northern Black Forest (11.8%) and Schleswig-Holstein South-West (12.3%). In 2015, most regions with high self-employment rates are located in those East German areas adjacent to Berlin, namely Oderland-Spree (11.7%) and Uckermark-Barnim (12.2%). The only West German planning region where the level of self-employment is in the same range is Oberland (located close to Munich), where the self-employment rate is even slightly higher (12.9%).

Figure A1 in the Appendix clearly shows that the distribution of regional self-employment rates in East and West Germany is

approximately in the same range for three out of four selected years (1925, 1939 and 2014). An obvious exception is1989, the final year of the GDR era where East German regions have the lowest self-employment rates. There was some notable variation regarding the levels of self-employment among East German regions in 1989: whereas all regions

Table 1: Mean comparison tests of self-employment rates in different years

	Mean (West)	Mean (East)	Difference	Standard error
Pre-separation period				
1925	0.1058	0.0985	0.0073**	0.0031
1939	0.0946	0.0830	0.0116***	0.0027
End of the GDR period				
1989	0.0786	0.0204	0.0582***	0.0023
Post-reunification period				
1991	0.0786	0.0468	0.0318***	0.0023
1992	0.0791	0.0607	0.0184***	0.0023
1993	0.0816	0.0679	0.0137***	0.0023
1994	0.0850	0.0722	0.0127***	0.0023
1995	0.0875	0.0727	0.0148***	0.0024
1996	0.0901	0.0740	0.0161***	0.0025
1997	0.0923	0.0775	0.0148***	0.0027
1998	0.0918	0.0799	0.0120***	0.0026
1999	0.0901	0.0820	0.0082***	0.0026
2000	0.0900	0.0873	0.0027	0.0025
2001	0.0906	0.0915	-0.0010	0.0025
2002	0.0918	0.0954	-0.0036	0.0024
2003	0.0945	0.0995	-0.0051**	0.0024
2004	0.0974	0.1044	-0.0070***	0.0025
2005	0.1010	0.1113	-0.0103***	0.0025
2006	0.1020	0.1129	-0.0109***	0.0025
2007	0.1013	0.1114	-0.0101***	0.0025
2008	0.0994	0.1097	-0.0103***	0.0026
2009	0.0987	0.1103	-0.0116***	0.0026
2010	0.0982	0.1099	-0.0117***	0.0026
2011	0.0987	0.1098	-0.0111***	0.0027
2012	0.0978	0.1081	-0.0103***	0.0027
2013	0.0959	0.1054	-0.0096***	0.0026
2014	0.0938	0.1042	-0.0105***	0.0025
2015	0.0917	0.1026	-0.0110***	0.0025

Notes: Berlin and Saarland are excluded from the sample. The number of observations is 91 in all cases. ** (significant at the 5 percent level); *** (significant at the 1 percent level).

with the smallest values (below 1.5%) were located in Mecklenburg-Western Pomerania, the highest rates of nearly 3% were found in South Saxony, where industrialization was thriving in the early 20th century (Scherf and Schmidt 1984; Wyrwich 2012). It should be noted that before WWII, regions with the highest self-employment rates were all located in West Germany, whereas in 2015 this applies to East German regions.

The overall level of self-employment in western German regions prior to WWII (1939) amounted to 9.5%, whereas it was around 8.3% in East Germany. The difference is somewhat similar for the year 1925. In 1989, the difference in self-employment rates between East and West Germany was about five times larger than in 1925 and 1939. During the 1990s, the gap between the two parts of Germany narrowed considerably and around the year 2000, the difference is no longer statistically significant. By the year 2003, the level of self-employment is significantly higher in East Germany (Table 1).

4.2 Baseline results

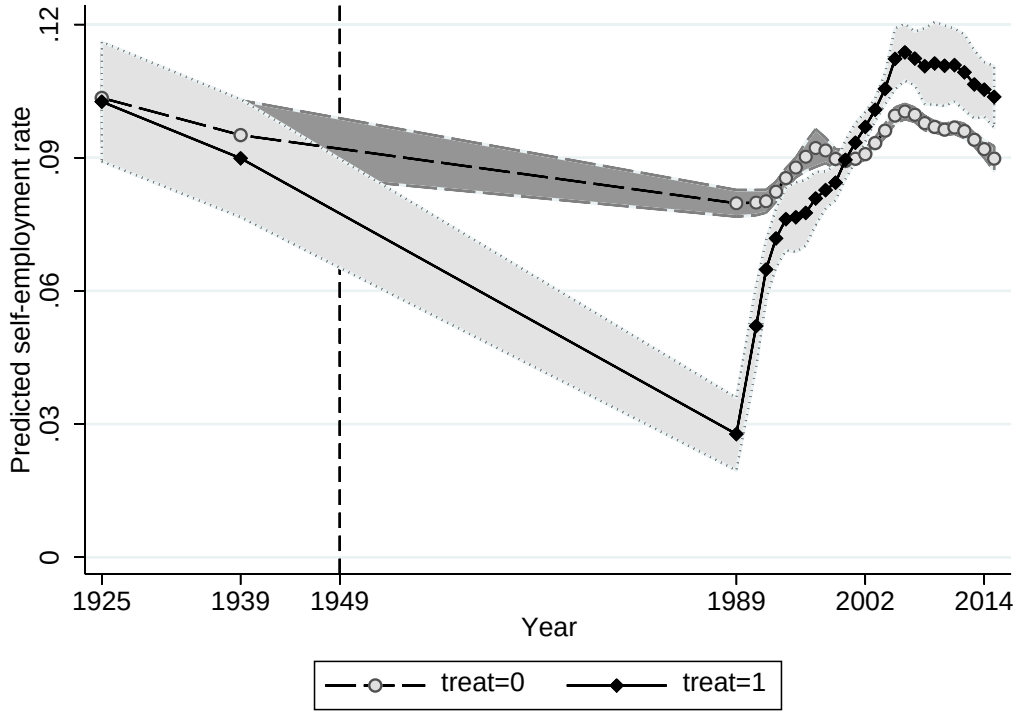
The estimated DiD coefficients of the baseline model with control variables are presented in Figure 2.[10] Figure 3 shows the predicted self-employment rate throughout the period under consideration for East and West Germany separately for the baseline model. The coefficients (Figure 2) show the treatment effects on the self-employment rate in percentage points. The resulting predicted outcomes (Figure 3) show the estimated self-employment rates after accounting for various controls. The reference year is 1939. All estimated models show insignificant coefficients for the interaction between the treatment dummy with the year 1925, which implies that the crucial assumption of parallel pre-treatment trends holds in our setting. In the following discussion, we focus on the results of Model II.

[10] The full baseline results are presented in Table A4 in the Appendix. Model I of Table A4 does not include the vector of year-specific control variables, while Model II does. Model II is also the basis for Figure 2. Moreover, in Model III we interact year dummies with regional conditions. The results of all three models are quite similar.

Notes: Figure shows coefficients for the full baseline model including all controls (Model II of Table A4). Grey dashed lines represent the 95% confidence interval.

Figure 2: Difference in Difference (DiD) coefficients

The DiD coefficient for the year 1989 indicates that the direct negative effect of socialism on the self-employment rate was about 4.8 percentage points. Hence, about 88% of the East-West disparity in that year (5.8% according to Table 1) can be attributed to the socialist treatment. The DiD coefficient for the first years after reunification suggest that the effect of the socialist treatment on the level of self-employment faded out relatively quickly. For the first available post-reunification year in 1991, the effect is only about 2 percentage points, and for 1993, the effect is no longer statistically significant. The insignificance of the treatment effect in later years of the 1990s (Figure 2) suggests that four decades of anti-entrepreneurial policies and the crowding out of private initiatives during the GDR regime did not leave any long-term traces on regional self-employment rates.



Note: The prediction is shown for the full baseline model including all controls (Model II of Table A4). Shaded areas around the lines represent the 95% confidence interval.

Figure 3: Predicted self-employment rate in each period for the control and treatment group

Around the year 2000, the treatment effect becomes significantly positive. The values of the DiD coefficients first increase and then remain stable after reaching a level of 1.8% in 2005. Figure 3 supports the above discussion and shows that immediately after reunification East German regions started to catch up with West German regions, and by the beginning of 2000s overtook them in terms of predicted self-employment levels. Hence, the historical pre-shock trajectory of entrepreneurial development in East Germany takes an unexpected turn in a positive direction. This result draws into question the claims made by some of the research dealing with the effects of a socialist legacy in East Germany (Alesina and Fuchs-Schuendeln 2007; Bauernschuster et al. 2012).

4.3 Further analyses: understanding the surprising positive treatment effect on self-employment

In further analyses, we try to understand the channels behind the surprising positive treatment effects since the year 2000. There are

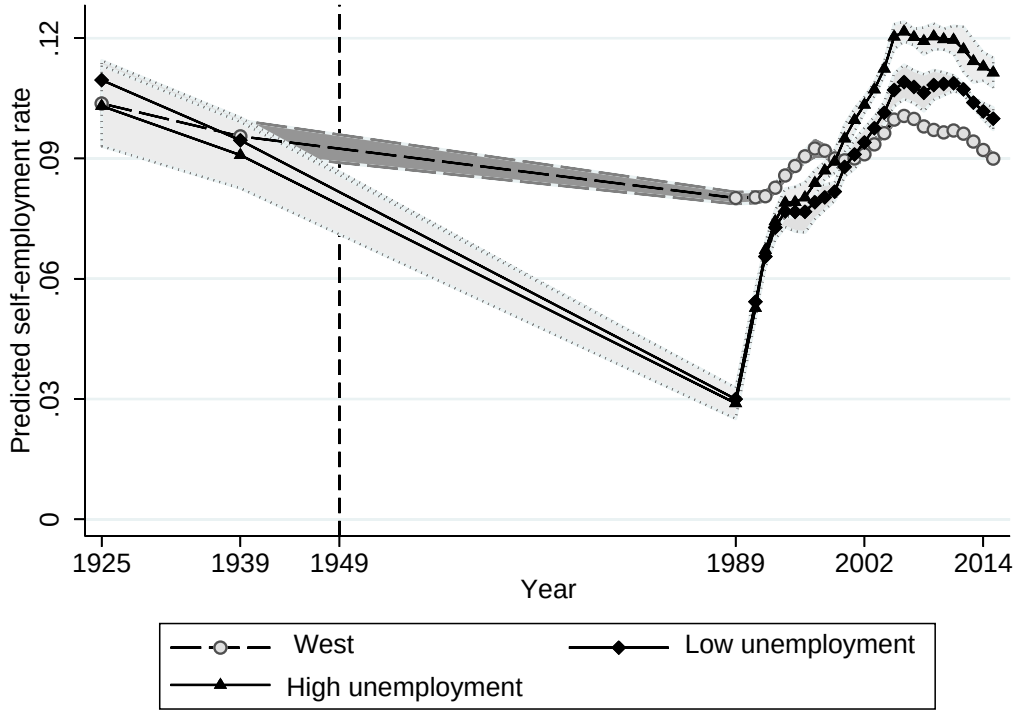
several possible explanations for our results. First, the shock transformation to a market economy created high levels of unemployment in East Germany. This reality, combined with the inferior development of the East German economy, could have forced large numbers of people to choose necessity self-employment as the work option. Second, it is possible that the positive effect seen in our results is driven by a few specific East German regions marked by a strong historical entrepreneurial tradition that survived the socialist period. As mentioned in Section 2.1, previous research shows that historically grown entrepreneurial culture plays an important role for the re-emergence of entrepreneurship after 1989 (e.g. Fritsch and Wyrwich 2014).

To assess the first explanation, we subdivide the sample of East German regions into three nearly equal parts at the 33rd and 66th percentile of the distribution based on the average level of unemployment between 1991 and 2000 (see Columns 1-3 of Table A5 in the Appendix).[11] For all of the regions, we find significant negative treatment effects that quickly diminish. For regions with high and moderate unemployment rates, the DiD coefficients turn into significant positive effects after 2000, and for regions with low unemployment the same results appear from the year 2005 on. For regions with the low unemployment rate, the positive value of the DiD coefficients increases up to 2010, with a slightly decrease thereafter. For the other regions, the value of the positive coefficients continues to rise through 2015, the end of the observation period. In regions with high unemployment rates, the positive treatment effects are more than twice as large as in regions with low unemployment. This result confirms our expectations regarding the necessity nature of self-employment in the post-transition period.

We also find that the predicted levels of self-employment in regions with the highest unemployment rates in the 1990s differ significantly compared to the level of regions with the lowest unemployment rates (Figure 4). Indeed, this result indicates that high levels of unemployment

[11] Data on unemployment are obtained from Federal Employment Services. The unemployment rate is calculated as a share of persons in a region who are unemployed over all employees in a region (in %).

have been a driver of self-employment in East Germany, and contribute to explaining why East German self-employment rates are higher than in the West.



Note: the prediction is shown for the full baseline model including all controls (Columns 1 and 3 of Table A5). Shaded areas around the lines represent the 95% confidence interval. The treated regions are grouped according to their unemployment levels in the 1990s. The results are shown for two groups, those regions with high unemployment rates (i.e., above the 66th percentile) and those with low unemployment (below the 33rd percentile). The curve for regions with moderate unemployment rates (Column 2 of Table A5) is omitted for brevity.

Figure 4: Predicted self-employment rate in each period for the control and treatment groups based on unemployment rates in the 1990s

To assess the second explanation, we subdivide the sample into three nearly equal parts based on the self-employment level in 1989. The self-employment rate in 1989 across East German regions is strongly correlated with a pre-socialist entrepreneurial tradition (Wyrwich 2012). The results from 1989 indicate a strong negative treatment across all regions. This negative treatment sharply decreases and vanishes shortly after reunification (see Table A5 in the Appendix), and we see positive DiD coefficients for the years after 2000. Although there are some significant differences in effect sizes between the three groups of regions, they are

much less pronounced and less robust when compared to our previous assessment, where we use unemployment rates in the 1990s rather than self-employment rates in 1989 to distinguish regions. (see Figure A2 in the Appendix).

Apparently, regional unemployment rates play a more important role in explaining the positive treatment effect than a historically grown entrepreneurial tradition. However, it may also be the case that there is an interplay between economic necessity and entrepreneurial tradition. For example, unemployed people in regions with a strong entrepreneurial tradition may be more likely to actively respond to their necessity by starting own ventures. Thus, we assess the interplay between self-employment in 1989 and the average unemployment rate over the observation period by considering four types of regions with high/low self-employment rates in 1989 and high/low post-reunification unemployment rates. Running the analysis for the four types of regions separately, we find that the negative DiD coefficient for the direct socialist treatment effect in 1989 is about the same size across all types of regions (see Table A6 in the Appendix). For all types of regions, the negative treatment effects begin to fade out around the years 1991 and 1992, and turn positive in the longer run.

There are, however, differences with respect to the year when this positive effect occurs as well as with respect to the size of the positive effect. In regions with relatively low unemployment rates, the positive treatment effect becomes statistically significant around the year 2005, while in regions with high unemployment the positive effect can be observed beginning in the year 2000. Furthermore, the effect size tends to be considerably larger in regions with high unemployment levels. This difference between regions with relatively high and low unemployment is more pronounced for those regions that had relatively high self-employment rates at the end of the socialist period. These results suggest that unemployment was a main driving force behind the growth of self-employment in East Germany after the year 2000. However, the ‘entrepreneurial’ response to unemployment was stronger in regions with a tradition or ‘culture’ of self-employment.

It is interesting that there are no clear regional differences with respect to treatment effects for the 1990s, the period when privatization policies became effective. Across all regions, the treatment effects are insignificant after 1992. One cautious interpretation of these results is that the emergence of many small and medium-sized enterprises due to privatization policies can explain why the negative socialist treatment on self-employment faded out relatively quickly everywhere. At the same time, regional differences in a historically based entrepreneurial tradition and self-employment out of necessity played less of a role in the 1990s, while the persistent negative economic development of most East German regions after reunification fostered a surge in necessity entrepreneurship in the 2000s.

Overall, our results suggest that although there is a significantly negative GDR effect on self-employment shortly after reunification, this pattern fades out relatively soon. Our explanation for this quick recovery is based on two key factors. First, privatization policies fostered the emergence of a significant number of small and medium-sized enterprises that created opportunities for entrepreneurial activity. Second, one of the effects of the shock transformation to a market economy in East Germany was high levels of unemployment that forced individuals into necessity self-employment. It should be noted that our detailed regional analyses reveal that regions with a pronounced entrepreneurial tradition have a stronger ‘entrepreneurial’ response to unemployment. Having said this, our results suggest that the persistently poor performance of the East German economy engendered a prevalence of necessity entrepreneurship. This factor can explain why the treatment effect becomes positive a decade after German reunification. Hence, the transition shock after 1990 left more of an imprint on self-employment rates across East German regions than the four decades of socialism.

5. Conclusions

We analyze whether and to which degree historical shocks affect development trajectories with respect to entrepreneurship. Our analysis exploits the case of Germany after WWII. While the western part of the

country developed towards a modern market-based economy, the eastern part followed a socialist ideology and adopted a massive anti-entrepreneurship policy. With the sudden reunification of both parts of the country, the formal institutions of West Germany were introduced in the eastern part of the country causing a shock transformation. Against this background, we analyze the treatment effects on self-employment across East German regions of both historical shocks; the introduction of the anti-entrepreneurial socialist regime and the shock transformation four decades later.

Previous research argues and shows that anti-entrepreneurial policies in the socialist regime negatively affected start-up intentions and pro-market attitudes in the East (Alesina and Fuchs-Schuendeln 2007; Bauernschuster et al. 2012). Based on these results one should expect a negative socialist treatment effect on self-employment after transition. However, we find such a negative treatment effect only for the very first post-reunification years, while there is a long-run positive treatment effect that becomes statistically significant about ten years after reunification, from the year 2000 onwards. This result suggests that the transition shock had a positive effect that overshadows the negative effects of four decades of anti-entrepreneurial socialist policies. Our analyses also reveal that the increase in self-employment after 1990 was more pronounced in regions with high unemployment rates, with more robust results for those regions that have a historical legacy of an entrepreneurial culture. High levels of unemployment were an inevitable component of the economic transition. Thus, our findings suggest that many East Germans engaged in necessity-based self-employment.

Our surprising evidence corroborates recent literature that critically reflects on research that explores the division and reunification of Germany to determine the effect of socialism. A main point of this critique is that many analyses do not appropriately consider pre-separation differences in East and West Germany (Becker et al. 2020). East-West differences with respect to factors like voting patterns, church membership, and female labor force participation existed before WWII. There is also some indication that the level of entrepreneurship was

already lower in the area of East Germany before WWII (Fritsch and Wyrwich 2014). It is also surprising that Heineck and Suessmuth (2013), as well as Bonin et al. (2009), find that East Germans have, on average, a higher willingness to assume risks, which hardly fits into the picture of a state-reliant individual with a wage worker mentality. These findings suggest that a proper assessment of the effect of socialism on entrepreneurship requires a closer inspection of the regional conditions that existed before the introduction of socialism. Obviously, regions follow different long-term development trajectories that should be accounted for in an empirical analysis, policy making, as well as in theoretical approaches that attempt to explain regional growth.

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Appendix

Table A1: Definition of variables

Variable	*Definition*
Self-employment rate 1925	Number of self-employed persons in non-agricultural private sector industries over all employees (excl. helping family members)
Self-employment rate 1939	Number of self-employed persons in non-agricultural private sector industries over all employees (excl. helping family members)
Self-employment rate 1989	Number of self-employed persons in non-agricultural private sector industries over all employees.
Self-employment rate 1991-2015	Number of self-employed persons in non-agricultural private sector industries over all employees
Population density	Population over distance in km^2
Distance to a technical university in 1900	Distance to a technical university (*Technische Hochschule*) that already existed in the year 1900 in km
Employment share in manufacturing	Number of employees in manufacturing industries over all employees
Notes: Self-employment rate after 1989 includes helping family members. However, their numbers are negligible and this category of the workforce does not play a significant role compared to economic structures from the period before WWII.	

Table A2: Descriptive statistics for East Germany

West	Mean	Minimum	Maximum	Standard Deviation	Number of observations
Self-employment rate 1925	0.1058	0.0575	0.1375	0.0135	70
Self-employment rate 1939	0.0946	0.0572	0.1233	0.0115	70
Self-employment rate 1989	0.0786	0.0591	0.1204	0.0102	70
Self-employment rate 1991-2015	0.0928	0.0591	0.1451	0.0121	1750
Population density 1925/1939	171.362	39.167	882.9114	169.209	161
Population density 1991-2015	295.574	71.021	1242.201	252.697	1750
Employment share in manufacturing 1925/1939	0.3494	0.1498	0.6632	0.113	161
Employment share in manufacturing 1991-2015	0.3026	0.139	0.5228	0.073	1750
Unemployment rate 1991-2015	0.0778	0.0241	0.1807	0.0279	1680
Distance to nearest technical university in 1900	95.3773	0	253.0052		1750

Table A3: Descriptive statistics for West Germany

East	Mean	Minimum	Maximum	Standard Deviation	Number of observations
Self-employment rate 1925	0.0985	0.0861	0.1103	0.0081	21
Self-employment rate 1939	0.083	0.0675	0.0941	0.0079	21
Self-employment rate 1989	0.0204	0.0116	0.0291	0.0047	21
Self-employment rate 1991-2015	0.0923	0.0389	0.1355	0.0208	525
Population density 1925/1939	165.764	42.428	882.9114	154.825	112
Population density 1991-2015	131.603	42.564	308.2873	68.9793	525
Employment share in manufacturing 1925/1939	0.3807	0.1741	0.6632	0.1129	112
Employment share in manufacturing 1991-2015	0.2808	0.1464	0.4897	0.0633	525
Unemployment rate 1991-2015	0.1622	0.0624	0.2581	0.0405	399
Distance to nearest technical university in 1900	102.586	0	186.3476	-	525

Table A4: Baseline results of the Difference in Difference analysis

	I	II	III
East X Year1925	0.004	0.004	0.001
	(0.70)	(0.64)	(0.14)
East X Year1989	-0.047***	-0.047***	-0.048***
	(-10.05)	(-9.06)	(-9.65)
East X Year1991	-0.020***	-0.023***	-0.022***
	(-4.14)	(-4.29)	(-4.48)
East X Year1992	-0.007	-0.010**	-0.010**
	(-1.49)	(-2.08)	(-2.06)
East X Year1993	-0.002	-0.005	-0.005
	(-0.45)	(-1.08)	(-1.04)
East X Year1994	-0.001	-0.004	-0.004
	(-0.23)	(-0.82)	(-0.76)
East X Year1995	-0.003	-0.006	-0.006
	(-0.66)	(-1.19)	(-1.22)
East X Year1996	-0.004	-0.007	-0.008
	(-0.95)	(-1.47)	(-1.58)
East X Year1997	-0.003	-0.006	-0.006
	(-0.67)	(-1.24)	(-1.31)
East X Year1998	-0.000	-0.004	-0.004
	(-0.07)	(-0.79)	(-0.82)
East X Year1999	0.003	-0.000	-0.000
	(0.81)	(-0.03)	(-0.07)
East X Year2000	0.009**	0.005	0.005
	(2.08)	(1.17)	(1.14)
East X Year2001	0.013**	0.009*	0.009*
	(2.98)	(1.92)	(1.85)
East X Year2002	0.015***	0.011**	0.011**
	(3.69)	(2.51)	(2.41)
East X Year2003	0.017***	0.013**	0.012**
	(4.08)	(2.84)	(2.69)
East X Year2004	0.019***	0.015**	0.014**
	(4.46)	(3.23)	(3.06)
East X Year2005	0.022***	0.018***	0.017***
	(4.86)	(3.71)	(3.49)
East X Year2006	0.023***	0.019***	0.018***
	(5.04)	(3.87)	(3.68)
East X Year2007	0.022***	0.018***	0.017***
	(4.93)	(3.76)	(3.62)
East X Year2008	0.022***	0.018***	0.017***
	(4.58)	(3.54)	(3.44)
East X Year2009	0.023***	0.020***	0.019***
	(4.71)	(3.72)	(3.66)
East X Year2010	0.023***	0.020***	0.019***
	(4.76)	(3.76)	(3.69)
East X Year2011	0.023***	0.019***	0.019***
	(4.79)	(3.79)	(3.71)
East X Year2012	0.022***	0.018***	0.018***
	(4.52)	(3.59)	(3.51)
East X Year2013	0.021***	0.018***	0.017***
	(4.50)	(3.53)	(3.51)
East X Year2014	0.022***	0.019***	0.018***
	(4.92)	(3.88)	(3.96)
East X Year2015	0.023***	0.019***	0.019***
	(4.87)	(3.88)	(4.04)
Manufacturing share		-0.032***	-0.026**
		(-5.87)	(-2.09)
Population density		-0.000***	-0.000
		(-7.79)	(-1.28)

Figure A4 *continued*

	I	II	III
Distance to a Technical University in 1900		-0.000***	-0.000
		(-5.33)	(-1.57)
Controls $Year_t$ X Post-Treatment $Year_t$	N	N	Y
Federal State FE	Y	Y	Y
Number of observations	2548	2548	2548
R-squared	0.74	0.75	0.76

Notes: Berlin and Saarland are excluded from the sample because only certain parts of Berlin came under socialist rule, and the data for this city cannot be subdivided into treated and non-treated areas. In the case of Saarland, the data for 1925 is not available. Robust standard errors are in parentheses. The clustering is on state-by-time level. The number of planning regions is 91. The number of federal states is 14. Constants are omitted for brevity. The East dummy cannot be interpreted because of multicollinearity with the federal state dummies. Year dummies and interactions between year dummies and regional characteristics are not shown for brevity. *** significant at the 1 percent level; ** significant at the 5 percent level; * significant at the 10 percent-level.

Table A5: Treatment according to the levels of the self-employment rate 1989 and the unemployment rate

	Low unemploy-ment rate	Moderate unemploy-ment rate	High unemploy-ment rate	Low self-employ-ment rate 89	Moderate self-employ-ment rate 89	High self-employ-ment rate 89
Treatment Year1925	0.007	0.002	0.004	0.006	0.005	0.002
	(1.15)	(0.34)	(0.45)	(1.08)	(0.51)	(0.24)
Treatment Year1989	-0.049***	-0.045***	-0.047***	-0.046***	-0.045***	-0.050***
	(-11.23)	(-8.44)	(-7.65)	(-10.42)	(-6.39)	(-7.89)
Treatment Year1991	-0.025***	-0.020***	-0.023***	-0.021***	-0.019**	-0.027***
	(-5.51)	(-3.45)	(-3.95)	(-4.55)	(-2.47)	(-4.80)
Treatment Year1992	-0.014**	-0.008	-0.009	-0.009**	-0.007	-0.015**
	(-3.24)	(-1.61)	(-1.54)	(-2.13)	(-1.00)	(-2.79)
Treatment Year1993	-0.009**	-0.004	-0.004	-0.004	-0.004	-0.009
	(-2.03)	(-0.80)	(-0.64)	(-1.00)	(-0.47)	(-1.65)
Treatment Year1994	-0.008*	-0.002	-0.002	-0.002	-0.003	-0.008
	(-1.71)	(-0.53)	(-0.35)	(-0.48)	(-0.33)	(-1.49)
Treatment Year1995	-0.010**	-0.004	-0.004	-0.004	-0.004	-0.011*
	(-2.10)	(-0.77)	(-0.72)	(-0.96)	(-0.49)	(-1.96)
Treatment Year1996	-0.013**	-0.004	-0.006	-0.004	-0.006	-0.013**
	(-2.48)	(-0.95)	(-0.92)	(-0.99)	(-0.72)	(-2.43)
Treatment Year1997	-0.012**	-0.003	-0.004	-0.003	-0.004	-0.011**
	(-2.52)	(-0.58)	(-0.66)	(-0.89)	(-0.58)	(-2.00)
Treatment Year1998	-0.011**	-0.001	-0.000	-0.002	-0.002	-0.007
	(-2.36)	(-0.18)	(-0.04)	(-0.62)	(-0.25)	(-1.37)
Treatment Year1999	-0.007*	0.002	0.004	0.000	0.002	-0.003
	(-1.72)	(0.62)	(0.67)	(0.06)	(0.36)	(-0.59)
Treatment Year2000	-0.001	0.006	0.010*	0.005	0.008	0.003
	(-0.15)	(1.59)	(1.70)	(1.27)	(1.30)	(0.56)
Treatment Year2001	0.002	0.010**	0.014**	0.009**	0.011*	0.006
	(0.44)	(2.50)	(2.47)	(2.52)	(1.83)	(1.01)
Treatment Year2002	0.004	0.012**	0.017**	0.013***	0.013**	0.008
	(0.87)	(3.29)	(3.03)	(3.68)	(2.11)	(1.43)
Treatment Year2003	0.005	0.014***	0.018**	0.014***	0.014**	0.010*
	(1.16)	(3.77)	(3.28)	(4.29)	(2.20)	(1.80)
Treatment Year2004	0.006	0.016***	0.021***	0.017***	0.015**	0.012**
	(1.42)	(4.37)	(3.70)	(5.01)	(2.38)	(2.17)
Treatment Year2005	0.008*	0.020***	0.025***	0.021***	0.018**	0.015**
	(1.79)	(4.90)	(4.36)	(5.84)	(2.68)	(2.56)
Treatment Year2006	0.009**	0.020***	0.026***	0.021***	0.018**	0.016**
	(1.99)	(4.85)	(4.52)	(6.01)	(2.74)	(2.73)
Treatment Year2007	0.009*	0.019***	0.025***	0.021***	0.018**	0.015**
	(1.92)	(4.62)	(4.45)	(5.83)	(2.69)	(2.60)
Treatment Year2008	0.009*	0.018***	0.026***	0.022***	0.018**	0.014**
	(1.94)	(3.75)	(4.43)	(5.17)	(2.57)	(2.45)
Treatment Year2009	0.012**	0.018**	0.028***	0.022***	0.020**	0.016**
	(2.68)	(3.06)	(4.80)	(4.54)	(2.72)	(2.89)
Treatment Year2010	0.013**	0.017**	0.028***	0.022***	0.020**	0.017**
	(3.01)	(2.86)	(4.88)	(4.29)	(2.74)	(3.09)
Treatment Year2011	0.013**	0.017**	0.027***	0.020***	0.020**	0.018**
	(3.08)	(3.06)	(4.62)	(4.36)	(2.83)	(3.27)
Treatment Year2012	0.012**	0.017**	0.026***	0.017***	0.020**	0.018***
	(2.97)	(3.18)	(3.95)	(3.84)	(2.90)	(3.37)
Treatment Year2013	0.011**	0.017***	0.025***	0.016***	0.019**	0.017**
	(2.65)	(3.39)	(3.86)	(3.90)	(2.85)	(3.16)
Treatment Year2014	0.011**	0.019***	0.025***	0.020***	0.019**	0.016**
	(2.55)	(4.04)	(4.31)	(5.06)	(2.94)	(2.90)

Figure A5 *continued*

	Low unemployment rate	Moderate unemployment rate	High unemployment rate	Low self-employment rate 89	Moderate self-employment rate 89	High self-employment rate 89
Treatment Year2015	0.011**	0.020***	0.026***	0.022***	0.020**	0.016**
	(2.51)	(4.15)	(4.37)	(5.28)	(2.96)	(2.76)
Number of observations	2548	2548	2548	2548	2548	2548
R-squared	0.77	0.77	0.77	0.76	0.76	0.76

Notes: Berlin and Saarland are excluded from the sample because only certain parts of Berlin came under socialist rule, and the data for this city cannot be subdivided into treated and non-treated areas. In the case of Saarland, the data for 1925 is not available. All models include the control variables like in Table A4 Model II. Robust standard errors are in parentheses. The clustering is on state-by-time level. The number of planning regions is 91. The number of federal states is 14. Constants are omitted for brevity. The East dummy cannot be interpreted because of multicollinearity with the federal state dummies. Year dummies and interactions between year dummies and regional characteristics are not shown for brevity. *** significant at the 1 percent level; ** significant at the 5 percent level; * significant at the 10 percent level.

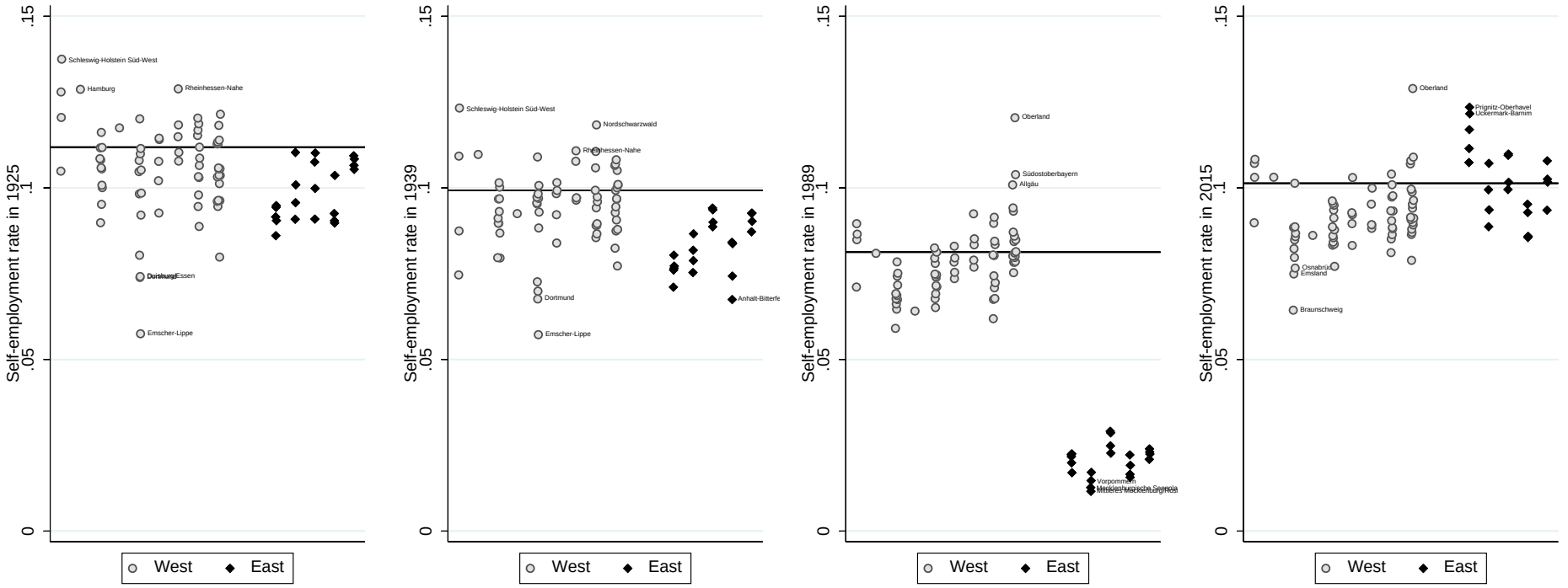
Table A6: Treatment according to the relationship of the self-employment rate 1989 (SER89) and the unemployment rate

	High SER89 - high unemployment	High SER89 - low unemployment	Low SER89 - high unemployment	Low SER89 – low unemployment
Treatment Year1925	-0.001	0.004	0.006	0.006
	(-0.17)	(0.62)	(0.75)	(0.83)
Treatment Year1989	-0.044***	-0.050***	-0.045***	-0.048***
	(-6.58)	(-8.29)	(-7.59)	(-9.19)
Treatment Year1991	-0.020**	-0.026***	-0.020**	-0.024***
	(-3.13)	(-4.46)	(-3.20)	(-4.84)
Treatment Year1992	-0.006	-0.014**	-0.008	-0.012**
	(-0.92)	(-2.50)	(-1.42)	(-2.61)
Treatment Year1993	0.000	-0.009	-0.004	-0.008*
	(0.06)	(-1.48)	(-0.69)	(-1.73)
Treatment Year1994	0.002	-0.008	-0.002	-0.007
	(0.25)	(-1.31)	(-0.40)	(-1.35)
Treatment Year1995	0.000	-0.011*	-0.004	-0.008
	(0.06)	(-1.72)	(-0.72)	(-1.54)
Treatment Year1996	-0.002	-0.013**	-0.004	-0.010*
	(-0.26)	(-2.09)	(-0.79)	(-1.82)
Treatment Year1997	0.002	-0.011*	-0.003	-0.010*
	(0.32)	(-1.91)	(-0.65)	(-1.90)
Treatment Year1998	0.005	-0.009	-0.002	-0.008
	(0.90)	(-1.48)	(-0.33)	(-1.56)
Treatment Year1999	0.011*	-0.005	0.001	-0.004
	(1.71)	(-0.94)	(0.26)	(-0.68)
Treatment Year2000	0.015**	0.002	0.006	0.002
	(2.42)	(0.29)	(1.29)	(0.43)
Treatment Year2001	0.019**	0.004	0.010**	0.006
	(2.93)	(0.71)	(2.24)	(1.21)
Treatment Year2002	0.021***	0.007	0.013**	0.008
	(3.43)	(1.13)	(3.04)	(1.44)
Treatment Year2003	0.023***	0.008	0.015***	0.009
	(3.76)	(1.38)	(3.49)	(1.60)
Treatment Year2004	0.025***	0.009*	0.017***	0.010
	(4.03)	(1.72)	(4.04)	(1.61)
Treatment Year2005	0.030***	0.011**	0.021***	0.013*
	(4.33)	(2.08)	(4.80)	(1.80)
Treatment Year2006	0.030***	0.012**	0.021***	0.014*
	(4.36)	(2.28)	(4.93)	(1.91)
Treatment Year2007	0.028***	0.011**	0.021***	0.015**
	(4.34)	(2.14)	(4.70)	(2.01)
Treatment Year2008	0.028***	0.011**	0.021***	0.016**
	(3.83)	(2.07)	(4.13)	(2.08)
Treatment Year2009	0.028***	0.013**	0.021***	0.019**
	(3.49)	(2.57)	(3.64)	(2.73)
Treatment Year2010	0.027***	0.014**	0.021***	0.019**
	(3.37)	(2.73)	(3.48)	(3.13)
Treatment Year2011	0.028***	0.015**	0.020***	0.019**
	(3.59)	(2.83)	(3.51)	(3.03)
Treatment Year2012	0.029***	0.015**	0.018**	0.018**
	(3.78)	(2.83)	(3.24)	(2.66)
Treatment Year2013	0.028***	0.014**	0.018***	0.016**
	(3.93)	(2.61)	(3.36)	(2.36)

Table A6 *continued*

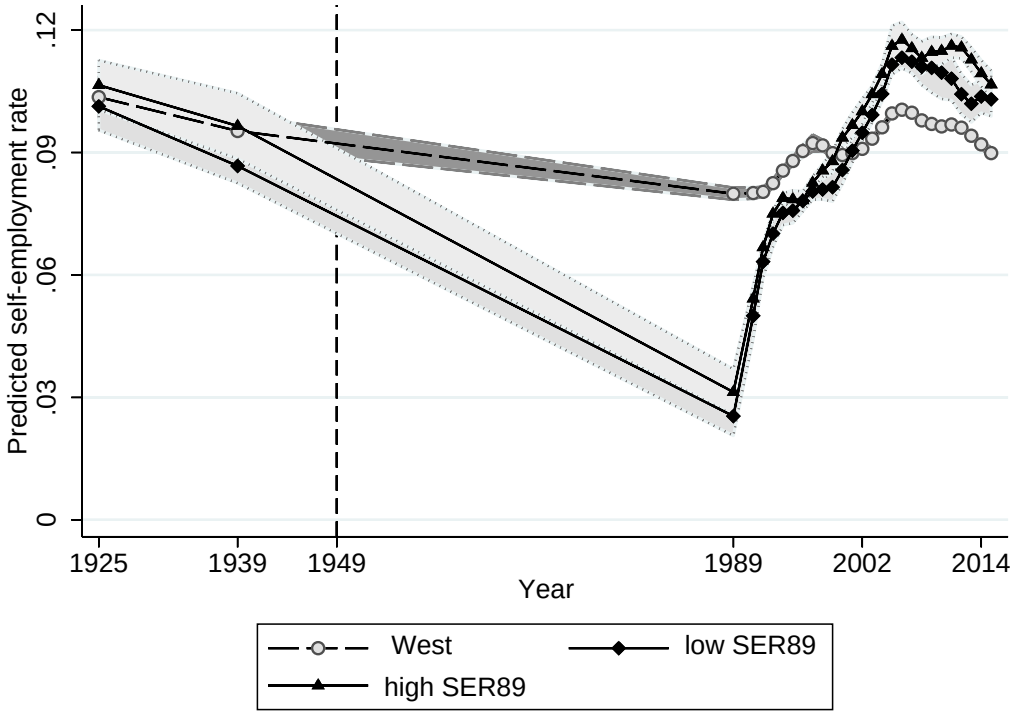
		High SER89 - low unemployment	Low SER89 - high unemployment	Low SER89 – low unemployment
Treatment Year2014	0.028***	0.013**	0.020***	0.017**
	(4.15)	(2.41)	(4.23)	(2.57)
Treatment Year2015	0.028***	0.012**	0.022***	0.018**
	(4.06)	(2.34)	(4.38)	(2.61)
Number of observations	2548	2548	2548	2548
R-squared	0.76	0.76	0.76	0.76

Notes: Berlin and Saarland are excluded from the sample because only certain parts of Berlin came under socialist rule, and the data for this city cannot be subdivided into treated and non-treated areas. In the case of Saarland, the data for 1925 is not available. All models include the control variables like in Table A4 Model II. Robust standard errors are in parentheses. The clustering is on state-by-time level. The number of planning regions is 91. The number of federal states is 14. Constants are omitted for brevity. The East dummy cannot be interpreted because of multicollinearity with the federal state dummies. Year dummies and interactions between year dummies and regional characteristics are not shown for brevity. *** significant at the 1 percent level; ** significant at the 5 percent level; * significant at the 10 percent level.



Notes: Regions with minimum and maximum values in both East and West Germany are labeled. The horizontal line marks the 75th percentile.

Figure A1: Self-employment rates in East and West Germany 1925, 1939, 1989 and 2014



Note: the prediction is shown for the full baseline model, including all controls (Columns 4 and 6 of Table A5). Shaded areas around the lines represent the 95% confidence interval. The treated regions are grouped according to their self-employment rates in 1989. The results are shown for two groups, those regions with high self-employment rates (i.e. above 66th percentile) and those with low self-employment (below the 33rd percentile). The results for regions with moderate unemployment rates (Column 5 of Table A5) is omitted for brevity.

Figure A2: Predicted self-employment rate in each period for the control and treatment groups according to self-employment in 1989

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