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## How long does it take to become an entrepreneurial society: The case of german convergence in self-employment

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# JENA ECONOMIC RESEARCH PAPERS



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## **How Long Does it Take to Become an Entrepreneurial Society – The Case of German Convergence in Self- Employment**

by

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# How Long Does it Take to Become an Entrepreneurial Society – The Case of German Convergence in Self-Employment

Yvonne Schindele\*

March 2010

## Abstract

Since the beginning of the transformation of East Germany from a socialist planned economy to a market economy, there has been an ambitious political goal of fostering entrepreneurial activity in that part of the country. One of the most-hoped for results of this undertaking is the anticipated contribution of small and new firms to solving the economic, social, and political problems of East Germany, thereby narrowing the gap between East and West Germany. This paper uses panel data from 1992 to 2005 on 97 German regions to analyze recent convergence in self-employment rates. An astonishing catching-up process is observed for East German regions during the period under study. However, the general convergence between East and West Germany observed during the first years after reunification has not been maintained. In short, some East German regions have achieved convergence with West German self-employment rates and some have not.

JEL-Classification: L26, M13, O1, O18, O47, R11

Keywords: Entrepreneurship, regional convergence, self-employment, regional development, transition, Germany

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*‘Part of interest in studying the transition economies is that they serve as test-bed for the strength of dormant entrepreneurial vigour that could be released after market liberalisation’ (Parker 2004, 12)*

## 1 Introduction

The German reunification initiated by the Fall of the Berlin Wall in 1989 initialized the transformation of East Germany from a socialist planned economy to a market economy. One of the fundamental prerequisites for establishing a market economy is to install a property rights structure, giving all persons the right to start their own business (Brezinski 1992), and, thus, enabling the development of a private business sector. In East Germany, this law was announced in March 1991 which can be seen as the potential starting-point of the bottom-up transformation – the change of economic structures due to the establishment of new enterprises (Brezinski & Fritsch 1996).<sup>1</sup> Viewing the former German Democratic Republic (GDR) as an outdated industrial economy in that its industrial structure in 1989 corresponded to that of West Germany at the end of the 1960s (Brezinski & Fritsch 1995), and its nearly complete lack of entrepreneurial activity, has led to an ambitious political goal of fostering entrepreneurial activity in that region of the country. One of the most-hoped for results of this undertaking is the anticipated contribution of small and new firms to solving the economic, social, and political problems of East Germany, thereby narrowing the gap between East and West Germany (Keren 1996; Reynolds 1996). Thus, numerous political programs have been embarked upon with the specific purpose of promoting entrepreneurship in Germany, often with a specific focus on East Germany.

During the last decade, a whole strand of literature evolved analyzing convergence between poor and rich countries or regions. Experience from several countries and regions such as the U.S. South in the century plus after the Civil War, or the economic development of southern Italy since World War II and the recent growth performance of Schleswig-Holstein, the poorest area of the former West Germany, suggests that convergence usually takes a long time. On average, the gap between poor and rich tends to disappear at the same rate of about two percent per year (“iron law of convergence”). This rather slow adjustment process means that the time it takes

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<sup>1</sup>The second alternative of such a transformation is the top-down which denotes the privatization of state-owned enterprises also leading to the change of economic structures due to the development of already existing firms (Brezinski & Fritsch 1996).

to eliminate even half of the initial gap is about 35 years (Barro 1997). Better lessons for Germany come from several studies focusing on convergence between East and West German regions with the common result that it will take about two (or a couple of) generations to eliminate the gap between the two German states.<sup>2</sup> Whereas most studies analyze convergence of welfare (e.g., per capita income (Funke & Strulik 2000), wages (Steiner & Wagner 1997), labor productivity (Barrell & te Velde 2000), the aim of this paper is to go one step back and analyze whether one of the fundamental prerequisites for establishing a market economy – the emergence and development of a private business sector, and thus, economic development – has been reached.

Within this context, this paper will shed some light on regional differences in self-employment rates in East and West Germany for the years 1992 to 2005. The analyses are performed separately for East and West Germany, which allows me to make a unique comparison between a mature market economy (West Germany) versus a former centrally planned economy (East Germany) in the same country with the same formal institutional framework. By following the economic convergence debate of the last decade (Barro et al. 1991; Levine & Renelt 1992; Armstrong 1995; Tondl 1999; Herz & Roeger 1995), this paper analyzes whether regional differences in entrepreneurial activity have converged over time and whether East Germany has been able to catch-up to the West German level of self-employment.

The paper is structured as follows. Section 2 reviews the literature and provides an overview of business ownership in Germany. Section 3 introduces the data. Convergence theories are explained in Section 4, along with an empirical examination of same. In Section 5, an in-depth overview of self-employment rates and their development over time in East and West Germany is conducted. Section 6 describes the cross-section and Section 7 the panel data analysis. Section 8 presents the results; Section 9 concludes.

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<sup>2</sup>Barro (1997) estimates the rate at which the gap in per capita GDP between East and West is being closed to be around 8 percent per year with 1991 as the starting point. But he also points out that this surprisingly fast rate of convergence must reflect in part the German government's subsidies to economic activity in East Germany (estimates with 1990 or 1994 as the starting point amount to about 2 percent per year).

## 2 The development of self-employment in East and West Germany

In the economic literature, self-employment is often used as a synonym for entrepreneurship even though, of course, entrepreneurship is only part of self-employment. According to Schumpeter (1934), entrepreneurs are owners (or controllers) of small, innovative, independent firms that creatively destroy existing market structures (Carree et al. 2002), whereas all business owners can be considered self-employed. However, self-employment is viewed as the most suitable, closest approximation to entrepreneurship (Parker 2004).

Most current research on variation in German entrepreneurial activity focuses on how start-up rates within West Germany, measured as the number of new businesses that have at least one employee subject to obligatory social insurance, differ over the size of workforce in particular regions and years.<sup>3</sup> Although Fritsch & Mueller (2006) find a slightly increasing start-up rate over time, they note that there is a high variation of start-up rates across regions. In general, start-up rates tend to be higher in the northern part of the country, in southern regions around Munich, and in Cologne. Furthermore, most of the start-ups (56 percent) were located in agglomerated areas, whereas only around 11 percent were in rural areas.

East Germany is a rather special case. Before 1972, there was a relatively strong, but declining, small business sector in East Germany; in fact, in 1949 the workforce contained an above-average share (about 30 percent) of entrepreneurs (Bannasch 1993; Thomas 1996). However, in 1972, thousands of semi-state and private enterprises and cooperatives were taken over by the government and became state-owned. From that point right up to the fall of the Berlin Wall in 1989, the country's economic development was subject to all the problems characteristic of a centralized "command economy", with the small business sector being perhaps the most negatively affected by this environment (Bannasch 1993). For example, in this socialist planned economy, private initiative was viewed as bourgeois and undesirable (Brezinski & Fritsch 1995) with one result being that the share of entrepreneurs in the workforce declined to 2.2 percent by 1989 (in West Germany, at the same time, this share was 11.2 percent) (Thomas 1996). Reprivatization began after 1989, and

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<sup>3</sup>Most of the literature dealing with entrepreneurial activity in Germany uses start-ups as a measure of entrepreneurship. However, since the start-up rate is, in reality, only a part of the entrepreneurial activity, the results cannot be relied on entirely.

the enormous demand for personal services, including such things as IT consulting and shoe or auto repair, resulted in the establishment of small and new firms (“pull factor”). By the end of 1990, there were 59,435 registered new start-ups, 60 percent in the service sector and tourism (Bannasch 1993). Another factor driving this burgeoning start-up rate was a dramatic decline in employment, which went from 9.8 million employed in 1989 to 6.2 million in 1993, leaving about 15 percent of the workforce unemployed<sup>4</sup>, some of whom out of necessity started their own businesses (“push factor”). Also playing an important role in the increasing start-up rate were policies specifically designed to encourage entrepreneurship (Blien & Hirschenauer 1994). The governments of East European states, as well as international organizations and institutions, regarded the establishment of the small business sector as a major part of the transition process (European Bank for Reconstruction and Development 1994) to a market economy. For example, Elmar Pieroth, economic advisor to the German government during this era, set a target of 500,000 new enterprises in East Germany in the near future with the specific goal of creating million of jobs in all sectors of the economy so that East Germany would match West Germany’s productivity level within five to eight years (Bannasch 1993). In short, the combination of these push and pull factors resulted in an enormous increase in the number of self-employed.

However, East Germany has not, in fact, caught up with West Germany and the big question is whether it ever will. Several authors have attempted to answer this question by investigating convergence of the East German economy, focusing particularly on labor productivity. Estimates vary from about 2060 (Barro et al. 1991) to somewhere between 2003 and 2010 (Burda & Funke 1995). Keeping in mind that entrepreneurship is one of the driving forces of economic development, in this paper, I focus on the convergence of self-employment rates between East

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<sup>4</sup>After German reunification, East German industries suddenly had to compete internationally. However, given their old capital stock, the new demand conditions, and the loss of traditional trade links, as well as revaluation effects due to the monetary unification in October 1990, their productivity level was not sufficient to compete internationally. To increase productivity, firms attempted to rid themselves of their less productive workers. Many firms retained only 10–30 percent of their former employees and newly created firms were not been able to absorb the dismissed workers, with the result of mass unemployment. Moreover, East German wage bargaining was conducted primarily by West German unions and employers with strong incentives to push East German wages up in order to reduce migration of East German workers and West German firms. The result was a dramatic increase in wages (35 percent in 1992, an additional 15 percent in 1993, and 5 percent in each of the next two years). Since productivity also increased during that time, the wage gap was not closed, and this led to a sharp fall in East German employment (Merkel & Snower 2008; Sinn 2002).

and West Germany. To my knowledge, there is very little research to date on the development, variation, and convergence of self-employment rates across German regions in general, and even less that focuses on convergence between East and West Germany specifically. Therefore, the paper continues with an in-depth look at business ownership in Germany and its development over time in East and West Germany.

### 3 Data and measurement

This study employs data from the official statistics of the Regional Bureaus of Statistics. This database contains information on the overall population in Germany (Common New Statistical Information System) and the labor force (Arbeitskreis “Erwerbstätigenrechnung des Bundes und der Länder”). The spatial framework of the analysis is the 97 German planning regions (Raumordnungsregionen), each of which consists of at least one core city and the surrounding area. The advantage of using planning regions instead of districts (Kreise) as spatial units of analysis is that they can be regarded as functional units in the sense of travel-to-work areas and they encompass economic interaction between districts. Planning regions are slightly larger than what is usually defined as a labor market area. Districts, on the other hand, are generally smaller than a labor market area and may consist of only a single core city or a part of the surrounding suburban area.<sup>5</sup>

To calculate the absolute number of self-employed persons, it is necessary to know the size of the labor force and the overall number of employees in a certain region and year. Several ways of calculating the self-employment rate can be found in the literature, all of which have in common that the number of self-employed must be divided by a certain population, be it the size of the labor force, the working-age population (ages 15-64), the entire population, or the sum of the labor force and the unemployed. Due to data restrictions, I calculate the self-employment rate by dividing the number of self-employed (i.e., difference between labor force and number of employees) by the entire population for the years 1992 - 2005.<sup>6</sup> For ease

<sup>5</sup>See Federal Office for Building and Regional Planning (2003) for the definition of planning regions and districts.

<sup>6</sup>Unfortunately, data on the working-age population and the number of unemployed are not available before 1996. To test whether the results might be different by using the working-age population instead of the entire population, I ran the regressions for the shorter time period. The results for both groups are very similar.



of comparability of my results with other work in this field, as well as due to certain difficulties having to do with measuring self-employment in the agricultural sector<sup>7</sup>, the following analyses of self-employment rates are conducted for all private-sector industries taken together, with the exclusion of agriculture, hunting, forestry, and fishing.

## 4 Convergence theories and empirical research

### 4.1 The concept of convergence

Convergence is broadly defined as an increasing similarity over time (Knill 2005; Holzinger 2006). In principle, convergence processes can be modeled either as quasi-automated trends or as caused by and conditioned on underlying factors. The Solow model of economic growth (Solow 1956; Mankiw et al. 1992) is as a good example of a quasi-automated convergence process, which occurs because rational investors invest in the most rewarding businesses. Accordingly, the return on investment is diminishing, with the consequence being that poor countries tend to grow faster and per capita income converges (Pluemper & Schneider 2007). Theorists have developed an analytical distinction between convergence processes: conditional versus unconditional convergence. Imagine a country comprised of regions having the same steady state self-employment rates that only differ in their initial level of self-employment rate. In this environment, one could expect that regions starting with a lower self-employment rate will grow faster during a transition period in terms of self-employment rates than regions that began with high self-employment rates until they have converged toward an equal self-employment rate. This kind of convergence is called *absolute convergence* (Barro et al. 1991; Barro & Sala-i Martin 1995). Next, imagine the same country, but this time the regions, due to various factors, have different steady states. This situation is called *conditional convergence* and is obviously better suited to the “real” world where regions are different in many respects, including economic structures, level of education in the labor force, and so forth.

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<sup>7</sup>Since the self-employment data are based on reported occupation, it is not possible to distinguish between individuals who are actually self-employed versus individuals who are unpaid family workers but report their occupation as “self-employed”, a situation considerably more prevalent in the agricultural sector than in any other. The unweighted average of unpaid family workers over 16 OECD countries is 19.6 percent in agriculture, 7.3 percent in the nonagricultural sector, and 11.6 percent overall (Blanchflower 2000).

Within the concept of conditional convergence, is a phenomenon known as *club convergence* (Galor 1996), which occurs when regions with a common set of determinant characteristics all converge toward one self-employment rate, whereas regions with a different set of characteristics converge toward a different self-employment rate (Ben-David 1994). Thus, low-level regions will stay members of the low-level club unless a substantial change in the factors determining the various steady states allows them to switch to another steady state.

## 4.2 Empirical convergence research

The two most common convergence tests are the variance ( $\sigma$ -convergence) approach and the regression ( $\beta$ -convergence) approach (Barro & Sala-i Martin 1990, 1992, 1995). The first computes the change in sample variance or standard deviation for each period. A declining variance implies convergence; an increasing variance points to divergence. Alternatively,  $\sigma$ -convergence can be measured by the coefficient of variation (CV), which divides the sample variance in a given period by the sample mean of this period.<sup>8</sup>

The  $\beta$ -convergence approach analyzes, for given steady states, whether the speed of convergence is higher or lower than the initial level under the examination. Whereas the regression approach *estimates* convergence, the variance approach *measures* convergence. However, the variance approach has difficulty detecting many convergence processes and, indeed, most conditional convergence processes. For example, the variance approach might find divergence, even though it is really two convergence clubs that exist.

## 5 Overview of self-employment rates in Germany

Figure 1 shows the diminishing differences in average self-employment rates for East and West Germany over time. The minimum values are 2.53 percent in East Germany and 3.71 percent in West Germany; the maximum values are 4.49 percent in East Germany and 4.68 percent in West Germany. A two-sample t-test confirms this result and, moreover, shows that the differences are statistically significant until 2004, but

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<sup>8</sup>The advantage of the CV is that it is unitless and thus CVs can be compared to each other in ways that other measures, such as standard deviations or root mean squared residuals, cannot.

fail to be so beginning in 2005.<sup>9</sup> Figure A.1 in the Appendix displays the annual growth rates of self-employment rates for East and West Germany. Except for 1996, East Germany has higher, but decreasing, growth rates of the self-employment rate for the period under observation.

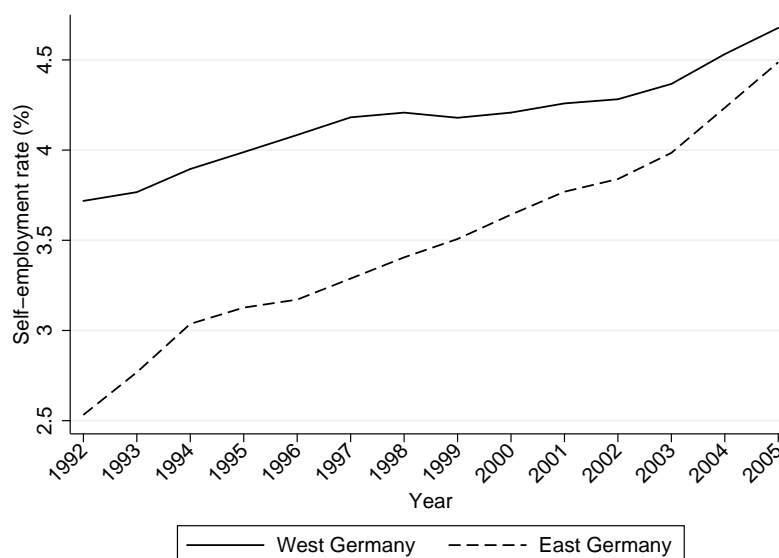


Figure 1: Development of self-employment rates over time

The large but diminishing gap between East and West Germany can be explained by the previously discussed push and pull factors (high demand for products and services, establishment of branches and subsidiaries, and policies supportive of entrepreneurship). More precisely, there has been a “window of opportunity” for entrepreneurship during the first years of transition, reflecting limited competition and many market opportunities due to the bounded availability of goods and services in the former GDR economy leading to a latent consumer demand. This resulted in a rapid increase of the self-employment rate during 1991 and 1995. From 1996 on, the growth rates of self-employment are settled down to a stable level, suggesting the closure of the “window of opportunity” due to increasing competition, the filling of market niches, and the general worsening of macroeconomic conditions.

To discover whether there are differences in the development of self-employment rates within East and West German regions, Figure ?? displays the regional distribution of self-employment rates in Germany. The figure reveals a remarkable

<sup>9</sup>Note that the self-employment rates are influenced by population changes (the population in East Germany decreased on average about 7 percent from 1992 to 2005).

variation in the magnitude of self-employment rates across regions. To see changes in the regional distribution over time, I divided the observation period into three subperiods, 1992-1996, 1997-2001, and 2002-2005. The regional distribution of self-employment rates is rather stable for West Germany during all three subperiods, but such is not the case for East Germany.

Figure 2 to 4 show that several East German regions show a stable increase, but that other East German regions, especially in the North, do not. Specifically, there are increasing self-employment rates in and around Berlin as well as in the southern regions of East Germany.<sup>10</sup> This implies a convergence trend between East and West Germany that is based on positive development in the southern part of East Germany and the regions around Berlin.

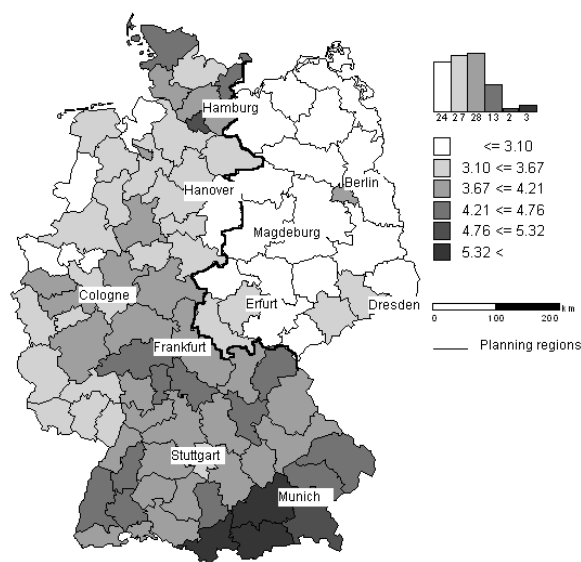


Figure 2: Regional distribution of the self-employment rates in Germany 1992-1996

<sup>10</sup>Since these regions had been the industrial core of Germany before World War II and the most important economic areas of the GDR (Scherf et al. 1984), it is assumed that path dependence plays an important role in this finding.

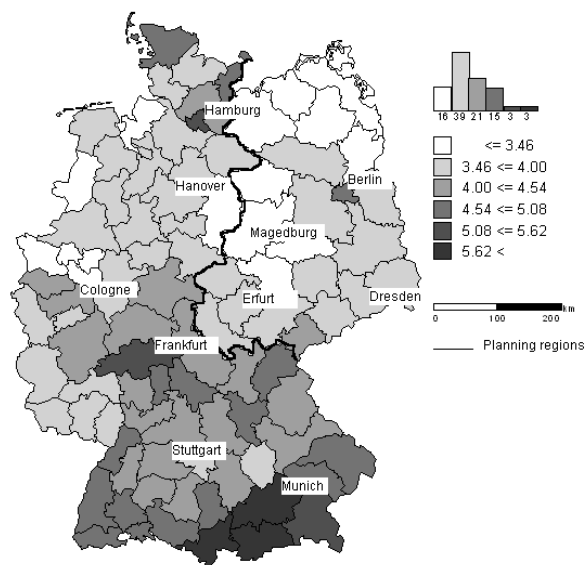


Figure 3: Regional distribution of the self-employment rates in Germany 1997-2001

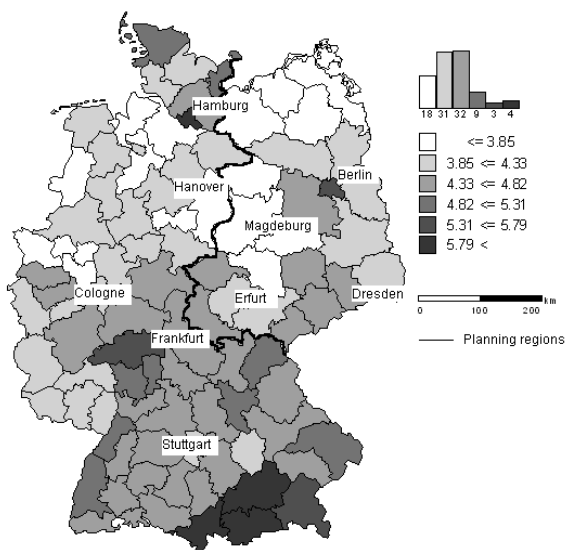


Figure 4: Regional distribution of the self-employment rates in Germany 2002-2005

## 6 Cross-section analysis

Figure 5 presents the development of the coefficient of variation (CV), which implies convergence for declining and divergence for increasing coefficients. Although the CV decreases for the whole of Germany over time, I find pronounced differences between the two German parts. In the early years, there is a strong decline in the CV within East Germany (“transition-convergence-regime”). Beginning in 1997, the standard deviations tend to increase until 2005. In other words, I find a slight divergence trend after 1997 that seems to be interrupted only by a shock in the year 2000.<sup>11</sup> For West Germany, Figure 5 shows only slight variance over the observational period and only after 1997 does there appear to be a weak convergence process.

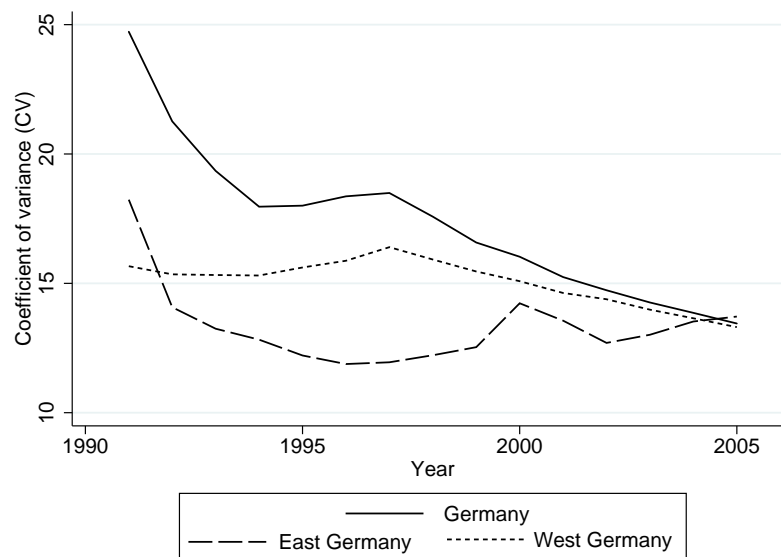


Figure 5: The development of the coefficient of variation over time ( $\sigma$ -convergence)

I next focus on  $\beta$ -convergence, and find that the initial level of self-employment and the relative average long-run growth of self-employment are negatively correlated, implying that regions with a lower initial level of self-employment have higher average growth rates than regions with higher initial levels. Figure 6 plots the relative average growth of the self-employment rate for the period 1992 to 2005 (growth of the self-employment rate in each region minus the national growth rate in self-employment) and the initial level of self-employment in 1992.

<sup>11</sup>As mentioned earlier, this divergence trend might be due to the existence of two convergence clubs (East and West Germany).

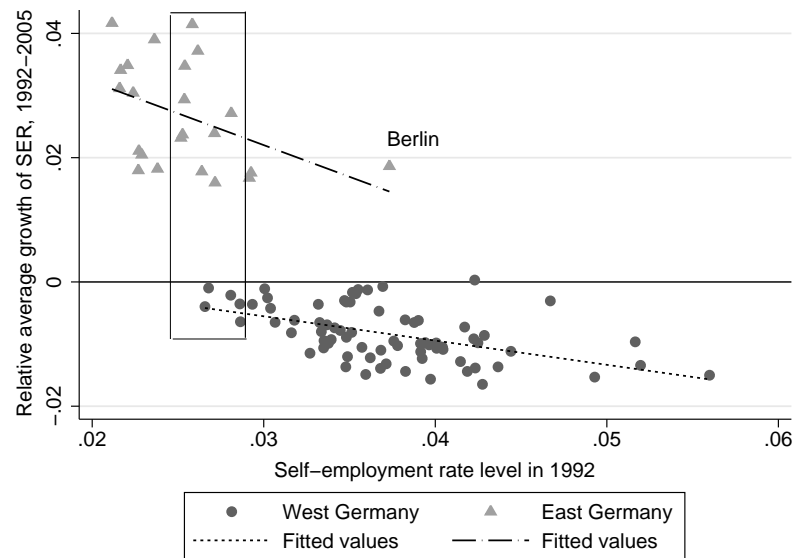


Figure 6: Regional level of self-employment in 1992 and its relative growth between 1992 and 2005

For both East and West Germany I find that a higher level of self-employment in 1992 relates to below-average long-run growth. Regions with low levels of self-employment in the base year show above-average growth rates. In addition, the  $\beta$ -convergence within East Germany is stronger than that in West Germany. Moreover, I find  $\beta$ -convergence between East and West Germany, since all West German values are below zero and all East German regions are above the reference line. Another finding of interest revealed by Figure 6 is that East and West German regions are clearly separated by their long-run growth. East German regions are situated in the top left part of the graph, implying relatively low levels of self-employment at the beginning of the observation period and growth rates superior to West German regions. Even though some East and West German regions have similar initial levels (marked with the rectangular box<sup>12</sup>), their growth rates are separated by about 7 percent in comparison to the average national growth. Also of interest is that there is a lower dispersion of initial self-employment levels and a higher variation in the growth rates in the East German regions than in the West German regions, meaning that, although there is an overall convergence process between East and

<sup>12</sup>Regions found in the rectangular box are Mittelthüringen, Südthüringen, Ostthüringen, Westsachsen, and Oberes Elbtal/Osterzgebirge in East Germany and Bremerhaven, Emsch-Lippe, Dortmund, and Braunschweig in West Germany.

West Germany, some East German regions are more similar to West German regions, while others appear evidence a club equilibrium.

As mentioned above, the convergence trend within East and West Germany appears to change over time. Therefore, I divided the analysis into two subperiods: 1992-1998 and 1999-2005. Figure 7 suggests that there is a rather strong convergence process in East Germany between the years 1992 and 1999 (“transition-convergence-regime”), whereas nothing of the sort can be seen for West Germany. Furthermore, while East German regions have very similar initial levels of self-employment, their growth rates vary widely, implying that only a few East German regions are catching up to West German regions. In the second subperiod (1999-2006), there is still convergence between East and West Germany, but I find some evidence for divergence within East German regions (“post-transition-convergence-regime”).

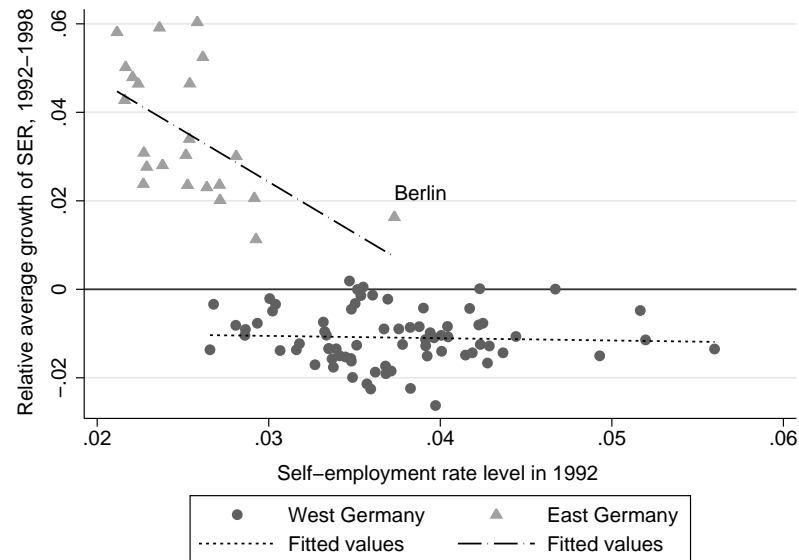


Figure 7: Regional level of self-employment in 1992 and its relative growth between 1992 and 1998

In addition, according to Figure 8, there is now more variation in the initial levels in East Germany and the growth rates are more equal. Within West Germany, a relatively stronger convergence process can be observed for the second subperiod (Figure 8) compared to the first subperiod (Figure 7). A closer look at the convergence patterns confirms that there are still differences between the two parts of the country. More specifically, some East German regions appear to have adjusted, or are adjusting, to West Germany levels of self-employment, whereas other East German regions look as though they are stuck in a club equilibrium.



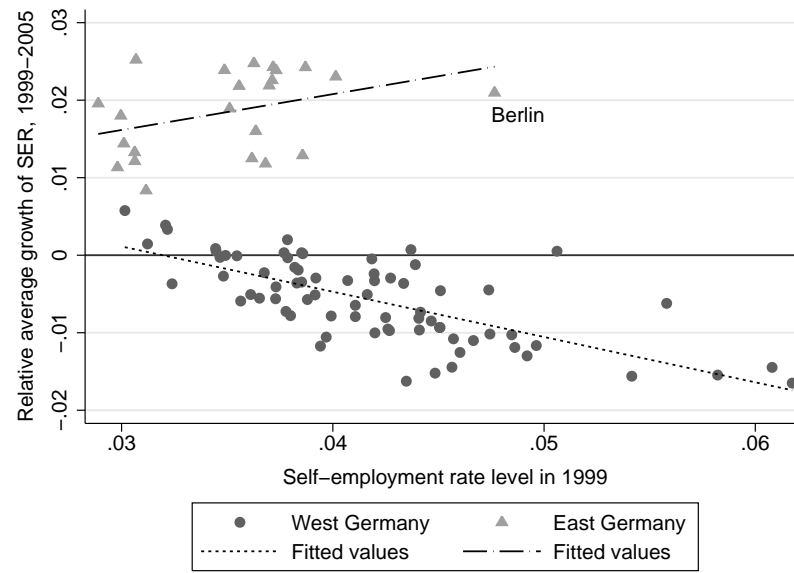


Figure 8: Regional level of self-employment in 1999 and its relative growth between 1999 and 2005

Figure 9 shows the regional distribution of the self-employment rates in 2005. Whereas the southern regions of East Germany around Erfurt (Thuringia) and Dresden (Saxony), as well as the regions around Berlin (Brandenburg) have caught-up to the West German level in self-employment, the regions in the north such as Saxony-Anhalt and Mecklenburg-Western Pomerania (except for some coastal regions characterized as tourism regions) still lay behind. Furthermore, one can distinguish between East German regions that still grow (albeit only with a very low rate of about 1 percent) and regions that desist in catching-up (marked with the black dots).

These results refer to the concept of different regional growth regimes which encompasses regions-specific factors such as specific knowledge stock that shapes innovative activity, regional industrial structures and the underlying technological regimes, and the density of economic activity (Audretsch & Fritsch 2002). Whereas West Germany already was a mature market economy in 1990, East Germany was marked by 40 years of central planning and quickly adopted the institutional framework of West Germany at this time. This resulted in the emergence of different persistent growth regimes in both parts of the country (Fritsch 2004). More specifically, by classifying East German regions into different types of regions with regard to industrial history and entrepreneurial tradition, Wyrwich (2009) confirms the revealed pattern of Figure 9 in the sense that agglomerated and moderated congested

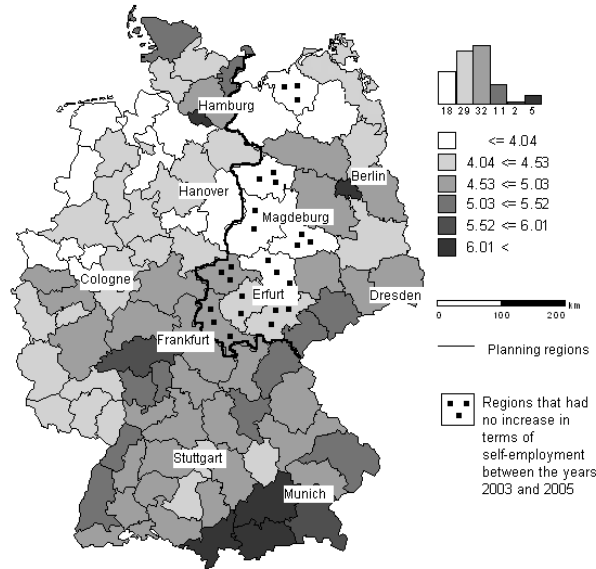


Figure 9: Regional distribution of self-employment rates in 2005

regions with a long industrial history and entrepreneurial tradition such as the regions around Dresden have higher growth rates in self-employment than the very rural areas in the north of East Germany.

To assess the significance of the results obtained from Figures 6 to 8, the following equation is estimated.

$$Av.\Delta SER_{i,1992/1999-1998/2005} - \overline{\Delta SER_{1992/1999}} = \alpha + \beta SER_{i,1992/1999} + \varepsilon_i \quad (1)$$

The dependent variable is the average growth in self-employment of region  $i$  minus the national growth of the self-employment rate for the subperiods 1992 to 1999 and 1998 to 2005, respectively, and the independent variable is the respective level of self-employment in 1992 and 1999. Cross-section estimations are performed for Germany as a whole, as well as for East and West Germany separately (Table 1). The cross-section analysis confirms the overall picture seen in Figures 6 to 8. Given a convergence rate of 5.34 percent during the whole observation period, it took about 13 years for the regions to eliminate even half the difference in self-employment rates.

Table 1: Cross-section analysis

	Germany		
	1992-2005	1992-1998	1999-2005
SER level (1992, 1999)	-0.0534*** (0.00454)	-0.0688*** (0.00762)	-0.0432*** (0.00454)
Constant	-0.157*** (0.0152)	-0.205*** (0.0256)	-0.118*** (0.0145)
Conv. rate	5.34%	6.88%	4.32%
“Half-life” t*	13 years	10 years	16 years
Observations	97	97	97
R-squared	0.655	0.553	0.373

	East Germany	West Germany	East Germany	West Germany	East Germany	West Germany
	1992-2005	1992-2005	1992-1998	1992-1998	1999-2005	1999-2005
SER level (1992, 1999)	-0.0245** (0.00928)	-0.0148*** (0.00239)	-0.0586*** (0.0136)	-0.00200 (0.00375)	0.0164** (0.00755)	-0.0254*** (0.00273)
Constant	-0.0420 (0.0338)	-0.0321*** (0.00800)	-0.155*** (0.0500)	0.0114 (0.0124)	0.0942*** (0.0252)	-0.0654*** (0.00885)
Conv. rate	2.45%	1.48%	5.86%	-	-	2.54%
“Half-life” t*	28 years	46 years	12 years			27 years
Observations	23	74	23	74	23	74
R-squared	0.181	0.268	0.336	0.003	0.153	0.512

Note: Robust standard errors in parentheses; \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

## 7 Panel data analysis

The cross-section approach presented above is subject to criticism on econometric grounds, so I now turn to panel data analysis. The disadvantage of a cross-section regression analysis is that it ignores unobservable factors that determine regional differences in the self-employment rate and result in different steady states of self-employment rates. Islam (1995) shows that cross-section analysis suffers an omitted variable bias leading to systematic bias of the convergence coefficient. Similar arguments can be found in Canova & Marcet (1995).

To test whether there is conditioned  $\beta$ -convergence in Germany, respectively allowing for different steady states and different convergence rates between East and West Germany, I estimate the following equation:

$$\ln(\text{ser}_{it}/\text{ser}_{i,t-1}) = \alpha_i + \rho \ln(\text{ser}_{i,t-1}) + x_{it} + z_{it} + \mu_t + \varepsilon_{it} \quad (2)$$

where  $\text{ser}_{it}$  is the self-employment rate in region  $i$  and period  $t$ ,  $\alpha_i$  is a regional fixed effect,  $\mu_t$  is a time-specific effect,  $z_{it}$  the control for the regional industry

structure<sup>13</sup> and  $x_{it}$  other control variables as the population density and GDP per capita. According to this equation, the annual growth rate of the self-employment rate  $\ln(\text{ser}_{it}/\text{ser}_{i,t-1})$  should be negatively related to the level of the self-employment  $\ln(\text{ser}_{i,t-1})$ . This equation is similar to the one used in cross-section analysis. Regions are expected to have a higher growth rate when their level of self-employment is low, but it should decline when self-employment rises. The common coefficient  $\rho$  represents this relation. A region-specific fixed effect that does not vary over time is captured by  $\alpha_i$ . Hence, the model operates with a region-specific intercept, instead of a common one for all regions as was done in the cross-section analysis. A Hausman test indicates that a fixed effects regression technique is appropriate. The term  $\mu_t$  serves as the time-specific effect affecting all regions in period  $t$  that captures global shocks, i.e., decline in economic activity, in order to solve the problem of nonstationarity of the regressors.

In the presence of lagged dependent variables and serially correlated errors, the estimators of the fixed effects regression might yield biased estimates (Nickell 1981). The most common estimator for dynamic panels with fixed effects is the GMM estimator by Arellano & Bond (1991). In a first step, the fixed effects are eliminated by using first differences. Then, an instrumental variable estimation of the differenced equation is performed. As instruments for the variables that are correlated with the differenced error term, all lagged levels of the respective variable are used. To check the consistency of the GMM estimator, a test for second-order serial correlation in the residuals of the differenced specification and the Sargan test of overidentifying restrictions were conducted. Since the lagged levels of the self-employment rate do not serve as a good instrument, these results have to be interpreted with caution and are displayed in Table A.1 in the Appendix. Furthermore, I conducted a fixed effects regression with first-order autoregressive (AR(1)) disturbances and a GLS regression in the presence of AR(1) autocorrelation and heteroskedasticity across panels. In addition, I controlled for spatial correlation applying a spatial lag model since I expect spatial dependencies between regional observations. Since all the results of the different estimation methods are almost the same and the spatial lag is not significant, the results seem to be quite robust and only the results of the fixed effects regression will be interpreted.

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<sup>13</sup>Since sector-specific information is not available, I am not able to estimate the model separately by sectors. Because I expect that the regional composition of industries has an effect on the self-employment rate, I included the employment shares of 14 out of 15 industry groups per region (e.g., chemicals and synthetic material, mechanical engineering, business- and household-related services, etc) and year (lagged by one year).

## 8 Regression results

With regard to the concept of conditional convergence, the focus is now on convergence to a region's own steady state. Thus, if a region is closer to its own steady state than to the average steady state, the convergence coefficient is higher than it was in the cross-section analysis.

Table 2 reports the fixed effects regression results for the convergence coefficients ( $\rho$ ) as well as the convergence rates and half-life  $t^*$ s, which can be calculated by  $t^* = \ln(2)/\rho$ . The results are given for Germany as a whole as well as for East and West Germany separately. Moreover, panel data estimates are reported for two subperiods, 1992 to 1998 and 1999 to 2005.

The convergence coefficients in Table 2 confirm the finding of conditional convergence of self-employment rates as all values are below zero. The convergence rate is 26.3 percent for Germany as a whole for the years 1992 to 2005 and is higher in the first years of transition (52.4 percent) than in the second half of the observation period (40.5 percent). Regarding conditional convergence within West Germany (29.5 percent for the whole observation period), I find that the convergence process is much stronger in the first half of the observation period, than in the second half (37.9 percent). The convergence rate of East Germany is 31 percent for the overall period and about 50 percent in both subperiods.

With respect to the fact that the fixed effects regression results might yield biased estimates, Table A.1 in the Appendix shows the GMM estimation results which confirm the outcome obtained from the fixed effects regression. There is conditional convergence across all German regions as well as across East and West German regions as all coefficients are below unity. In general, convergence is higher in the first subperiod and within East Germany.

Table 2: Fixed effects regression results

Dep. var:	1992-2005		1992-1998		1999-2005	
$\Delta$ self-empl. rate (ln)	East		West		East	
	Germany	East Germany	Germany	West Germany	Germany	East Germany
Self-empl. rate ( $t-1$ )(ln)	-0.263*** (-12.62)	-0.310*** (-5.279)	-0.295*** (-11.06)	-0.524*** (-11.84)	-0.544*** (-5.258)	-0.575*** (-7.027)
Convergence rate (%)	26.3	31.0	29.5	52.4	54.4	57.5
“Half-life” $t^*$ (years)	2.64	2.24	2.35	1.32	1.27	1.21
Population density (ln)	-0.147*** (-3.395)	0.0475 (0.534)	-0.131* (-1.767)	-0.295** (-2.278)	-0.114 (-0.539)	-0.396* (-1.765)
GDP per capita (ln)	-0.0402*** (-2.683)	-0.0310 (-1.001)	-0.00959 (-0.452)	-0.0176 (-0.678)	-0.0577** (-2.146)	-0.000136 (-0.00227)
Constant	-0.252 (-1.193)	-1.460** (-2.185)	-0.288 (-0.686)	-0.292 (-0.447)	-1.657 (-1.283)	0.367 (0.317)
Lagged industry structure (ln)	yes	yes	yes	yes	yes	yes
Year dummies	yes	yes	yes	yes	yes	yes
Observations	1344	308	1036	672	154	518
R-squared	0.57	0.76	0.49	0.67	0.85	0.46
Number of regions	96	22	74	96	22	74

Note: The dependent variable is  $\ln(\text{serv}_{it}/\text{serv}_t)$  as the average annual growth rate of self-employment rates. As independent variable the lagged level of self-employment rates  $\ln(\text{serv}_{it-1})$  are used. Estimation method is fixed effects regression including the jointly significant lagged regional industry structure and year dummies. The Berlin region is excluded because it is not possible to distinguish between East and West Germany in this region during the observation period. Robust t-statistics are reported in parentheses below the coefficients. Significance levels are indicated as: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .

As both the descriptive and regression results suggest, only some East German regions appear to have adjusted, or are adjusting, to West Germany levels of self-employment. In addition, there is a serious hint to path dependency since the regions which already caught-up to West Germany in terms of self-employment, such as Thuringia or Saxony, are those old-industrialized regions being also the most important areas of the former GDR with relatively high self-employment rates during these times. A random effects regression including the self-employment rate level in 1989 reveals a significant positive impact on the self-employment growth rate.<sup>14</sup>

## 9 Summary and conclusions

Regional convergence of self-employment rates has occurred, both across Germany as a whole and within East and West German regions. The speed of this convergence has declined over the past 14 years and, in fact, today's rate can hardly be called "speed" at all, it is rather slow. Shortly after reunification, East Germany, on average, performed a noteworthy feat of catching up and has now nearly reached the West German level of self-employment. However, a closer look at the convergence patterns reveals that there are two sides to the picture of East Germany's convergence with West Germany. On one side, regions in the south of East Germany and those regions around Berlin have converged to the national average. On the other side, however, there is evidence suggesting that even though regions in the north of East Germany experienced fast growth in self-employment during the first years after reunification, these regions have not been able to stabilize their growth rates at a level sufficient to match the national average. Using these findings to forecast the future (with full realization of what a doubtful game that is!), means that given an actual convergence rate of 3.54 percent in the year 2005, it will take about 20 years to eliminate half and about 40 years to eliminate three-quarters of the difference in self-employment rates between East and West Germany. But, and as Barro (1997) already mentioned, we do not know how much of this surprisingly fast convergence process at least in the first years of transition can be traced back to the immense government's subsidies to entrepreneurial activity in Germany which are still lasting.

How long does it take to become an entrepreneurial society? On average, East Germany nearly reached the West Germany level in self-employment and thus, a

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<sup>14</sup>Since the self-employment rate level in 1989 is a time-invariant variable, it cannot be included in the fixed effects model.

pronounced private business sector has emerged during the last 20 years of transition. But, a recent study of Hall & Ludwig (2006) analyzing convergence of per capita income in Germany term the actual development “Godot convergence” since the estimated time span for convergence is so distant in the future. This implies that even convergence in self-employment is nearly achieved and the prerequisites for a well functioning market economy are given, differences in welfare seem to persist.

One possible explanation for this might be distinctive differences in the quality of the start-ups in terms of their contribution to regional development. Reasons for differences in terms of quality are manifold. For example, the motivation to start a business is of particular importance for its survival and growth chances. Businesses controlled by “opportunity entrepreneurs” with the intention of profit maximization and expansion have higher survival and growth chances than those managed by “necessity entrepreneurs” which are only interested in securing their own job. Since many start-ups in East Germany are driven by the fear to be or to become unemployed, many start-ups in East Germany have lower chances to survive and particularly to grow and to create jobs, respectively. In addition, the lacking experience of East German founders in managing their own enterprise, or the lower chances to accumulate capital and to develop market connections lead to start-ups with only low survival and growth chances. Furthermore, by analyzing differences concerning the industry structure of East and West German start-ups, the number of start-ups in high-tech, knowledge or R&D intensive industries is significantly lower in East Germany. Since the quality and the success of new firms is more fundamental to a regional economy than merely the presence of a high number of new businesses, further research should shed light on the regional conditions that drive differences in new business success.

In a nutshell, the challenges that East German regions are confronting today result no more solely from their transition from a socialist planned economy to a market economy, but from new east-specific problems which emerged during the “shocking” German approach to transformation. Policies aimed at fostering entrepreneurial activity and, thus, enabling economic development in East Germany should take such regional east-specific problems into account.



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## Appendix

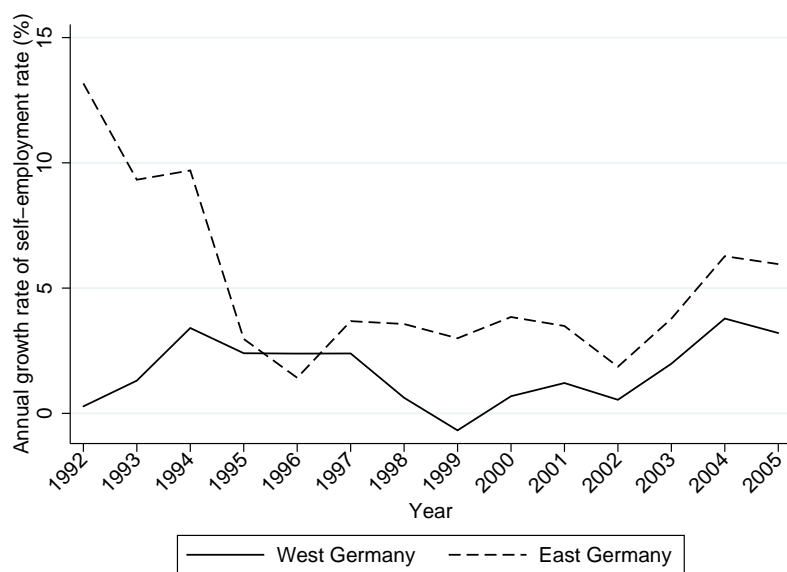


Figure A.1: Development of annual growth of self-employment rates over time

Table A.1: GMM effects regression results

Dep. var:	1992-2005			1992-1998			1999-2005		
$\Delta$ self-empl. rate (ln)	East Germany		West Germany	East Germany		West Germany	East Germany		West Germany
Self-employment rate (t-1) (ln)	0.722*** (15.47)	0.553*** (7.916)	0.479*** (7.480)	0.371*** (6.207)	0.395*** (3.602)	-0.190 (-1.214)	0.762*** (14.14)	0.525*** (10.78)	0.620*** (8.989)
Population density (ln)	-0.236** (-2.458)	0.142 (1.166)	-0.579*** (-2.887)	-0.396** (-2.380)	-0.111 (-0.401)	-1.001*** (-2.901)	-0.0326 (-0.336)	-0.240* (-1.914)	-0.189 (-1.282)
GDP per capita (ln)	-0.0573** (-2.103)	0.0559 (0.931)	0.0134 (0.225)	0.0231 (0.572)	-0.0729 (-1.228)	0.0616 (0.643)	0.247*** (5.976)	0.196*** (2.663)	0.250*** (5.807)
Constant	0.0738 (0.179)	-2.033*** (-2.753)	1.376 (1.230)	0.0467 (0.0555)	-1.945 (-1.211)	1.671 (1.014)	0.226 (0.378)	0.277 (0.367)	0.591 (0.672)
Lagged industry structure (ln)	yes	yes	yes	yes	yes	yes	yes	yes	yes
Year dummies	yes	yes	yes	yes	yes	yes	yes	yes	yes
Sargan test of overidentifying restrictions	427.067*** (0.000)	225.811*** (0.000)	286.73*** (0.000)	104.50*** (0.000)	54.153*** (0.000)	57.674*** (0.000)	324.037*** (0.000)	144.365*** (0.000)	326.616*** (0.000)
No second order correlation	-0.44 (0.662)	-1.873* (0.061)	-0.003 (0.998)	-3.125*** (0.002)	-1.290 (0.197)	-1.181 (0.238)	-2.232** (0.026)	-2.347** (0.019)	-0.851 (0.395)
Observations	1248	286	962	576	132	444	672	154	518
Number of ror	96	22	74	96	22	74	96	22	74
Number of regions	96	22	74	96	22	74	96	22	74

Note: The dependent variable is  $\ln(\text{ser}_{it})$  as the self-employment rate in period  $t$  of region  $i$ . As independent variable  $\ln(\text{ser}_{it,t-1})$  is used. Estimation method is GMM (one-step Arellano Bond dynamic panel estimation) including the lagged industry structure and year dummies. T-statistics are reported in parentheses below the coefficients. Significance levels are indicated as: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ .