Disparities, persistence and dynamics of regional unemployment rates in Germany

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Abstract

The paper shows that the distribution of regional unemployment rates in Germany exhibits strong persistent behaviour. Furthermore, panel unit root tests and autoregressive fixed effects models indicate that regional unemployment rates display conditional rather than unconditional convergence. Thus, highly persistent unemployment disparities can be regarded as r egion-specific unemployment rates due to different regional endowments, adjusting quite rapidly to their region-specific means and therefore towards a stable pattern of unemployment disparities, rather than towards the national unemployment rate.

Additionally, an investigation of adjustment processes suggests that the degree of persistence in western German unemployment rates after aggregate shocks has decreased markedly since the 1960s. For more recent years (1989-2004), neither aggregate nor region-specific shocks exhibit persistent behaviour. Therefore, slow-working adjustment mechanisms in response to shocks are not responsible for the persistent unemployment differentials.

A comparison of regions and districts shows that the two regional levels have quite similar adjustment paths. The estimated half-lives of both aggregate and region-specific shocks are found to be very robust within a range of 1-3 years.

Zusammenfassung

Das Papier zeigt, dass die Verteilung der regionalen Arbeitslosenquoten in Deutschland stark persistentes Verhalten aufweist. Außerdem zeigen panel unit root tests und autoregressive Modelle mit fixen Effekten, dass regionale Arbeitslosenquoten eher bedingter als unbedingter Konvergenz folgen. Daher können äußerst persistente Unterschiede in den regionalen Arbeitslosenquoten als regionsspezifische Arbeitslosenquoten aufgrund von unterschiedlichen Ausstattungsmerkmalen betrachtet werden, die sehr schnell zu ihrem regionsspezifischen Mittelwert zurückkehren und dadurch gegen ein stabiles Muster von Arbeitslosigkeitsdifferenzialen konvergieren nicht aber gegen die nationale Arbeitslosenquote.

Darüber hinaus zeigt die Untersuchung der Anpassungsprozesse, dass der Grad der Persistenz der Westdeutschen Arbeitslosenquoten nach Aggregatschocks seit 1960 deutlich gesunken ist. Für die Jahre 1989-2004 zeigen aber weder Aggregat- noch regionsspezifische Schocks persistentes Verhalten. Daher sind langsame Anpassungsprozesse nach dem Auftreten von Schocks nicht für persistente Unterschiede in den regionalen Arbeitslosenquoten verantwortlich.

Ein Vergleich von Bundesländern und Kreisen zeigt auch, dass die beiden regionalen Ebenen ein ähnliches Anpassungsverhalten aufweisen. Die geschätzten Halbwertszeiten sowohl von Aggregat- als auch von regionsspezifischen Schocks sind dabei sehr stabil und liegen in einer Spannbreite von 1 bis 3 Jahren.

JEL classification: C22, C23, O18, R11, R12

Keywords: unemployment disparities, regional adjustment, convergence, panel unit root

1 Introduction

Persistent high unemployment is one of the main problems faced by the German economy at present. Changes in the economic or political settings such as the oil price shocks at the beginning of the 1970s and 1980s or German reunification in 1989 led to a substantial rise in the national unemployment rate during the last decades. After each shock, the unemployment rate recovered slightly but did not return to its initial level. This observation suggests the existence of a slow-working adjustment mechanism. However, regions within the country are different in structure and should therefore react differently to common shocks such as a sharp rise in oil or steel prices. Furthermore, they may also react to specific shocks concerning certain regions or possibly one single region only, e.g. the establishment or closure of a major employer.

Decressin/Fatás (1995) find that aggregate shocks lead to the persistent effects known in European labour markets, but that they do not have permanent effects in the US. However, the regional unemployment rate is hardly affected after a region-specific shock in either Europe or the US. For Germany, research on adjustment is available for example in Decressin/Fatás (1995) and Möller (1995). Similar to their results for Europe, Decressin/Fatás (1995) find that a region-specific shock in Germany has settled completely after a few years. By contrast, Möller (1995) finds that after a shock the regional unemployment rate takes one to two decades to return to its initial value.

Since the datasets used by Decressin/Fatás (1995) and Möller (1995) only reach until the late 1980s / mid 1990s, their estimations do not capture major changes in the structural economic settings: a rapidly developing information technology sector and increasingly cheap transport (on the land as well as in the air, e.g. through low-budget airlines) have lowered transportation costs and increased the speed at which information, people and goods can be conveyed. These developments, together with the increasing openness of Eastern European and Asian countries, have led to an immense speed in the globalization of markets. It has become possible for firms to outsource large parts of their production to cheaper locations, first to Eastern Europe and later also to the Far East. The effects that these developments have had on the German labour market are hard to measure, but the labour market conditions in Germany changed substantially during the last decade. The number of regular jobs (jobs covered by social securi ty) decreased steadily and other forms of employment (part-time jobs, low and middle income jobs not covered by social security) started to flourish (see e.g. Dietz/Walwei 2006). The implications of these developments for the adjustment of national and regional labour markets and especially the unemployment rate are not clear and must therefore be re-investigated for more recent years. As both Decressin/Fatás (1995) and Möller (1995) report only adjustment dynamics after a region-specific shock in western German regions (regional

employment office areas [1]), this paper additionally provides results for regional adjustment dynamics after aggregate shocks in these regions.

Given persistent high unemployment at national level in 2004, unemployment rates vary substantially at district level (NUTS 3) in Germany. While some regions in southern Germany show unemployment rates of less than 5 % and are therefore close to full employment, at the same time other districts – mainly situated in eastern Germany – are in a deep crisis and exhibit rates of more than 25 %. The estimations are therefore also carried out at district level. There are good reasons why smaller regional units should behave differently than larger regions. Districts, for example, can hardly be seen as closed labour markets. The migration and commuting activities between neighboring districts are more intense than in larger regional units, where much of this takes place within the region. Thus, the adjustment after a (region-specific) shock should be reflected far more in interregional migration and commuting and less in the unemployment and the labour force participation rates.

The aim of this paper is to study the dynamics of regional unemployment rates at different regional levels. The main questions are: Do unemployment rates converge towards the national unemployment rate or instead towards a stable pattern of unemployment disparities, i.e. a spatial equilibrium distribution? Are unemployment rates persistent at district level in Germany? How strong is this persistence? Has the speed of adjustment in the aftermath of aggregate/region-specific shocks changed over time? Are the adjustment mechanisms at district level different to those observed for larger regional units? If so, are they slower or faster, weaker or stronger?

This paper provides detailed analyses for these questions. The main results show that the distribution of regional unemployment rates displays strong persistent behaviour. Both districts and larger regions in Germany converge towards their region-specific steady states and therefore towards a stable pattern of unemployment disparities rather than towards the national mean. The degree of persistence in the aftermath of aggregate shocks decreased markedly during the last decades. For more recent years (1989-2004) however, neither aggregate nor region-specific shocks lead to persistent behaviour. A comparison of the adjustment paths of different regional levels shows that districts react to shocks in a very similar way to larger regional units. Altogether, these results are a strong indication that the observed persistent distribution of regional unemployment rates can be interpreted as an equilibrium configuration.

Whenever possible, evidence from the US, Europe or Germany is given in order to compare our findings with the conclusions of other authors. When interpreting these

[1] Some of the regional employment office areas are identical to Federal States, some of them are larger. A detailed description follows in Section 3.

comparisons it has to be borne in mind that

- the district level is a smaller regional level (NUTS 3) than the usual disaggregation used for the US, Europe or other national studies (these are mainly the size of NUTS 2 regions)
- districts within Germany all have the same institutional settings, so research at this level is therefore comparable with nationwide research but not for example with European research.

Estimations are thus carried out for larger regional units as well as for districts in order to be able to compare the results directly with other studies.

The remainder of the paper is as follows: Section 2 gives a short summary of the relevant theoretical background. Section 3 briefly describes the dataset and the aims of the methods used in this paper. In Section 4, different approaches to measuring the relative unemployment rate are discussed. Section 5 gives a detailed picture of the disparities and persistence of unemployment rates at district level in Germany. Section 6 analyses the dynamics of regional unemployment rates for districts and regions and Section 7 concludes.

2 Theories of unemployment disparities

According to Frederiksson (1999) the comparatively stable pattern of regional unemployment disparities found in European countries may have different origins. First, these disparities constitute an equilibrium phenomenon. Second, both aggregate and region-specific shocks occur at such frequencies that disparities remain although regional adjustment mechanisms exist to equilibrate these disparities and third, different reactions to common and region-specific shocks in combination with slow-working adjustment mechanisms build and maintain regional disparities over long periods. Due to these explanations, two different points have to be investigated: first, the development of the distri bution of unemployment rates across regions and second, the adjustment of regions to shocks.

The first point deals with the question of whether the unemployment disparities at district level in Germany constitute an equilibrium configuration or whether unemployment disparities become smaller or larger. Theoretical explanations are available for all three cases: in a typically neoclassical approach, production factors such as capital or labour are mobile across regions and should equilibrate regional disparities[2]. The argument of factor mobility is generally valid between regions of different countries, but it is even more striking if disparities emerge within countries. As all regions within a country act under the same institutional settings, the unemployment distribution should converge towards the national mean.

[2] For a synopsis of the neoclassical model of regional growth, see e.g. McCombie (1988).

Regional models that lead to stable or increasing disparities of regional variables were developed after Romer (1986) and Lucas (1988) introduced the new growth theory. In these models, constant or even increasing returns to production factors lead to constant or increasing growth differentials and therefore to permanent or widening regional disparities. As models following the new growth theory assume full employment, they are only of limited relevance in explaining unemployment differentials.

A third type of model is able to account for convergence as well as divergence of regional disparities. Based on ideas that were already discussed in Marshall (1920) and Myrdal (1957), the seminal papers of Krugman (1991) and Krugman/Venables (1995) initiated the new economic geography: economic activities tend to concentrate in large agglomerations because of agglomeration advantages (internal and external returns to scale) and a positive home market effect (location decisions are made close to the place of demand). In the presence of transportation costs, this constellation produces centralizing forces and therefore leads to convergence. Only if the degree of economic integration is high and transportation costs are therefore low, are agglomeration advantages and the home market effect overcompensated by cheaper locations outside the agglomeration leading to a dispersion of economic activities and thus to divergence.

Interestingly, in the recent literature examples of divergent forces with respect to regional unemployment differentials can be found for neoclassical approaches as well as for models based on the new economic geography. Suedekum (2004) uses a neoclassical approach where skill-biased migration flows, i.e. a regional "brain drain", lead to an increasing divergence of regional unemployment. Epifani/Gancia (2005) on the other hand employ a new economic geography model to show that even in the presence of negligible migration costs, stable unemployment gaps between the core and the peripheral region result.

Following Frederiksson (1999) the other relevant question is whether shocks are only temporary or whether they lead to permanent effects in the unemployment rate. According to Elhorst (2003), the most extensive model to study regional adjustment is that developed by Blanchard/Katz (1992). In their model, a region responds to a labour demand shock through the adjustment of wages, the unemployment rate, the participation rate and interregional migration. The strength and speed of these adjustment processes are determined by the elasticities of labour demand.

This paper provides detailed analyses referring to the convergence/divergence of regions as well as to the adjustment processes after shocks, as the empirical part examines the development of the distribution of unemployment rates across regions and the adjustment of regions to shocks separately. Beforehand, the dataset and the empirical methods used in this paper are briefly introduced.

3 Regional data and methodological issues

The dataset of unemployment series used in this paper is provided by the German Federal Employment Agency (Bundesagentur für Arbeit). All of the series are on an annual basis. As already mentioned in the introduction, the paper pursues two aims: first, to be able to compare the development across different levels of aggregation and second, to make comparisons with estimations by other authors. Therefore, time series of different lengths for different regional levels are used. Due to the historical situation of Germany being divided until 1989, data for eastern and western Germany are not available to the same extent. At district level (439 districts), the western German unemployment rates from 1989-2004 and the eastern German rates from 1996-2004 are official figures from June of each year. The unemployment rates are calculated as the number of unemployed in relation to the dependent labour force[3]. Therefore, estimations and comparisons for unified Germany are only possible for the period 1996-2004. These data are used to describe the disparities and persistence of unemployment rates in Section 5. For the estimation of unemployment dynamics in Section 6, only western German unemployment rates are used because of their better time-series properties (longer series). For comparisons with results obtained by other authors, longer time series at a larger regional level are needed. Official figures from the Federal Employment Agency are available for western Germany only, to be more precise, for western German regional employment offices. Regional employment offices are closely related to the administrative level of Federal States. The regional employment office areas of Baden-Württemberg (BW), Bavaria (BV), Hesse (HE) and North Rhine-Westphalia (NRW) are identical to the corresponding Federal States. Each of the other 3 offices covers a larger and a smaller Federal State: Schleswig-Holstein/Hamburg (SHH), Rhineland-Palatinate/Saarland (RPS) and Lower Saxony/Bremen (LSB). For these seven units, which we refer to as "regions" in the following, the unemployment rates from 1966-2004 are used in Section 6 to make comparisons with estimations by other authors. Because of a structural break in the data due to a change in the definition of the unemployment rate in 1989[4], only complete periods before or after the structural break are used for the comparisons.

In the following three sections, different methodological approaches are applied to characterize the disparities, persist ence and dynamics of unemployment rates across German districts and regions. Here, a short overview is given to describe the

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[3] The dependent labour force includes employees s ubject to social security, marginal part-time employees, civil servants, the unemployed and expatriates.

[4] Before 1989, the dependent labour force was (under)estimated from the German "microcensus". For the years 1989-2000, the dependent labour force includes employees subject to social security, civil servants, t he unemployed, expatriates and estimates of marginal part-time employees from the microcens us. Since the year 2000, marginal part-time employees have been covered by social secu rity and have therefore been included in the official figures for the dependent labour force. In contrast to 1989, the inclusion of official figures for marginal part-time employees in 2000 does not lead to a structural break.

intention of the applied methods. Extended descriptions can be found in the relevant sections.

In Section 4, the cyclical sensitivity model according to Thirlwall (1966) and Brechling (1967) is estimated to measure how strongly the regional unemployment rate parallels the national unemployment rate. The estimated coefficients are used to derive relative unemployment rates. As one aim of the paper is to distinguish between aggregate and region-specific developments affecting the distribution and the adjustment processes of regional unemployment rates, all of the estimations are carried out for the absolute and the relative measures in Sections 5 and 6. Section 5 deals with the disparities and persistence of regional unemployment rates. As a basic principle and in contrast to Section 6, the disparities and persistence are analysed for districts only, as cross-section methods are applied and there are only seven units for regions. In Section 5.1, the disparities are illustrated simply and analysed using maps. Persistence is measured in Section 5.2 by means of a regression of regional unemployment rates at different points in time. The better the fit, the stronger the persistent behaviour, as unemploy ment rates do not tend to vary over time. The results in Section 6 are presented for regions as well as for districts. Section 6.1 seeks to answer the question whether the distribution of regional unemployment rates tends to converge towards a stable pattern of unemployment disparities or towards the national mean. This question is answered by estimating panel unit root tests and an autoregressive fixed-effects model to see if the regional or even the national mean act as an attractor for regional unemployment rates. Finally, in Section 6.2, impulse responses of unemployment rates to aggregate and region-specific shocks are calculated to illustrate and measure the strength and speed of the adjustment processes at work.

4 A measure of relative unemployment

If the matter of interest is the evolution of regional unemployment, it is necessary to fade out the variation due to the national component in order to observe the evolution of pure regional factors affecting the regional unemployment rate. A common method is to use the difference or the quotient between the regional and the national rates. But, as argued in Martin (1997), the conclusions that can be drawn from an investigation of regional unemployment disparities may seriously depend on the choice of these measures. While differences remain stable if the regional and the national rates change in the same absolute amount, ratios will converge or diverge. If, however, the regional and the national rates change in the same proportionate amount, ratios remain stable, but differences widen or narrow. Thus, if the objective is to investigate the evolution of regional disparities in the absence of aggregate movements, the choice of the measure determines the underlying hypothesis. In fact, in using differences to address this question, one assumes constant differences, if ratios are used, one assumes constant ratios between the regional and the national unemployment rates. This is important, because it makes a considerable

difference if the equilibrium outcome for a region is x percentage points above or below the national value or x times the national value.

In this section, the measure of relative unemployment is discussed as this is crucial for the construction of region-specific variables. Blanchard/Katz (1992) and Decressin/Fatás (1995) use region-specific variables in their analyses. However, they employ different measures. This section therefore investigates different approaches for obtaining region-specific variables – especially ways to deal with national information hidden in the data. An important issue in this context is how strongly regional unemployment rates are driven by the vari ation in the national unemployment rate. Here, this question is addressed according to the cyclical sensitivity model introduced by Thirlwall (1966) and Brechling (1967).

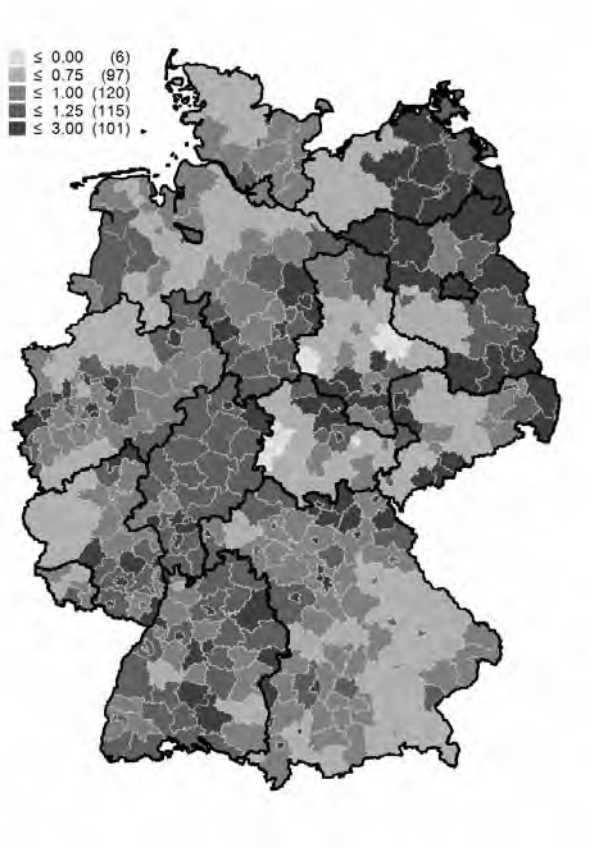
The central idea behind the cyclical sensitivity model is that the regions within a country are driven by national as well as regional factors. The extent to which national factors are of importance for t he regional development can easily be measured using a region-specific time-series regression of the following type:

$$U_{it} = a_i + b_i U_t + e_{it}\,, \qquad (1)$$

where U_{it} and U_t are the regional and the national unemployment rates, respectively. Thus the parameter b_i measures how the unemployment rate in region i is affected by variations in the national unemployment rate. There are numerous reasons why b_i should vary across regions. If, for example, a nationwide, world-wide, or Europe-wide shock (such as rising oil or steel prices) affects regions differently because of differences in their sectoral structure, this might be reflected in different coefficients. Thus, the national unemployment rate captures factors which are common to all regions and the coefficient measures how a region parallels the nationwide development.

Equation (1) was run for each district separately. Thus, there are 16 observations for western German districts and 9 observations for eastern German districts. Because of the sharp differences between the unemployment rates of the eastern and the western parts of Germany, the cyclical s ensitivity parameters are estimated for each district using the eastern/western German unemployment rate respectively. The spatial distribution of the cyclical sensitivity parameter of each district can be seen in Figure 1:

Figure 1
Spatial distribution of the cyclical sensitivity parameter



The map confirms the regional differences in the cyclical sensitivity. The range of the coefficients extends from -0.46 in Wernigerode (Saxonia-Anhalt, eastern Germany) to 2.59 in Uecker-Randow (Mecklenburg-Western Pomerania, eastern Germany) signifying that there are districts showing acyclical behaviour as well as districts with strong procyclical development. [5] In 223 districts the cyclical sensitivity is smaller than one, in about 40% of these cases (89) it is significantly lower. Of the districts with a sensitivity greater than one (216), 65 (about 30%) show a significant procyclical development. Some districts in western Germany (e.g. in southern Bavaria, western Rhineland-Palatinate, northern North Rhine-Westphalia, Lower Saxony or Schleswig-Holstein) and a large number of the districts situated in the western part of eastern Germany (on the former inner-German border) have developed quite independently of the western/eastern German unemployment rate. This indicates that there may be different reasons for the independence from the aggregate trend. While southern Bavarian districts possibly benefit from their stable economic development, the eastern German districts on the former inner-German border clearly benefit from the good labour market conditions of their western German neighbours. On the other hand, urbanised areas as autonomous municipal authorities ('kreisfreie

[5] The estimations were also carried out for western German regional employment office areas for the period 1989-2004. As regional employment office areas are large, homogenous regions the cyclical sensitivity coefficients are much less widely dispersed than those of districts and vary only within a range from 0.89 in Schleswig-Holstein/Hamburg to 1.19 in Hesse.

Städte') or districts in the Ruhr Area and western German districts situated close to eastern German districts have developed strongly procyclically. As urbanised areas constitute a large part of the economy, this result is in line with expectations, because it means that they are highly relevant for the development of both employment and unemployment. For the western German districts on the former inner-German border, the highly procyclical development reflects the additional influence of the neighbouring high-unemployment regions in eastern Germany.

The estimations above show that the cyclical sensitivity to the "national" unemployment rate varies greatly across districts and is often significantly different from unity. Nevertheless, the estimated constant for each region is often significantly different from zero, too. In the estimations the constant was significantly different from zero in 191 cases (in 115 districts significantly negative, in 76 significantly positive). The conclusion has to be that the national economic situation is important for explaining different regional economic developments but that there are regional conditions which can not be disregarded. In this sense, the decision between differences and ratios as relative regional variables characterizes a decision between two extremes: if all regions paralleled the national unemployment rate perfectly, the coefficient b_i in equation (1) should be equal to unity for all regions and the estimates should vary only in the constants. If the estimated constants were instead close or equal to zero, the regional unemployment rate could be expressed perfectly as a multiple of the national unemployment rate. Thus, if there were stable differences instead of stable ratios, the estimations should vary mainly in the constants, not in the parameter values for b_i. Obviously neither of the extremes are confirmed by the data. Therefore, the construction of region-specific variables in this paper follows Decressin/Fatás (1995). They are obtained by calculating the difference between the regional and beta times the national unemployment rate (beta-differences):

$$u_{it} = U_{it} - \hat{b}_i U_t \qquad (2)$$

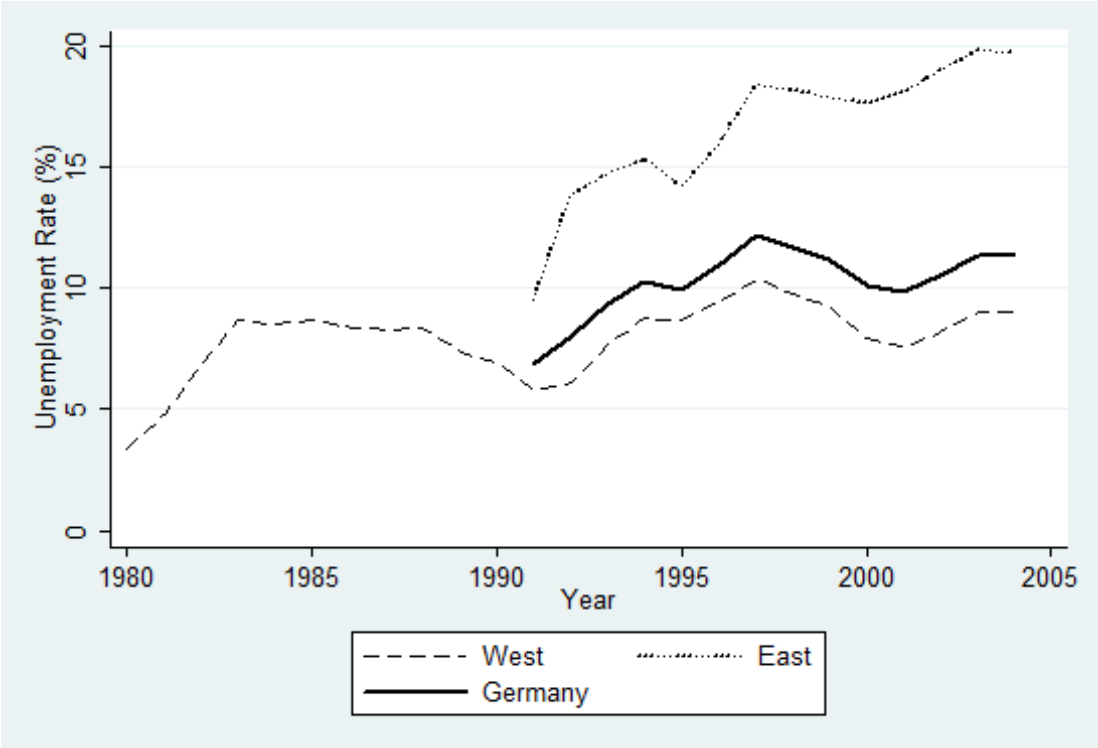
This concept can be interpreted as a mixture of the two extremes because the regional unemployment rate is only corrected for the part of the variation which is due to changes in the national rate. The remaining relative unemployment rate, u_{it}, can be regarded as a region-specific share of the unemployment rate. Therefore, we use beta differences to construct relative unemployment rates in the rest of the paper.

5 Disparities and persistence of unemployment rates

In this section, the disparities and persistence of unemployment rates across the 439 German districts are discussed. The aim of this section is to show that enormous disparities and strong persistence of district unemployment rates in Germany can be found for both absolute and relative unemployment rates.

The development of the unemployment rate in Germany and in the eastern and the western parts of the country can be seen in Figure 2:

Figure 2
Development of the German unemployment rate 1980-2004

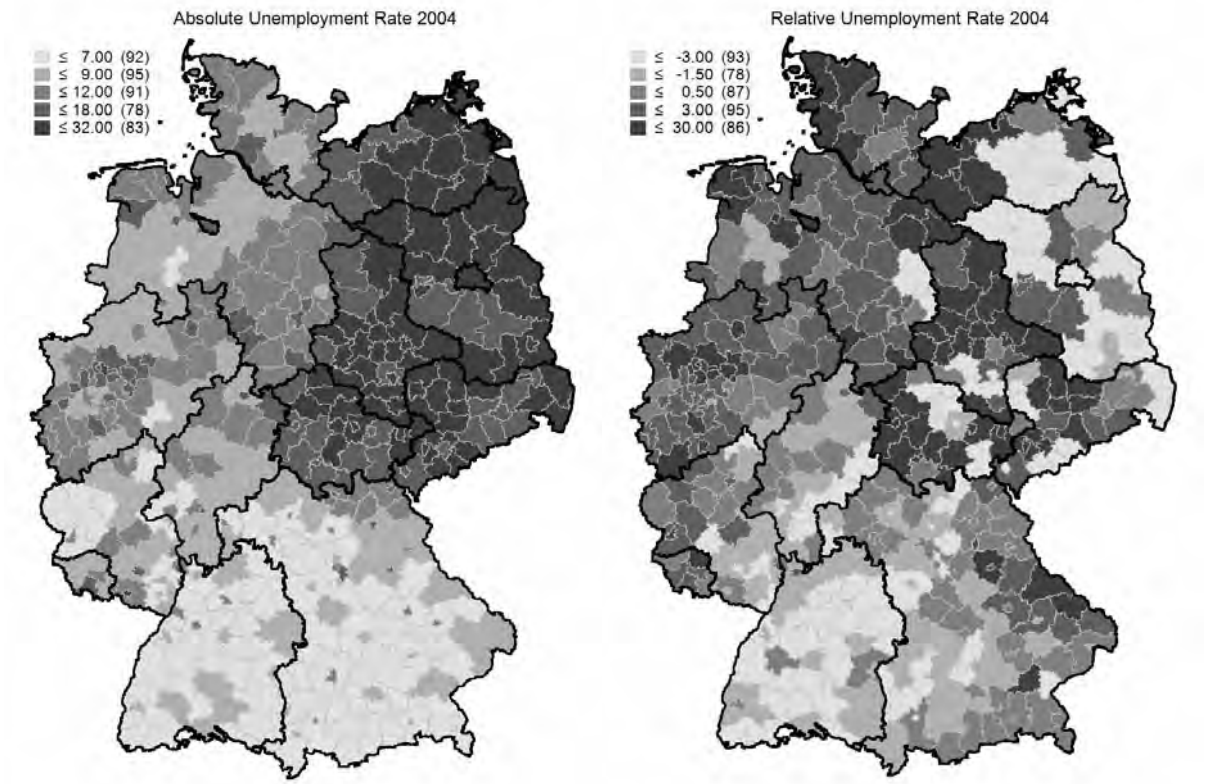


As already mentioned in the introduction, the (western) German unemployment rate has dramatically risen during the last decades. The second oil price shock at the beginning of the 1980s led to a sharp rise from 3.4 percent in 1980 to 8.7 percent in 1983. In the following years the situation on the labour market improved slowly and the unemployment rate reached a minimum of 6.8 percent in 1991. The 1990s were then affected by German reunification in 1989 and the German unemployment rate reached its peak in 1997 at 12.2 percent. The rate fell again to a level of 9.9 percent in 2001 during the "New Economic Boom" and has been rising since then. Apparently the unemployment rate recovered after each recession but did not reach its initial level again. This is even more striking for the eastern than for the western part of the country: the unemployment rate in eastern Germany has grown about twice as high as that in western Germany since the late 1990s. Figure 2 also suggests that the gap between the high-unemploym ent eastern and the low-unemployment western part of Germany is growing instead of showing the expected decline.

5.1 Disparities

To shed light on these disparities, a detailed disaggregated analysis of district unemployment rates in 2004 is provided in this section. In 2004, the unemployment rate in Germany as a whole amounted to 11.7 percent, but in the districts, it ranged from 3.7 percent in Eichstätt (Bavaria) to 31.9 percent in Uecker-Randow (Mecklenburg-Western Pomerania). The unemployment rate for all German districts in 2004 for the absolute and the relative measures can be seen in Figure 3.

Figure 3
Unemployment rates across German districts 2004



High (absolute) unemployment rates can be found primarily in the eastern part of Germany, the former German Democratic Republic (GDR). Here, the average unemployment rate in 2004 amounted to 20.1 percent, with a minimum of 12.2 percent in Sonneberg (Thuringia, on the border to Bavaria) and the maximum in Uecker-Randow (Mecklenburg-Western Pomerania) at 31.8 percent. Medium rates prevail in the northern and central western German Federal States including Schleswig-Holstein, Lower Saxony, North Rhine-Westphalia, Hesse, Rhineland-Palatinate and Saarland. Very low rates can be observed in the southern parts of Germany, i.e. Bavaria and Baden-Württemberg. The minimum unemployment rate amounts to 3.7 percent and is found in Eichstätt (Bavaria). Besides these patterns, city districts display noticeably higher unemployment rates than non-city districts, indicating that the centres of employment are also the centres of unemployment.

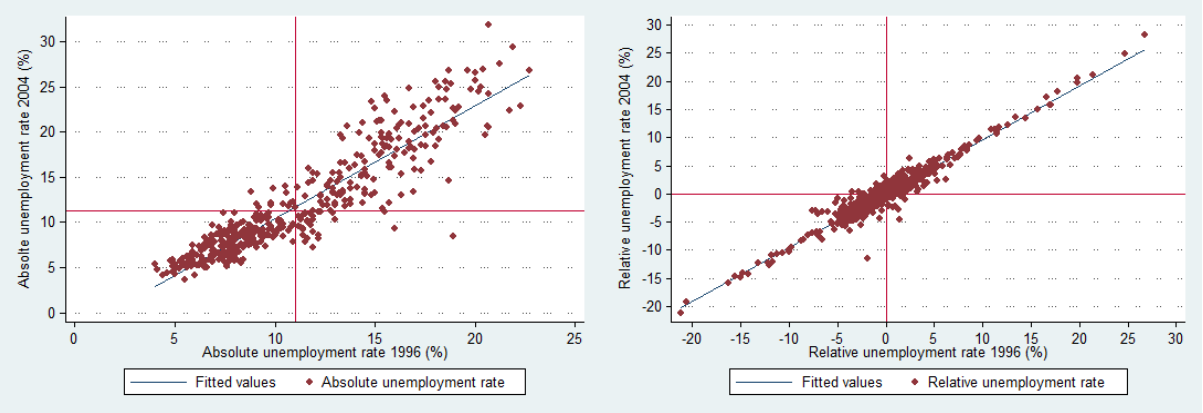
Relative unemployment rates also show a great variation between 18.7 percentage points in western Germany and 49.3 percentage points in the eastern part of the country. In western Germany the relative unemployment rates vary from -11.4 percent in the city district of Wolfsburg (Low er Saxony) to 7.2 percent in Essen (North Rhine-Westphalia). The minimum in eastern Germany amounts to -21.1 percent in Neubrandenburg (Mecklenburg-Western Pomerania) and the maximum is 28.2 percent in Dessau (Saxony-Anhalt). The distri bution of relative unemployment rates shows that the region-specific share of t he unemployment rates is larger in northern German districts, districts in eastern Ge rmany situated on the former inner-German boarder and in the eastern part of Bavaria. Small region-specific shares can be assigned to southern Germany and to districts in the eastern part of eastern Germany.

5.2 Persistence

Persistence of unemployment can be measur ed in different ways. For an overview see e.g. Mikhail et al. (2003). In this section, one measure is applied to show the extent of persistence across German district unemployment rates.

One approach used to measure the persistenc e of regional unemployment rates is to look at the correlation between the rates of districts at different points in time. If unemployment rates tend to be persistent, a district with a low rate should remain at a low level, whereas a district with a high rate should not be able to lower its rate and should therefore maintain the high level. The correlation should therefore be positive. Figure 4 shows a scatter plot of the absolute and relative regional unemployment rates in 1996 and 2004 including a regression line and the average values of the respective year and states this positive correlation:

Figure 4
Persistence of regional unemployment rates (scatter)



The observations clearly show persistent behaviour and state the assumed positive correlation: most districts that had a lower (higher) unemployment rate than the national average in 1996 (x-axes) were still better (worse) than the average in 2004 (y-axes).

For the absolute unemployment rate, only 16 districts (3.2%) changed from below the national average to an above-average unemployment rate in 2004. These include 4 northern Bavarian city districts close to the former inner-German boarder (Kulmbach, Nuremberg, Bayreuth, Coburg). They all had to record almost a doubling of their unemployment rates during this time span. On the other hand, also only 23 districts (3.9%) managed to improve from above to below the national rate. Put differently, this means that more than 90 % of all districts kept their position relative to the national unemployment rate unchanged during the observation period. The regression line is highly significant with a slope of 1.25 and an R^2 of 0.85. These figures are approximately the same for the relative unemployment rates, where 25 districts changed from above to below the national average and 19 districts vice-versa. The slope of this estimation is 0.95 and the R^2 is 0.94. The higher R^2 of the latter estimation shows that relative unemployment rates are still more persistent than their absolute counterparts.

In their estimations for Europe and the US, Decressin/Fatás (1995) found slopes of 1.18 and 0.17 with an R^2 of 0.32 and 0.17 respectively in regressions of the unemployment rate in 1987 on the unemployment rate in 1968. They concluded that the European unemployment rates are more persistent than those in the US. Because the time span and the regional level of the regressions above is not identical to those in Decressin/Fatás (1995), it is not possible to compare the results directly, but it is obvious that the estimated coefficient is closer to Europe than to the US. Therefore the conclusion here is that German district unemployment rates are - similar to European unemployment rates - more persistent than US unemployment rates. This result is interesting in particular given the fact that both US states and German districts act under national conditions that are the same for all regional units in the country. Therefore this comparison already shows that regional factors in Germany might be responsible for the persistent behaviour of district unemployment rates.

To sum up, both absolute and relative unemployment rates show enormous disparities between German districts. Furthermore, simple measures already show that the unemployment rates exhibit strong persistent behaviour. They hardly vary over time for most of the German districts and keep their position relative to the "national" unemployment rate. The relative distribution seems to be even more persistent than the absolute values. This is a first hint that persistent disparities might stem from a stable distribution of regional factors (such as the sectoral structure or the climate) that hardly vary over time. Persistence of unemployment rates has been reported in many studies for Germany (cf. Möller 1995, Suedekum 2004, Blien 2005), and for other European counties (e.g. Badinger/Url 2002 for Austria, Epifani/Gancia 2005 for Italy, Evans and McCormick 1994 or Gray 2004 for Great Britain, Pehkonen/ Tervo 1998 or Petteri 2003 for Finland), the whole of Europe (e.g. Decressin/Fatás 1995, Niebuhr 2003, Overman/Puga 2002, Suedekum 2005) or the U.S. (e.g. Neuman/Topel 1991, Vedder/Gallaway 1996).

Given the observed persistent unemployment differentials for both absolute and relative values, the next question to be answered is where these disparities come from. Are they natural in structure, i.e. a spatial equilibrium distribution, or are they due to slow-working adjustment mechanisms in the aftermath of aggregate or region-specific shocks? The first part of the next section shows that both absolute and relative unemployment rates converge towards a stable equilibrium distribution of unemployment disparities but not towards the aggregate mean. In the second part, impulse responses to aggregate and region-specific shocks are used to demonstrate that slow-working adjustment mechanisms do not prove to be responsible for these differences.

6 Unemployment dynamics

As shown in Section 5, the distribution of regional unemployment rates displays strong persistent behaviour. This result holds despite the great variance between districts. The question which then arises is why the observed distribution of unem-

ployment rates is persistent. Is it due to slow-working adjustment mechanisms towards a long-run equilibrium or is the observed spatial distribution itself an equilibrium? There might be tendencies to equalize regional disparities in the unemployment rate. Adjustment mechanisms like the migration of labour or firms are possible candidates for counteracting persistent disparities. Therefore, the next question to answer is whether there are mechanisms that remove this persistence and lead to a convergence of regional unemployment rates or whether instead the disparities remain stable or even tend to increase. In this section, we examine the dynamics of the absolute and relative regional unemployment rates to see whether

- regional unemployment rates form an equilibrium distribution
- the adjustment patterns have changed over time
- there are differences between smaller and larger spatial units.

6.1 Convergence or divergence?

The focus of this section is to explore the development of regional unemployment rates across regions and districts. In more detail the question is whether regional unemployment rates converge towards a national or region-specific equilibrium or whether instead divergent forces according to the "New Economic Geography" proposed in Krugman (1991) and Krugman/Venables (1995) can be found. Since the influential work of Barro/Sala-i-Martin (1991), the question of the convergence or divergence of regions has been a subject of controversial discussion in the theoretical and empirical literature (see for example Sala-i-Martin 1994, Quah 1996, Armstrong/Vickerman 1995). In recent years, regional models to explain divergent forces in the regional unemployment rates have been developed for example in Epifani/Gancia (2005) or Suedekum (2004) and (2005).

Barro/Sala-i-Martin (1991) emphasised two different concepts of beta-convergence in their work: unconditional and conditional convergence. If there is unconditional convergence, all units converge towards the same equilibrium, whereas in the case of conditional convergence, each unit converges towards its own steady state. Unconditional convergence also implies that the distribution of regional unemployment rates converges, i.e. the variation of the distribution decreases over time. Barro/Sala-i-Martin (1991) called this type of convergence sigma-convergence: if all units display convergence towards the national mean, the distribution of unemployment rates also converges towards this mean. This is not necessarily the case for conditional convergence: if each unit adjusts only towards its region-specific steady state, regional unemployment rates move towards a specific distribution but not towards the national mean. Thus, the concepts of beta- and sigma-convergence are not exclusive to each other. We test empirically for the different forms of convergence in this section. The tests for conditional and unconditional beta-convergence, i.e. the convergence of regional unemployment rates towards a region-specific or the national mean, are carried out using panel unit root tests and a fixed effects autoregressive estimation, respectively.

A relatively young approach to testing em pirically for conditional beta-convergence is to employ panel unit root tests: as mentioned above, conditional convergence implies that a variable returns to its region-specific value after an adverse shock. In the times-series literature the behaviour of a variable returning towards a specific value is called stationarity and is tested using unit root tests. In the other case – if a variable is not attracted by a specific value – the variable is said to be non-stationary. Thus, if regional unemployment rates display conditional convergence, they should be stationary and vary only in the region-specific constants. In recent years, a variety of tests with different properties have been developed. Breitung/ Pesaran (2006) provide a good review of the recent literature. In accordance with the testing procedure used by Bayer/Juessen (2007) the common first-generation tests of Levin/Lin/Chu (2002) and Im/Pesaran/Shin (2003) are first used to test for conditional convergence. In a second step, the hypothesis of unconditional convergence is tested by applying a fixed effects autoregressive model.

The basic regression used in both tests (LLC and IPS), is

$$\Delta y_{it} = \rho_i y_{i,t-1} + \sum_{k=1}^{K} \phi_{ik} \Delta y_{i,t-k} + z_{it}' \gamma_i + \varepsilon_{it} \qquad (3)$$

where the lagged differences of y_{it}, $\Delta y_{i,t-k}$, control for serial correlation between the ε_{it} and z_{it}' may be empty or include a constant term, fixed effects or a time trend into the regression. Also the null hypothesis, that $\rho_i = 0$ for all i, i.e. all time series are independent random walks, is the same in the LLC and the IPS test. Thus, both tests use the same basic regression and the same null hypothesis. They differ only in the underlying alternative hypothesis specification. LLC specify a homogenous alternative, where all ρ_i are equal and significantly lower than 0, i.e. all time series are stationary, whereas IPS test the less restrictive heterogeneous alternative, where ρ_i may differ across regions and only a significant proportion of all time series is stationary.

Given the disparities in the distribution of the absolute and relative unemployment rates seen in Figure 3, the question is whether German unemployment rates show conditional or even unconditional convergence. Determining the optimal lag length of equation (3) is usually done by means of sequential t-tests. These tests have been performed e.g. in Möller (1995) or Bayer/Juessen (2007). Both authors report an optimal length of two lags. Therefore, we do not test for the optimal lag length here and use a maximum lag length of two years ($k = 2$). Because of the differentiation and the inclusion of lagged differences, 3 observations are lost for each panel unit and for $k = 2$, 13 observations per unit remain. According to Breitung/Pesaran (2006) both tests are asymptotically efficient for more than six time periods ($T > 6$) if the number of cross-sections, *N*, tends to infinity. The results for LLC and IPS on conditional convergence, i.e. equation (2) estimated with fixed effects for each region / district, can be seen in Table 1:

Table 1
LLC and IPS tests for conditional convergence

Levin, Lin and Chu (LLC)					Im, Pesaran and Shin (IPS)			
Lags	**Obs.**	**Coeff.**	**t_{star}**	**P>t_{star}**	**Lags**	**Obs.**	**W(t_{bar})**	**P>t_{bar}**
Absolute unemployment rates								
Regions, 1989-2004								
0	105	-0.351	-2.359	0.009***	0	105	-1.708	0.044**
1	98	-0.468	-3.531	0.000***	1	98	-3.333	0.000***
2	91	-0.526	-0.739	0.230	2	91	-1.924	0.027**
Districts, 1989-2004								
0	4890	-0.267	-8.836	0.000***	0	4890	-3.741	0.000***
1	4564	-0.267	-10.386	0.000***	1	4564	-3.721	0.000***
2	4238	-0.267	-11.936	0.000***	2	4238	-5.230	0.000***
Relative unemployment rates								
Regions, 1989-2004								
0	105	-0.251	-1.993	0.023**	0	105	-0.530	0.298
1	98	-0.352	-3.311	0.001***	1	98	-1.790	0.037**
2	91	-0.437	-2.518	0.006***	2	91	-1.692	0.045**
Districts, 1989-2004								
0	4890	-0.374	-11.195	0.000***	0	4890	-9.189	0.000***
1	4564	-0.374	-12.953	0.000***	1	4564	-8.976	0.000***
2	4238	-0.374	-14.711	0.000***	2	4238	-10.336	0.000***

*, **, *** significant at the 10, 5 and 1 percent levels respectively.

For the absolute unemployment rates of regions in the period 1989-2004, the LLC test rejects the null of non-stationarity safely if no or 1 lag is included, whereas the IPS test rejects the null in all different settings. This result also holds for relative unemployment rates where only the IPS test without a lag is insignificant. The estimated coefficient for ρ shows the expected negative sign in all settings. Thus, the results of both tests indicate stationarity of regional unemployment rates, meaning that they converge towards a stable pattern of unemployment differentials.

The estimated half-life of a shock can be calculated from the coefficient of the LLC test as $ln(0.5)/ln(1-\rho)$. According to our results for the most significant estimations (1st lag), a shock to absolute unemployment rates has an estimated half-life of only 1.1 years whereas for relative unemployment rates it takes 1.6 years for 50 % of the shock to disappear. Thus, region-specific shocks take longer to disappear than absolute shocks. Bayer/Juessen (2007) estimated panel unit root tests for the unemployment rates of 10 West German Federal States in the period 1960-2002. They also found evidence of conditional convergence and a coefficient of $\rho = -0.117$ which implies a half-life of a shock of approximately 5.5 years. As Bayer/Juessen (2007) used simple differences ($u_{it} = U_{it} - U_t$) instead of beta-differences and additionally estimated for a different period and different regions, their results are not comparable to our estimations. However, Bayer/Juessen (2007) also demonstrate

that the estimated half-life is upwardly biased if structural breaks in the data are omitted. By including a structural break, they find half-life periods in a range of 1-3 years for single Federal States. As our estimation period does not contain structural breaks and the results of Bayer/Juessen (2007) are similar to our findings, the conclusion is that regions adjust quite rapidly to their region-specific means.

In the case of districts, both tests clearly reject the null of non-stationarity for all different lag lengths with t_{star} becoming more negative the more lags that are included. The estimated coefficients of $\rho = -0.267$ for absolute and $\rho = -0.374$ for relative unemployment rates implies half-lives of 2.2 and 1.5 years, respectively. Thus, the estimation results indicate stationarity of district unemployment rates, meaning that they converge towards a stable pattern of unemployment differentials for absolute and relative values. In contrast to regions, for districts absolute shocks take longer to disappear than region-specific shocks. The estimated half-life of absolute shocks is twice as long for districts. The relative unemployment rates, however, display nearly the same half-lives for districts and regions.

The stronger concept of convergence is to test for unconditional convergence, i.e. all districts converge towards the same (national) equilibrium. Here, unconditional convergence is tested by estimating a fixed effects autoregressive model of the form

$$u_{it} = a_i + b_i u_{it-1} + e_{it} \qquad (4)$$

where the fixed effects a_i are tested for joint significance. The results are displayed in Table 2:

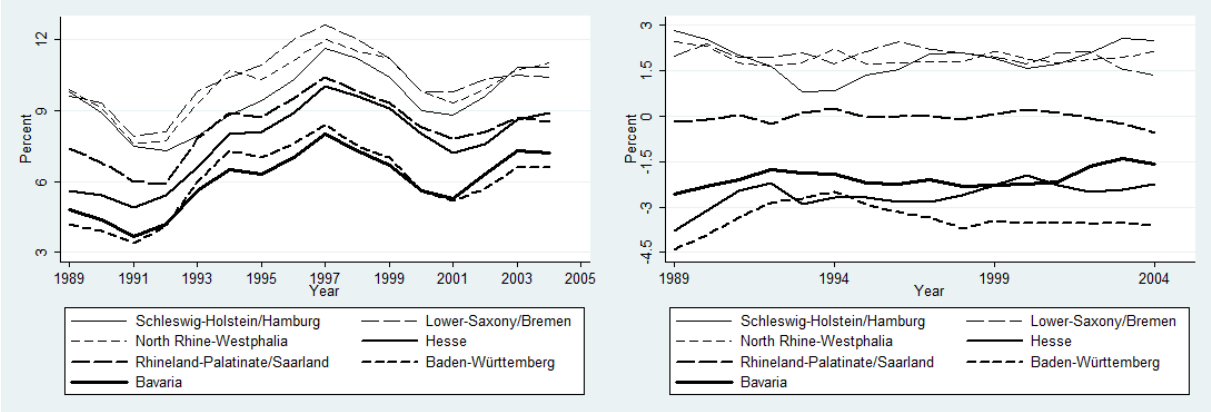
Table 2
Fixed-effects autoregressive model for unconditional convergence

Absolute unemployment rates							
Regions, 1989-2004 (105 observations, R^2=0.646)							
Var.	Coef.	T	P>t	F-test	Stat.	F	P>F
Cons	1.787	3.62	0.000***	Model	F(1.97)	178.98	0.000***
Lag 1	0.796	13.38	0.000***	FE	F(6.97)	0.93	0.475
Districts, 1989-2004, 1989-2004 (4889 observations, R^2=0.552)							
Var.	Coef.	T	P>t	F-test	Stat.	F	P>F
Cons	2.189	29.06	0.000***	Model	F(1.4889)	6022.69	0.000***
Lag 1	0.724	77.61	0.000***	FE	F(325.4889)	2.11	0.000***
Relative unemployment rates							
Regions, 1989-2004 (105 observations, R^2=0.631)							
Var.	Coef.	T	P>t	F-test	Stat.	F	P>F
Cons	-0.038	-1.22	0.226	Model	F(1.97)	165.79	0.000***
Lag 1	0.730	12.88	0.000***	FE	F(6.97)	3.58	0.003***
Districts, 1989-2004 (4889 observations, R^2=0.405)							
Var.	Coef.	T	P>t	F-test	Stat.	F	P>F
Cons	-0.249	-28.39	0.000***	Model	F(1.4889)	3323.97	0.000***
Lag 1	0.547	57.65	0.000***	FE	F(325.4889)	6.07	0.000***

*, **, *** significant at the 10, 5 and 1 percent levels respectively

The model (first row on the right, F-test model) and the first lag (Lag 1) are highly significant in all estimations (regions and districts). The F-test of the AR(1) model (second row on the right, F-test FE) rejects the null hypothesis that all fixed effects are zero, but only in three out of four settings: in both estimations for relative unemployment rates and for the absolute values of districts. Therefore, for these estimations one can conclude that at least one fixed effect is significantly different from zero, indicating conditional rather than unconditional convergence. For the absolute unemployment rates of regions, the F-test that all fixed effects are zero cannot be rejected. As absolute convergence of absolute unemployment rates would necessarily imply also absolute convergence of re lative unemployment rates (if all regions display the same unemployment rate, all relative rates are one), we look at this result in more detail. The absolute and relative unemployment rates of regions in the period 1989-2004 are displayed in Figure 5:

Figure 5
Absolute and relative unemployment rates of regions



The absolute unemployment rates of regions clearly follow a cyclical development. They display an almost parallel development over time. This development is obviously captured entirely by the first lag of the AR(1) estimation. Therefore, no region-specific constants are necessary, which implies convergence towards the national mean. Relative unemployment rates, however, are corrected for variations due to aggregate factors. They hardly vary over the observed period and show approximately horizontal lines at different levels captured by significant regional fixed effects in the estimation. As mentioned above, absolute convergence means that the distribution of unemployment rates becomes more even over time. According to Figure 5 this can not be found for absolute unemployment rates. The development over the period 1989-2004 rather suggests that both absolute and relative unemployment rates move within a region-specific distance around the national average. Hence, we conclude from this examination that both the absolute and relative unemployment rates of regions display conditional rather than unconditional convergence.

Comparing the results for conditional and unconditional convergence shows that the concept of conditional convergence is more likely than unconditional convergence for western German unemployment rates. According to the estimations, 50 % of

both region-specific and aggregate shocks disappear within approximately 1-2 years in the observation period of 1989-2004. A region-specific shock has approximately the same half-life at both regional levels, whereas the half-life of an aggregate shock is approximately twice as long for districts as for regions.

The main conclusions that can be drawn from these empirical investigations are the following: both the absolute and the relative unemployment rates of both regional levels (regions and districts) display convergence towards their region-specific means and therefore towards a stable distribution of regional unemployment disparities. This result is due to an adjustment mechanism that leads to a convergence of each spatial unit towards its steady-state unemployment rate. Thus, highly persistent regional unemployment disparities as seen in Figure 3 can be regarded as region-specific unemployment rates due to different regional endowments, adjusting quite rapidly to their region-specific means, but not towards the national unemployment rate.

This result raises the question of how long the complete adjustment process after aggregate and region-specific shocks lasts and what shape the adjustment curve of the regional unemployment rate takes on. These questions are approached by estimating impulse responses to shocks in the following section.

6.2 Adjustment to shocks

In this section, the time it takes for a shock in the regional unemployment rate to settle is calculated using a dynamic panel model and displayed as an impulse response function. In addition to the time-space combinations used in Section 6.1, we estimate an impulse response for regions for the period 1966-1987. This enables us to compare the results directly with the analysis conducted by Decressin/Fatás (1995). All of the estimations are carried out with two lags and include a fixed effect for each region / district[6]. The equation to be estimated is:

$$u_{it} = a_i + b_i u_{it-1} + c_i u_{it-2} + e_{it} \qquad (5)$$

where a_i is the individual regional fixed effect. Because the ordinary least squares dummy variable estimator (LSDV) is biased and inconsistent in this case (see Kiviet 1995, 1999), the bias-corrected LSDV estimator proposed by Bruno (2004) is applied.

To analyse the impact of both aggregate and regional shocks the model is estimated for absolute and relative unemployment rates. The results for regions and districts can be found in Table 3[7].

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6 Test results for the optimal lag length (AIC-/BIC-Criteria) across regions and districts indicate differences in the underlying lag structures. But, a common result across all test results is that at least two lags have to be included. Therefore and in order to compare our results to the estimations of other authors, we also used two lags in all estimations.

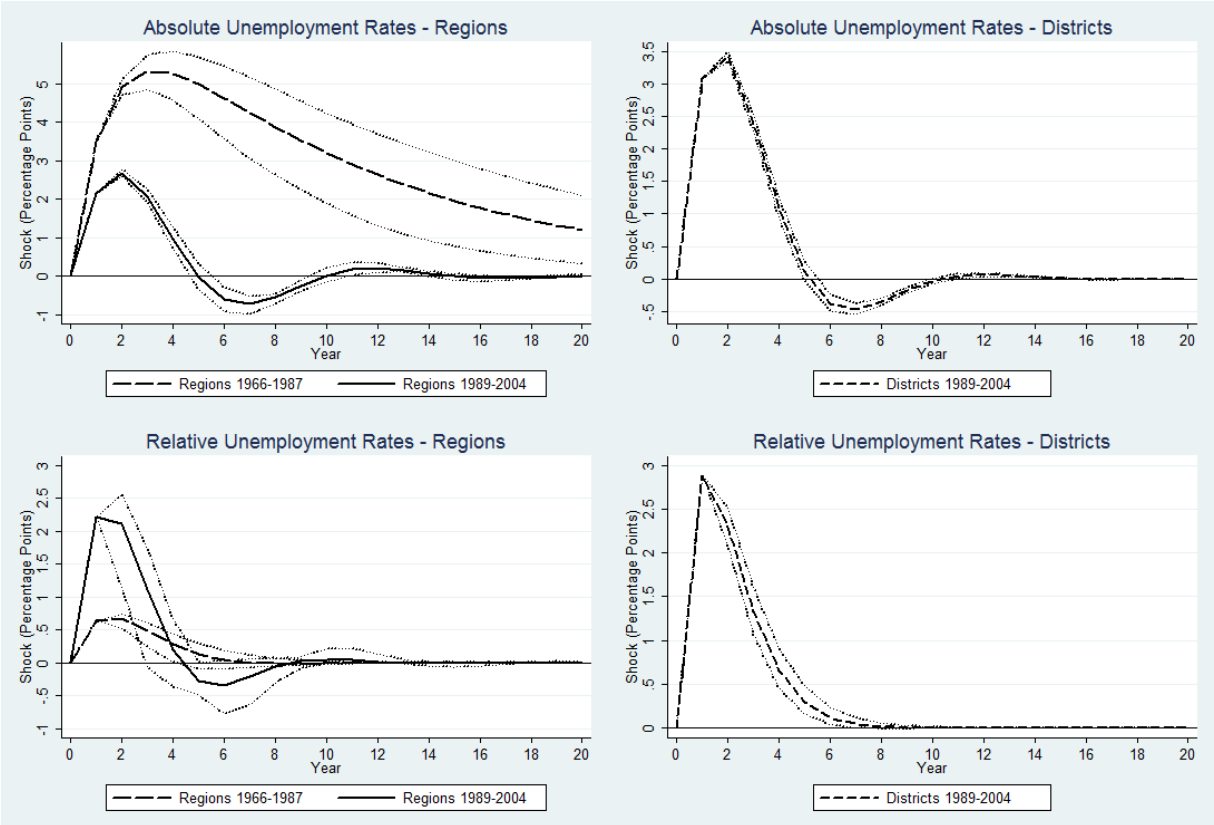
7 The cyclical sensitivity coefficients for regional employment office areas were estimated for each period separately.

Table 3
Adjustment of regional unemployment

Region	Period	Panel units	Abs. unemployment		Rel. unemployment	
			Lag 1	Lag 2	Lag 1	Lag 2
Regions						
West Germany	1966-1987	7	1.406	-0.453	1.052	-0.341
West Germany	1989-2004	7	1.247	-0.596	0.955	-0.411
Districts						
West Germany	1989-2004	326	1.112	-0.460	0.796	-0.175

The corresponding adjustment processes for regions and districts after a positive shock to regional absolute and relative unemployment rates are displayed in Figure 6. The corresponding 95 %-confidence intervals are plotted as dotted lines[8]. As the aim is to compare regional units with different levels of unemployment rates, we construct shocks as one-standard deviations of all observations in each panel. This allows us to compare the regional units with respect to both the magnitude of the region-specific-shocks and the time it takes to reach the initial level again.

Figure 6
Adjustment of regional unemployment



[8] The 95 %-confidence intervals were generated by bootstrap methods and are based on 1,000 replications of each estimation, see e.g. Efron/Tibshirani (1993).

Figure 6 contains 4 graphs: the upper two represent the adjustment paths of absolute unemployment rates for regions (left) and districts (right). The two graphs below mark the adjustment paths of relative unemployment rates, again for regions (left) and districts (right). Period one always represents the initial shocks. The estimations for regions in the two different periods show that shocks to absolute unemployment have decreased whereas shocks to relati ve unemployment have increased during the last decades. As the shocks are created as one-standard deviations, it follows that the variation across regions has decreased for absolute rates and increased for the relative measure. Thus, shocks to relative unemployment have gained importance compared with shocks to absolute unemployment.

According to Decressin/Fatás (1995) the adjustment of unemployment rates in the US lasts about 10 years for absolute and 6 years for relative unemployment rates, whereas the corresponding values for Europe are far more than 15 years for absolute but only 3 years for relative unemployment rates. They therefore conclude that aggregate shocks lead to the persistence of unemployment rates known in European countries and that this is not the case in the US. For Europe, Decressin/Fatás (1995) use unemployment rates for the period 1966-1987. A look at the same observation period for regions in Germany confirms their findings: absolute unemployment rates take more than 20 years to return to their initial value and relative unemployment rates get insignificant after only about 4 years. If the estimation is carried out for the period 1989-2004, it can be observed that the adjustment process of absolute unemployment is similar to that es timated for relative unemployment rates and that the adjustment duration for both measures is about 3-4 years. Therefore, the conclusion reached by Decressin/Fatás (1995) holds only for the period 1966-1987. These results show on the one hand that the estimated speed of adjustment depends strongly on the underlying observation period. On the other hand, for western Germany we can conclude that the degree of persistence of the unemployment rate due to aggregate shocks has decreased substantially during the last decades. Region-specific shocks, in contrast, did not have permanent effects in previous periods and shocks are still less persistent in present times. In the case of districts neither aggregate nor region-specific shocks show persistent behaviour in the period 1989-2004 and display an adjustment duration for both measures of about 4-5 years.

Considering both regional levels, the most important finding is that unemployment rates adjust fairly quickly after a district / region is hit by a negative shock. According to Figure 6, the half-life of a shock is in a range of about two to three years for both aggregate and region-specific shocks for the two regional levels. This result indicates that regional adjustment mechanisms work well for unemployment rates in the observation period 1989-2004. With regard to aggregate shocks, the time it takes for the unemployment level to return to its initial level is about four years for both regional levels. However, the time it takes for a region-specific shock to disappear entirely is about seven years for districts whereas regions adjust within about four years. This demonstrates that smaller spatial units react more sensitively to region-specific shocks than larger units.

The conclusions from this section are as follows:

The degree of persistence in the absolute unem ployment rates in western Germany has decreased markedly during the last decades. Region-specific shocks did not leave permanent effects in previous periods and are still less persistent in present times. Thus, the results found by Decressin/Fatás (1995) for the period 1966-1987 are confirmed, but the data show that they are no longer valid for more recent years. Therefore, their conclusion that aggregate shocks are responsible for the persistent effects known in Europe (and also in western Germany) must be reformulated: both aggregate and region-specific shocks have not been responsible for the persistent behaviour of unemployment rates in the last 16 years. This result also holds for districts.

As already seen in Section 6.1, both absolute and relative unemployment rates adjust fairly quickly and display half-lives of a shock lasting about two to three years. This result holds for regions and districts. As unemployment rates do not exhibit convergence towards the national mean, slow-working adjustment mechanisms in response to shocks are not responsible for persistent unemployment differentials as described above. The remaining alternative explanations for these disparities are: first, region-specific shocks occur very frequently and predominantly affect the same regions, which maintains these spatial disparities. Second, regional unemployment disparities are driven by other factors and constitute an equilibrium phenomenon. The latter is the more probable alternative given the observed permanent effects of aggregate shocks in earlier decades (mainly the 1960s and 1970s). As there is no tendency for differentials built up during this time to decrease (there is no convergence towards the national mean), the observed disparities remain (and constitute a new equilibrium) although the adjustment mechanisms performed well during the last decades.

7 Conclusion

The paper shows that the distribution of unemployment rates at district level in Germany exhibits strong persistent behaviour . Unemployment rates display an enormous range across the country but hardly vary over time for most of the districts. The relative distribution seems to be even more persistent than absolute values. These findings are similar to those found for most European countries but contrast sharply with those for the US, where unemployment rates are hardly persistent. This result holds given the fact that US states and German districts act under national conditions that are the same for all regional units within the country.

Panel unit root tests indicate that both the absolute and the relative unemployment rates of regions and districts display convergence towards their region-specific means and therefore towards a stable distribution of regional unemployment disparities. This result is due to an adjustment mechanism that leads to a convergence of each spatial unit towards its steady-state unemployment rate. Thus, highly persistent regional unemployment disparities can be regarded as region-specific unem-

ployment rates due to different regional endowments, adjusting quite rapidly to their region-specific means, but not towards the national unemployment rate.

The investigation of adjustment processes suggests that the degree of persistence in the absolute unemployment rates in western Germany has decreased markedly during the last decades. Thus, the results found by Decressin/Fatás (1995) are confirmed for the period 1966-1987 but are no longer valid for more recent years. Therefore, our conclusion is that neither aggregate nor region-specific shocks have been responsible for the persistent behaviour of unemployment rates in the last 16 years. This result also holds for districts. Therefore, slow-working adjustment mechanisms in response to shocks are not responsible for the persistent unemployment differentials.

Taking these results together, there is no tendency for differentials between spatial units that grew in earlier periods to decrease, although adjustment mechanisms performed well during the last decades. This is a strong indication that the stable distribution of unemployment rates found above constitutes an equilibrium relationship.

Comparing the results obtained for regions and districts shows ambivalent results for their adjustment processes: according to panel unit root tests, aggregate shocks display longer half-lives for districts, whereas region-specific shocks have approximately the same half-life. The estimated impulse responses show exactly the opposite result – longer adjustment periods after region-specific shocks for districts but similarly long periods after aggregate shocks. As all of the estimated half-lives – for both regions and for districts – are found to be very robust within a range from 1-3 years, our conclusion is that the adjustment processes of districts and regions do not differ markedly.

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