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Unemployment dynamics in West Germany

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Mit der Reihe „IAB-Discussion Paper“ will das Forschungsinstitut der Bundesagentur für Arbeit den Dialog mit der externen Wissenschaft intensivieren. Durch die rasche Verbreitung von Forschungsergebnissen über das Internet soll noch vor Drucklegung Kritik angeregt und Qualität gesichert werden.

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Abstract

The results for labour demand shocks at the place of residence for German Federal States and districts according to the model of regional adjustment developed by Blanchard/Katz (1992) are in line with other studies in this field. They suggest that adjustment to region-specific shocks in the year of the shock is mainly through participation behaviour and unemployment changes, not by migration. If, however, the estimations additionally allow for commuting as adjustment mechanism, the unemployment rate and interregional mobility (i.e. migration and commuting activities) capture the major part of the regional adjustment process.

Thus, migration and commuting are highly relevant for the adjustment behaviour of districts as well as for Federal States. As the major part of the shock has settled within only about one to two years, slow working adjustment mechanisms in the aftermath of labour demand shocks are not responsible for persistent unemployment differentials. Furthermore, the hypothesis that the adjustment process for smaller spatial units is much more reflected in interregional mobility and less in changes in the unemployment and the participation rate is confirmed.

Zusammenfassung

Die Ergebnisse der Anpassung nach Arbeitsnachfrageschocks am Arbeitsort für Bundesländer und Kreise nach dem Modell von Blanchard/Katz (1992) entsprechen den Ergebnissen aus anderen Studien in diesem Bereich. Sie zeigen, dass die Anpassung auf regionsspezifische Schocks im Jahr des Schocks hauptsächlich durch das Partizipationsverhalten und die Arbeitslosenquote, nicht aber durch Migration erfolgt. Wird in den Schätzungen allerdings auch Pendeln als möglicher Anpassungsmechanismus mit berücksichtigt, erfolgt der Großteil der Anpassung über die Arbeitslosenquote und die interregionale Mobilität (also durch Migration und Pendeln).

Daher sind Migration und Pendeln höchst relevant für das Anpassungsverhalten von Kreisen und Bundesländern. Da der Großteil des Schocks bereits nach nur ein bis zwei Jahren abgebaut ist, sind langsame Anpassungsprozesse nach Arbeitsnachfrageschocks nicht für persistente Arbeitslosigkeitsdifferenziale verantwortlich. Darüber hinaus kann die Hypothese, dass die Anpassungsprozesse von kleineren regionalen Einheiten sehr viel stärker durch interregionale Mobilität und weniger durch Änderungen in der Arbeitslosenquote geprägt sind, bestätigt werden.

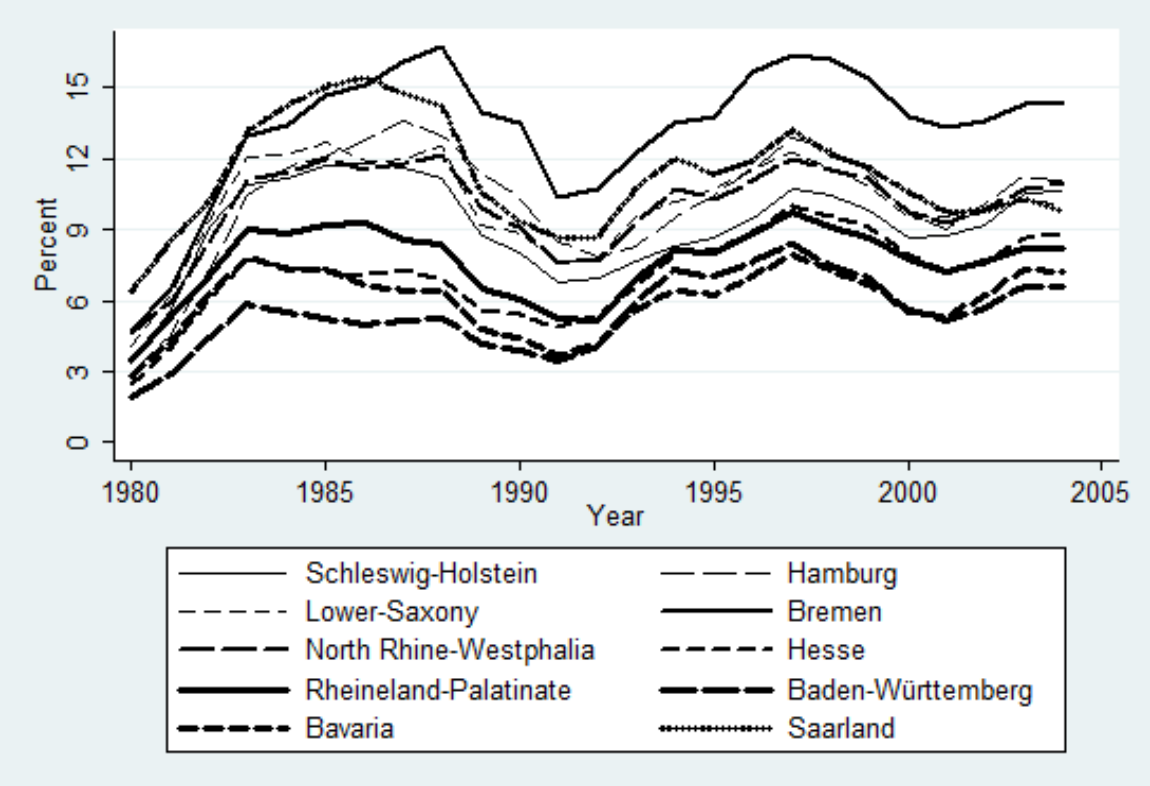
JEL classification: C22, C23, O18, R11, R12

Keywords: unemployment disparities, regional adjustment, labour mobility

1 Introduction

Persistent high unemployment is one of the main problems faced by the German economy during the last decades. Changes in the economic or political settings as the oil price shocks at the beginning of the 1970s and 1980s or German reunification in 1989 led to a substantial rise of the national unemployment rate during the last three decades. This observation holds also for German regions. The development of the unemployment rate across West German Federal States (NUTS1) can be seen in Figure 1:

Figure 1
Development of Federal States Unemployment Rates 1980-2004



After each shock, regional unemployment rates recovered slightly but did not return to their initial level. Both, the second oil price shock at the beginning of the 1980s and the consequences of German reunification in 1989 led to a sharp rise in regional unemployment. As regions differ in their sector structure and exhibit different amenities, they react differently to common shocks and unemployment disparities seem to widen during recession years and narrow again in economically stable periods. Given the moderate spread of 7% to 13% in the unemployment rates of Federal States in 2004 (see Figure 1), unemployment rates at district level (NUTS3) in Germany vary substantially. 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 East Germany – are in a deep crisis and exhibit rates of more than 25%. Given these observations, regional unemployment disparities might be considered as a result of different adjustment paths of regions to shocks due to their different sector structure.

However, regions do not only react to common shocks, but also to region-specific shocks concerning some regions or possibly one single region only. Positive or negative regional labour demand shocks as the foundation or closure of a major employer have sustainable effects on regional variables and have gained importance during the last 40 years in Germany, see Kunz (2009). As the investigation of regional adjustment by Blanchard/Katz (1992) for the US and Decressin/Fatás (1995) for Europe and the US shows, adjustment to region-specific shocks differs substantially between Europe and the US. First, the long-run effect on a region´s employment share is much larger in the US than in Europe. Second, in the US, labour market shocks are immediately reflected in labour migration, whereas in Europe, the participation rate is the dominant equilibrating mechanism. If region-specific shocks in combination with slow working adjustment are responsible for persistent unemployment disparities, estimations at different regional levels can provide a sound view of commonalities and differences in the underlying processes. Therefore, the analysis of migration, commuting and regional adjustment is carried out at Federal States as well as 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. Migration and commuting activities between neighboring districts are more intense than in larger regional units, where much of this takes place inside the region. Thus, the adjustment after a region-specific shock should be much more reflected in interregional migration or commuting and less in changes in the unemployment and the participation rate. As especially the effect of commuting is usually ignored in the adjustment literature, this paper sheds light on this issue by tracing the effects of different shocks to the regional labour market: first, shocks to the employment growth rate at the place of residence are used to measure the extent of migration in the regional adjustment process. Second, shocks to the employment growth rate at the place of work are used to calculate the same effect if additionally commuting activities are considered.

The aim of this paper is to study adjustment processes in the aftermath of a region-specific shock. As the effects should differ between regional levels, adjustment behaviour at Federal States and district level in Germany is analysed. The questions that are addressed and answered in the empirical part of this paper are: Are slow working adjustment mechanisms after a region-specific shock responsible for regional unemployment disparities? Which variables contribute to the adjustment process – the unemployment rate, labour force participation or labour mobility? Are the adjustment mechanisms at district level similar to those observed for larger regional units (e.g. Federal States)? Or do the different forms of labour mobility, i.e. migration and commuting activities, turn out to be more important? What happens to the unemployment and the participation rate in a region, if a shock in labour demand at the place of work – e.g. by the establishing of a new firm – takes place? Furthermore, how much of these new jobs are filled by immigration and incommuting? These questions can be best approached by applying the framework of Blanchard/Katz (1992). Its basic ideas and implications are shortly presented in Section 2. In Section 6 evidence from the US, Europe and Germany is given to show the find-

ings of other authors and the model of Blanchard/Katz (1992) is estimated for West German Federal States and districts in the period 1989-2004.

The rest of the paper is organized as follows: In Section 2 the theoretical background for regional adjustment dynamics is presented. In Section 3 follows a brief description of the dataset used in this paper. Section 4 empirically investigates migration and commuting activities in Germany. Section 5 shows how region-specific variables are obtained and introduces the empirical framework. The joint movement of regional employment, unemployment and participation is the focus of Section 6, and Section 7 concludes.

2 A framework for regional evolutions

The observation of enormous regional disparities in the unemployment rate described above draws the attention to their potential origin: 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 relationship. Second, aggregate as well as region-specific shocks occur in such frequencies that disparities remain although regional adjustment mechanisms exist to equilibrate those disparities and third, different reactions to common and region-specific shocks in combination with slow working adjustment mechanisms build and hold up regional disparities over long periods. An overview of theoretical and empirical research on regional unemployment differentials can be found in Elhorst (2003). According to these explanations, research on unemployment can be classified into three types of studies:

Most studies on regional unemployment concentrate on equilibrium explanations and use theoretical long-run relationships between unemployment and other variables like job vacancies (Beveridge Curve), the national unemployment rate (Cyclical Sensitivity model) or regional amenities (Amenity model) to investigate differences in regional unemployment. Other models of the equilibrium type as migration- or wage-setting-curve- (Phillips-Curve) based approaches use theoretical explanations, where the unemployment rate is not directly estimated, but can be calculated out of these relationships. A further approach is to use the labour market accounting identity: the labour market can be characterized by one equation, the labour market identity, where unemployment results out of the difference between labour supply and labour demand. Commonly, the different parts of the identity (working age population, participation rate, commuters or employment) are replaced by their theoretical functions.

The chain reaction theory proposed by Karanassou/Snower (2000) belongs to the second type of models. The approach claims that labour market shocks are felt through time. Therefore in the chain reaction theory, the total response of unemployment to a labour market shock (the long-run elasticity) consists of the immediate response (the short-run elasticity) and the persistence (the cumulated short-run elasticities over all periods). Thus, the chain reaction theory contains elements of

time-series analysis in the sense that the unemployment series can be seen as a stochastic process that keeps the effect of a shock in memory.

The third type of models was proposed e.g. by Blanchard/Katz (1992). They present a framework of the regional economy which is – according to Elhorst (2003) – the most extensive regional model currently available. Therefore this model is chosen to analyse regional evolutions in this paper.

In their regional model, Blanchard/Katz (1992) follow two basic ideas. Each region produces a specific bundle of goods and workers as well as firms are mobile across the country. The central question to be answered by the model is: What happens on the labour market if a region exhibits a positive (negative) shock in the demand of its products? Thus the model gives an answer to the very plausible case that a region is specialised in the production of certain goods and that the exogenous demand for these goods increases (decreases) by some reason. To avoid talking in braces, the focus here is on a positive shock, but the solution presented by the model holds in the same way for a negative shock[1]. The story told by the model is that an increase in product demand directly translates into an increasing demand for labour as well as higher wages. Higher wages lead to net-out-migration of firms. Increasing labour demand and higher wages lead to a rise in employment. The adjustment of the employment level to increasing labour demand and higher wages (the additional workers needed) may work through different channels: additional workers may be required out of the pool of unemployed persons, people who do not participate in the labour market at present or from net-in-migration. Therefore, when a positive regional shock hits a region, the unemployment rate is expected to fall, while the participation rate and immigration should rise. How strong the employment level is finally affected by this demand shock, depends on the strength and speed of these adjustment mechanisms. The weaker wages respond to the shock, the more important is the adjustment of the employment level and therefore the larger is the permanent effect on employment. As the focus is on the physical adjustment processes on the labour market (the channels through which additional workers are hired), the response of wages is not further discussed in the following.

Especially in the case of small spatial units as districts, other forms of adjustment might become important. As already mentioned above, commuting is a possible candidate. In studies by Blanchard/Katz (1992), Decressin/Fatás (1995) or Möller (1995), the regional level of disaggregation is NUTS1 or larger (Federal States or regional employment offices), where much of the commuting activities takes place inside a region. In the case of districts instead, distances decrease substantially and commuting is a factor that can not be ignored (for a detailed discussion see Section 4). The question answered by the model of Blanchard/Katz (1992) is: what happens

[1] Pekkala/Kangasharju (2002) tested the hypothesis that positive and negative labour demand shocks display different adjustment paths. Their results show that region-specific shocks in Finland do only show little asymmetries.

if a region is hit by a labour demand shock? Which reaction shows the unemployment and the participation rate and how much of the permanent effect on employment is captured by migration? This seems to be sufficiently detailed if the level of disaggregation is NUTS1 or larger. In the case of districts instead, the commuter share in the regional labour market increases dramatically and the labour force of surrounding districts is involved. New jobs in a region might possibly not only be filled by the unemployed, new participants or migrants, but also by people who permanently live outside a district and commute to their work daily. Therefore, the distinction between the place of residence and the place of work of an employed person becomes relevant. We account for this distinction in our estimations to visualize the effect of commuting. More precisely we estimate the model in two different settings: First, we estimate the effects of a labour demand shock at the place of residence to unemployment, participation and migration. This setting answers the following question: Which reaction shows the unemployment and the participation rate at the place of residence and how much of the permanent effect on employment (at the place of residence) is driven by migration? Thus, a local effect is measured. Second, we estimate the effects of a labour demand shock at the place of work to the same variables than in the first setting. Following the model of Blanchard/Katz (1992) consequently, the permanent effect on employment – i.e. the part of the shock that is not absorbed by unemployment or participation – is then captured by migration and commuting. Thus, this approach is able to account for both, migration and commuting activities in the adjustment process and enables us to answer the following questions: what happens to the unemployment and the participation rate in a region, if a shock in labour demand at the place of work – e.g. by the establishing of a new firm – takes place? Furthermore, how much of these new jobs are filled by immigration and incommuting? As is makes a big difference for the job opportunities of workers at the place of residence, if e.g. 20, 50 or 80% of these new jobs are filled by immigration and incommuting, the estimation results are also highly relevant for decision makers in politics and economics.

3 Regional Data

The data set used in this paper is provided by the German Federal Employment Agency and the German Statistical Office. Variables obtained from the Federal Employment Agency are employment, unemployment and commuting figures. Data from the German Statistical Office contain migration and age groups of regional population figures. All series are on an annual basis. Unemployment rates from 1980-2004 at Federal States level described in Section 1 are official figures and are calculated as unemployed over the dependent labour force[2]. In Section 4, regional

[2] For the years 1980-1989, the dependent labour force was estimated from the German "Mikrozensus". For the years 1989-1999, the dependent labour force contains employees obliged to the social security contributions, civil servants, unemployed, expatriates and (underestimated) estimations for marginal employees from the "Mikrozensus". Since the year 2000, marginal employees are covered by the social security system and therefore available as official figures in the dependent labour force.

unemployment rates, migration and commuting figures for all German districts in the year 2004 are used to analyse the potential that these variables might have for regional adjustment processes. Migration is thereby defined as move of the residence across a district boarder and commuting is given, if a person works in another district than in its place of residence. The estimation of regional adjustment processes in Section 6 is carried out for West German districts and Federal States. The dataset consists of employment figures at the place of residence and at the place of work, the number of unemployed and the working age population from 1989-2004. The employment level contains only people covered by the social securitiy system ("sozialversicherungspflichtig Beschäftigte"). The working age population is calculated as a regions` population in the age of 15-64 years. From these series all other variables needed for the estimation (employment growth rates, employment rates, participation rates) can be calculated. For comparisons with larger regional units used in other studies, district data are aggregated on Federal States level. Due to a lack of consistent time-series for the former Eastern part of Berlin, the City State Berlin is excluded from the estimations in Section 6.

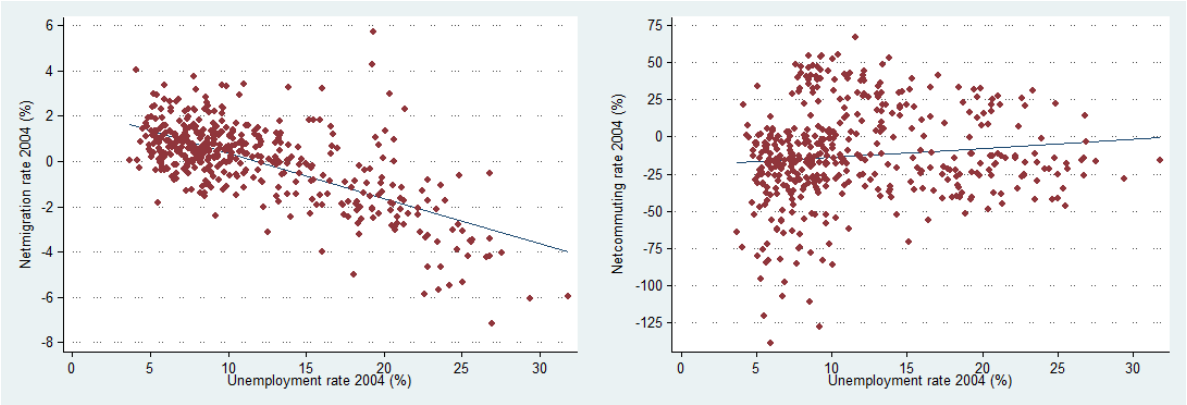
4 Migration and commuting activities in Germany

This Section empirically analyses, why districts should adjust differently than larger regional units. As already mentioned in Sections 1 and 2, distances between districts are much lower than between Federal States. Mobility that takes place inside larger regional units becomes visible if districts are the object of analysis. Therefore, migration and commuting activities should be much larger for districts than for Federal States. For this reason, the relationship between net migration, net commuting and the regional unemployment rate is investigated. Additionally, different figures to measure the intensity of migration and commuting are calculated for districts and compared to the Federal States level.

As the main focus of this paper is the existence of enormous unemployment disparities described already in Section 1, we are interested in the relationship between migration and commuting figures. A common statement in the German migration literature is that migration steadily flows from East to West Germany since German reunification in 1989. Alecke/Untiedt (2000), Hunt (2000), Burda/Hunt (2001) or Parikh/Van Leuvensteijn (2002) found this result for the first ten years of transition. But, as Burda (2005), Snower/Merkl (2006) or Uhlig (2007) show, substantial East/West migration is still present even more than 15 years after German reunification. According to theses studies, the reasons for this development are persistent regional disparities in e.g. nominal wages, unemployment rates, labour productivity between the two parts of Germany but also gradually shrinking subsidies. In all papers, the unemployment rate is thereby negatively related to net migration. Results for a relationship between net commuting and regional unemployment are instead not available for Germany to my knowledge. Figure 2 displays two scatter plots including a regression line for first, the net migration rate and second, the net commuting rate against the unemployment rate for 439 German districts in 2004. For

both measures, employment at the place of residence is used as denominator to show the extent of migration and commuting in relation to the persons actually working in the respective district.

Figure 2
Netmigration, netcommuting and unemployment of districts in 2004

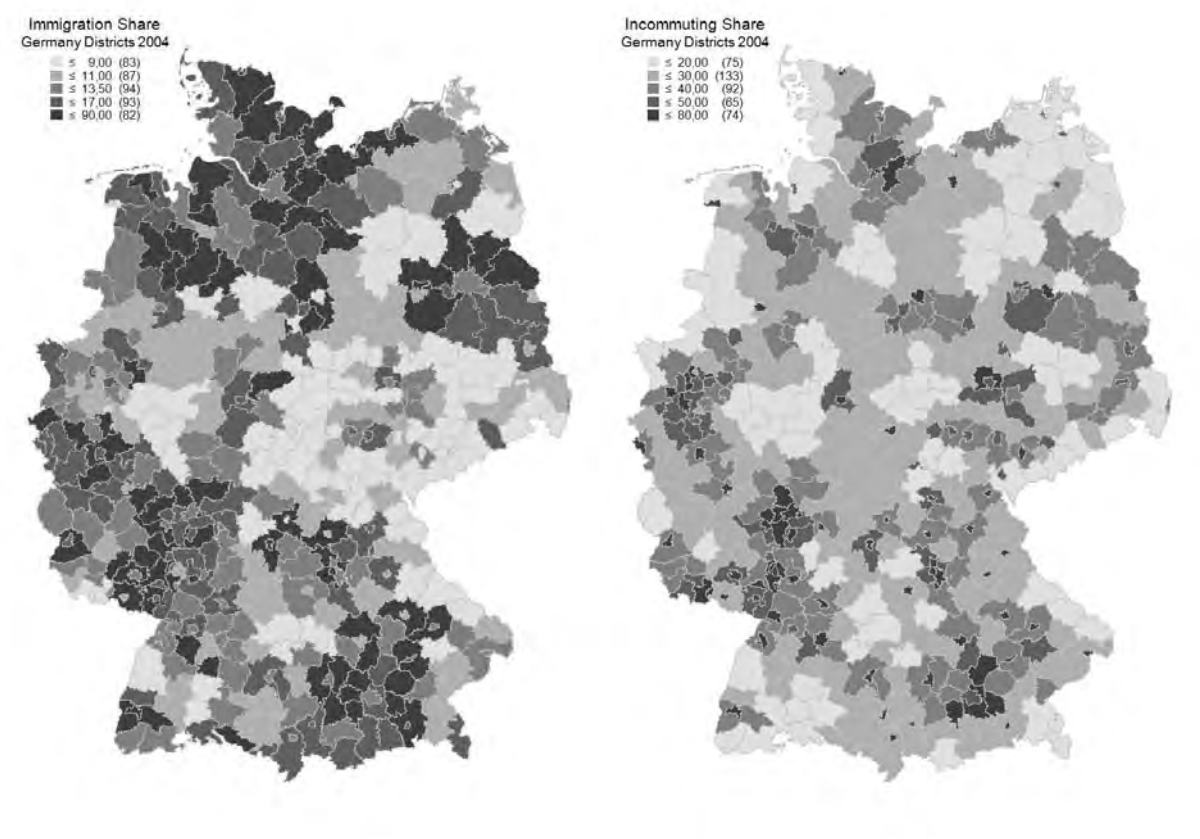


The net migration rate (left figure) shows a range of about -7% to 6% of all employed at the place of work, whereas the net commuting rate (right figure) varies between -130% to 75%. For the net migration rate, most districts in Eastern Germany with high unemployment rates show negative net migration rates, i.e. more emigrants than immigrants. Consequently, the net migration rate shows a clearly negative relationship with the unemployment rate and confirms the findings of the migration literature cited above. The coefficient for the unemployment rate amounts to -0.20 and is significant on the 1%-level. The R^2 of the estimation is quite high and amounts to 0.44. The regression of the commuting rate on the unemployment rate shows instead a slightly positive influence which is significant on the 5%-level. This is due to the fact that cities often display high unemployment rates as well as positive net commuter streams. But, as the R^2 of the estimation is almost zero (0.01), we conclude that commuting activities are largely independent of the unemployment rate. Thus, in the case of commuting, urban-rural structures are more likely to dominate the sign of the rate: rural districts often show negative net commuting rates, whereas urban districts have more incommuters than outcommuters.

Up to now, the relationship between migration, commuting and the unemployment rate was investigated by using net values. As net values hide the actual extent of mobility between districts, gross figures are probably still more important. They show the actual extent of the mobility present in the labour market and characterize the adjustment potential of these variables. If e. g. the unemployment rate in a district is 10%, but immigration amounts to 20 and incommuting even to 50% of all employed persons, one can easily imagine that additional workers needed through a positive labour demand shock are likely to come from all source, i.e. unemployed, immigrants and incommuters. Therefore, gross figures of migration and commuting for Federal States and districts are analysed in the following. As districts are quite small compared to larger regional units like Federal States, already relatively small distances are sufficient to cross a district boarder. Consequently, migration and com-

muting activities should be much more intense than on a larger regional level. The share of immigrants and incommuters to all employed in a district (place of work) can be seen in Figure 3:

Figure 3
Shares of immigrants and incommuters for districts in 2004



The left map of Figure 3 shows the immigration share with respect to all employed persons per district in 2004. With the exception of Göttingen, where the immigration share amounts to 82%[3], the immigration shares vary between 5% and 32%. As not all immigrants are at the same time new job owners as they bring their families with them, the share of immigrants who actually fill a vacancy should be lower. But, given the observed magnitude, these figures impressively demonstrate the importance of migration activities at district level. Generally, high immigration shares can be found in districts close to city districts. This development reflects recent suburbanisation trends. In Saxony, Saxony-Anhalt and Thuringia, immigration proportions are low, whereas especially around the capital city of Berlin and around big metropolitan areas like Munich (Bavaria), Frankfurt (Hesse) or Hamburg (City State of Hamburg), immigration shares are high.

[3] Immigraton and Emigration figures in the district of Göttingen amount to 71,803 and 70,920, respectively and thus amount to about 40% of the resident population. These figures show an enormous fluctuation and might be due to the large University situated in the district. As the migration effect in the estimations of Section 6 is determined as residual value and is therefore neither endogenous nor exogenous, the district remains in the sample and is not excluded.

The share of incommuters displayed in the right map of Figure 3 even shows much higher values than for immigration. The range of the incommuting share varies between 10% and 76% of all employed in a district. As commuters are defined as people who live in another district as they work, all incommuters are at the same time also employed in their district of destination. This means that up to ¾ of all employed in a district live outside the district they work. These figures show the potential influence that commuting activities might have on adjustment processes at district level in the aftermath of a labour demand shock. As can be seen from Figure 3, commuting patterns are even more clear cut than for immigration shares: with the exception of Berlin, commuter streams clearly concentrate towards city centres. Regions with low commuting figures are partly the same than those with low immigration rates. Those regions are probably simply not attractive to workers due to a lack of job offers.

To be able to compare the figures for districts to a larger regional level, we calculate different mobility measures for districts as well as for Federal States. The means of these measures over all 439 districts and 16 Federal States (East and West Germany) are displayed in Table 1:

Table 1
Different Mobility measures for districts and Federal States in 2004[4]

	Districts	Federal States	Districts/Federal States
Immigration share	13.18	7.75	1.70
Emigration share	12.38	8.03	1.54
Incommuting share	34.21	12.99	2.63
Outcommuting share	38.98	12.35	3.15
Incommuting/Immigration	2.84	1.56	1.82
Outcommuting/Emigration	3.49	1.61	2.17

For each regional level immigration and emigration as well as incommuting and outcommuting shares have approximately the same size. As each movement across a Federal States boarder is also registered as movement between districts, the figures for districts must necessarily be higher. The question that arises is how much: Emigration and immigration are about 1.5 to 1.7 times as large and incommuting and outcommuting ratios are even 2.6 to 3.2 times as large. Another important observation is that for districts as well as for Federal States, the commuting shares are higher than the migration shares. The ratio of commuting to migration is around 3 for districts, meaning that commuting activities are about 3 times as large as migration figures. For Federal States, this ratio still amounts to approximately 1.5.

[4] Immigration and incommuting shares are based on employment at the place of work, emigration and outcommuting shares are based on employment at the place of residence.

The main results from this short investigation are the following: The net migration rate shows a clear negative relationship with the unemployment rate, which demonstrates that migration streams move from high to low unemployment regions. Net commuting rates instead turn out to be largely independent from regional unemployment rates. The spread of both, net migration and net commuting rates across districts are immense, but, the spread of the net commuting rates is more than 10 times larger. Gross migration and commuting activities are also immense for districts as well as for Federal States, but mobility is still much larger for districts. Thus, migration and commuting offer a high potential for the adjustment behaviour of districts as well as for Federal States after adverse labour demand shocks. Consequently, the two different approaches to estimate the model of Blanchard/Katz (1992) discussed at the end of Section 2 need to be applied for both regional levels.

5 Empirical framework and district-specific data

This section introduces the empirical framework proposed by Blanchard/Katz (1992) and shortly characterises the region-specific dataset via the most important statistics. The estimation results and comparisons with other studies on regional adjustment are presented in Section 6.

In their seminal paper, Blanchard/Katz (1992) have developed a regional model to explain the adjustment mechanism at work after a region is hit by a shock (see Section 2). Furthermore, in the empirical part of their paper, they use a Vector-Autoregressive (VAR) approach for each single region and do pooled OLS-estimations for groups of regions and the whole US to trace the effects of a labour market demand shock on the regional employment level, the unemployment rate and the participation rate. Blanchard/Katz (1992) use simple differences between the regional and the aggregate variables to obtain region-specific variables. Our data are on a highly disaggregated regional level and show strong differences in the cyclical sensitivity, i.e. regional variables do not necessarily follow the development of their national counterparts. This holds for unemployment rates as well as for other variables like regional employment growth, employment rates or participation rates. As the aim of the estimations is to trace the adjustment of regional variables, variation in the data due to national effects has to be removed. As regions – especially on a small regional level – are different in their sector structure, the extent of the cyclical sensitivity varies substantially. Therefore, the influence of the national on the regional variables is estimated for each regional unit separately according to the cyclical sensitivity model developed by Thirlwall (1966) and Brechling (1967). The equation to estimate for each regional unit and each variable is

$$X_{it} = a_i + b_i X_t + e_{it}, \qquad (1)$$

where X_{it} and X_t are the regional and the national variable, respectively. Thus the parameter b_i measures, how a variable in region i is affected by variations in its national counterpart. Region-specific variables are then constructed as beta differ-

ences, i.e. the regional value minus b_i times the national value. For a general discussion about the construction of regional relative variables see Kunz (2009). The regional employment growth rate, $\tilde{N}_i$, can be approximated via the relation

$$\tilde{N}_{it} \approx \Delta log(N_{it}) = log(N_{it}) - log(N_{it-1}) \quad (2)$$

where N_i is the regional employment level. The regional relative employment growth rate, Δn_i, is then given by

$$\Delta n_{it} = \tilde{N}_{it} - \hat{\alpha}\tilde{N}_{Dt}, \quad (3)$$

where $\tilde{N}_i$ is defined as in equation (2) and $\tilde{N}_D$ is the national employment growth rate.

For the regional relative employment rate, e_i,

$$e_{it} = log(E_{it}) - \hat{\beta} log(E_{Dt}), \quad (4)$$

is used, where E_i and E_D stand for the regional and the national employment rate, calculated as the ratio of employment to the labour force.[5] As $\log(E_{it}) \approx -U_{it}$, the regional relative employment rate can also be interpreted as the negative of the regional unemployment rate, u_i, given by

$$u_{it} = U_{it} - \hat{\delta} U_{Dt}. \quad (5)$$

Last, the regional relative participation rate, p_{it}, can be calculated as

$$p_{it} = log(P_{it}) - \hat{\gamma} log(P_{Dt}) \quad (6)$$

where P_i is the regional participation rate (the regional labour force divided by the working age population) and P_D for the national counterpart.

To give an impression of the national and regional variation in the data, the minimum and maximum values of the regional employment growth rate approximated by log differences $\tilde{N}_i$, the employment rate E_i, the participation rate P_i for districts and the corresponding national means for Germany in 2004 are briefly described. The mean employment growth rate at the place of work for Germany was -1.48%. Those values were nearly the same for the employment rate measured at the place of residence. The regional variation of $\tilde{N}_i$ at the place of work was instead substantial and reached from -5.32% in the district Südwestpfalz (Rhineland-Palatinate) up

[5] Employment is the number of persons with a job that contributes to the social security system. The labour force is defined as the sum of employed and unemployed persons.

to 2.82% in the city district of Hamm (North-Rhine Westfalia). For the place of residence the employment growth rate also varied substantially although not as strong as for the place of work: the minimum of -3.82% was measured in Wilhelmshaven city (Lower-Saxony) and the maximum growth rate amounted to 0.74% in the city district Landau in der Pfalz (Rhineland-Palatinate). As the estimations in Section 6 only use regional employment and participation rates, both measured at the place of residence, here only these variables are described. The national employment rate, defined as employed over labour force[6], amounted to 88.72%. The regional span of the employment rate reached from 75.71% in Bremerhaven city (Bremen) to 95.51% in Eichstätt (Bavaria). The national mean of the participation rate, defined as labour force over the population aged 15-65 years, amounted to 54.40% in the year 2004. Similar to the regional employment rate, the participation rate across districts was found to vary within a span of about 20 percentage points: the lowest value was observed in the city district of Heidelberg (Baden-Württemberg) where only 42.01% of the working-age population were actually in the labour force, whereas the same value amounted to 62.40% in Coburg city (Bavaria). The region-specific values are then obtained by regressing the national on each regional time series for each variable.

Given these region-specific variables, the empirical framework of Blanchard/Katz (1992) is employed in the following system of equations:

$$\Delta n_{it} = \lambda_{i10} + \lambda_{11}(L)\Delta n_{it-1} + \lambda_{12}(L)e_{it-1} + \lambda_{13}(L)p_{it-1} + \varepsilon_{i\Delta nt} \quad (7)$$

$$e_{it} = \lambda_{i20} + \lambda_{21}(L)\Delta n_{it} + \lambda_{22}(L)e_{it-1} + \lambda_{23}(L)p_{it-1} + \varepsilon_{iet} \quad (8)$$

$$p_{it} = \lambda_{i30} + \lambda_{31}(L)\Delta n_{it} + \lambda_{32}(L)e_{it-1} + \lambda_{33}(L)p_{it-1} + \varepsilon_{ipt} \quad (9)$$

where λ_{ij} represents a lag-polynom and L is a time-series lag operator. The variables in the system are defined as in equations (3), (4) and (6) and were tested for stationarity according to common panel-unit-root tests proposed e.g. by Levin/Lin/Chu (2002) and Im/Pesaran/Shin (2003). The null of non stationarity is rejected on a highly significant level in both tests, i.e. all variables in the system are stationary[7]. To ensure that we indeed capture the effect of a labour demand shock, the regional relative employment growth rate may affect the unemployment rate and the participation rate in the same period but not vice-versa. The effect of an innovation in labour demand is identified by tracing the effects of a shock in the regional relative employment growth rate, $\varepsilon_{i\Delta nt}$.

6 The labour force is always measured at the place of residence.

7 In both tests, the null of non stationarity is rejected on the 1% significance level for all variables. The results can be obtained from the author upon request.

6 Regional adjustment dynamics

In this Section, the empirical framework of Blanchard/Katz (1992) is applied to West German Federal States and districts to obtain the adjustment processes of the involved labour market variables. The results are compared with respect to two dimensions: First, the results for Federal States are compared with the smaller regional level of districts. Second, the results for the estimations of shocks in the employment growth rate at the place of residence are compared to those estimated for shocks at the place of work. Before, a brief overview of results from several studies for different countries including Germany is presented.

6.1 International research results

In Table 2 the short-run-effects of a shock in employment and the duration until unemployment and participation rates return to their initial value (in years) have been summarized from a number of papers for different countries. The column "Adjustment" contains the share of adjustment that is captured by the unemployment rate u_i, the participation rate p_i, and migration m_i in first year of the shock. "Duration" is the number of years until the unemployment / participation rate return to their initial level for the first time. If the shock has settled in both variables, the additional workers that are needed to reach the new employment level come completely through migration.

Table 2
Selected research on regional adjustment (US, EU, EU countries)

Study		Adjustment			Duration	
Country	**Author ,year, region, time**	**u_i**	**p_i**	**m_i**	**u_i**	**p_i**
US	Blanchard/Katz (1992), 51 states, 1978-90	0.32	0.17	0.51	5	6
US	Decressin/Fatás (1995), 51 states, 1975-87	0.18	0.30	0.52	4	6
EU	Decressin/Fatás (1995), 51 regions, 1975-87	0.22	0.74	0.04	4	3
Spain	Jimeno/Bentolila (1998), 51 regions, 1975-87	0.36	0.23	0.41	>15	>15
UK	Decressin/Fatás (1995), 11 regions, 1975-87	0.15	1.00	-0.15	6	8
Italy	Decressin/Fatás (1995), 11 regions, 1975-87	0.28	0.67	0.05	2	∞
Sweden	Frederiksson (1999), 24 regions, 1966-93	0.08	0.26	0.66	2	2
Finland	Petteri (2003), 11 Provinces, 1976-96	0.33	0.61	0.06	1	12
Germany (W)	Decressin/Fatás (1995), 7 Regions, 1975-87	0.11	0.75	0.14	1	2

As the investigation of regional adjustment by Blanchard/Katz (1992) for the US and Decressin/Fatás (1995) for Europe and the US shows, adjustment to region-specific shocks differs between Europe and the US. First, the long-run effect on a regions employment share is much larger in the US than in Europe (not depicted in Table 2, see Decressin/Fatás (1995)). Second, they find that in the US, labour market shocks are immediately reflected in labour migration, whereas in Europe, the participation rate is the dominant equilibrating mechanism. In Europe, migration accounts only after three years in the aftermath of a shock for a substantial part of the adjustment

process. Surprisingly the regional unemployment rate is hardly affected after a region-specific shock in both, Europe and the US. Decressin/Fatás (1995) also provide results for German regions: similar to their results for Europe they find that the employment level rises permanently by approximately two third of the initial labour demand shock (not depicted in Table 2, see Decressin/Fatás (1995)). The adjustment process of the employment level has completely settled after about 9 years. As in their results for Europe, the labour force participation rate is the dominant equilibrating mechanism, whereas the unemployment rate and migration do not account for much in the first year after the shock. This can be similarly found in other European countries like Italy, the UK or Finland. In Spain, Sweden and the US instead, migration plays a more important role. A quick adjustment of the unemployment rate can also be found in Finland, Italy and Sweden, whereas the Spanish unemployment rate recovers only very slowly. Only the Swedish participation rate recovers nearly as quickly as the German one. The Finnish and the Spanish one need 12 and more than 15 years to reach their initial value and the Italian participation rate remains permanently at a higher level after a shock. The quick adjustment of both, the unemployment and the participation rate in Germany suggests strong migration flows in the years after the shock. Thus, already in the second year after the shock, the additional workers that are needed to reach the new employment level come completely through migration. A similarly quick adjustment pattern can be only observed for Sweden.

6.2 Estimation results for Germany

For the estimation of regional adjustment, the time series cover only nine observations for East German (1996-2004) and 16 for West German districts (1989-2004). Following the studies of Blanchard/Katz (1992), Decressin/Fatás (1995) or Frederiksson (1999), two lags are allowed for each variable[8]. Due to the differentiation and the inclusion of two lags of each variable, three observations are lost. As the estimation period for the series in East Germany thereby decreases to 6 observations (1999-2004), we do not run pooled regressions for the East German part and the unified Germany. Thus, estimation results are provided only for the relatively long period of 1989-2004 for West Germany. The estimations are additionally run for West German Federal States to compare the adjustment of different regional levels. Nickell (1981) shows that a fixed effects estimator in a dynamic panel model is inconsistent for fixed *t*. Pesaran/Smith/Im (1995) suggest a mean-group estimator, i.e. the mean of separate regressions obtained for each group, which yields consistent estimates of the average effects as the number of time periods increases to infinity. Frederiksson (1999) argues that the Seemingly Unrelated Regression (SURE) produces similar, but more precise results, as it is more efficient and considers the re-

[8] Tests results for the optimal lag length (AIC-/BIC-Criteria) showed that the inclusion of one lag for each variable would be sufficient. In order to allow for non-monotone adjustment paths and to be able to compare our results to the estimations of other authors, we also used two lags for each variable.

gional correlation between each variable in the VAR. Therefore, the system of equations above is estimated by three-stage-least squares (3-SLS) where all right hand side variables are assumed to be exogenous. This estimation procedure is equivalent to a SURE and has the advantage that it is still comparable to studies using a VAR-model estimated by OLS. As mentioned above, two lags are allowed for each variable. Additionally, a dummy-variable for each district in each equation is added to capture regional fixed effects. As already outlined in Sections 2 and 4, the estimations are carried out for two different scenarios: first, shocks in the employment growth rates observed at the place of residence are traced to measure the effect of a labour demand shock on unemployment, participation and migration. Second, shocks in the employment growth rates observed at the place of work are traced to measure the effect of a labour demand shock on unemployment, participation and labour mobility, defined as migration and commuting activities. The estimates of equations 7-9 for both scenarios of Federal States and districts in the period 1989-2004 are listed in The aim of the estimations is to compare the dynamics of the system for different regional levels with respect to the magnitude and the length of the adjustment mechanisms. Therefore we trace the effect of a one-standard-deviation shock in the relative employment growth rate. Figure 4 displays the adjustment of relative employment, the unemployment rate and the participation rate after a positive one-standard-deviation-shock to relative employment growth rate (a shock in $\varepsilon_{i\Delta n}$) at the place of residence according to the above estimation results. The corresponding 95%-confidence intervals are plotted as dotted lines.

Table 3.[9] The first column contains the independent variables of each equation. Δ is a time-series difference operator and the variables are defined as in equations 3, 4 and 6. Columns 2-5 show the estimation results equation by equation for each setting.

The aim of the estimations is to compare the dynamics of the system for different regional levels with respect to the magnitude and the length of the adjustment mechanisms. Therefore we trace the effect of a one-standard-deviation shock in the relative employment growth rate. Figure 4 displays the adjustment of relative employment, the unemployment rate[10] and the participation rate after a positive one-standard-deviation-shock to relative employment growth rate (a shock in $\varepsilon_{i\Delta n}$) at the place of residence according to the above estimation results. The corresponding 95%-confidence intervals are plotted as dotted lines[11].

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9 The values of the region-specific dummies are not presented to save space.

10 The results for the unemployment rate are obtained by using the relationship $u_{it} \approx -e_{it}$. By using this relationship, the unemployment rate as well as the participation rate are calculated with the same number of people in the labour force.

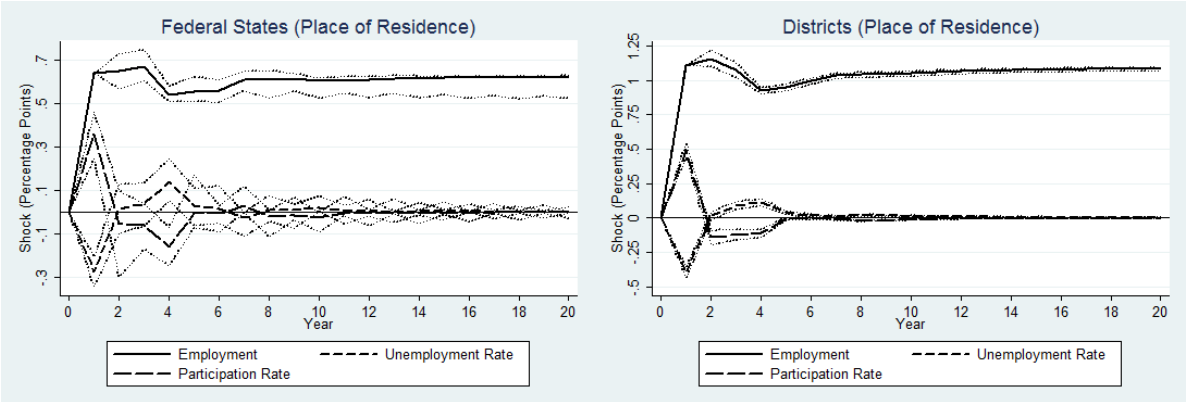
11 The 95%-confidence intervals were generated by bootstrap methods and are based on 1,000 replications of each estimation, see e. g. Efron/Tibshirani (1993).

Table 3
Estimation coefficients of regional adjustment (equations 7-9)

	Federal States: Place of		Districts: Place of	
	Residence	**Work**	**Residence**	**Work**
Observations	**130**	**130**	**4,238**	**4,238**
Equation (7)	Dependent Variable: Employment Growth Rate Δn_{it} Dependent Variable: Employment Growth Rate			
Δn_{it-1}	0.173	0.347***	0.157***	0.130***
Δn_{it-2}	0.350***	0.042	0.153***	0.087***
e_{it-1}	-0.096	-0.145	-0.046*	0.060
e_{it-2}	-0.249*	-0.134	-0.215***	-0.328***
p_{it-1}	-0.184**	0.054	-0.225***	-0.032
p_{it-2}	-0.081	-0.075	-0.047***	-0.116***
Equation (8)	Dependent Variable: Employment Rate e_{it}			
Δn_{it}	0.431***	0.525***	0.354***	0.132***
Δn_{it-1}	-0.055	-0.114	-0.063***	0.004
e_{it-1}	0.961***	0.989***	0.971***	0.932***
e_{it-2}	-0.302***	-0.275***	-0.236***	-0.240***
p_{it-1}	0.067	-0.021	0.099***	0.022**
p_{it-2}	0.061	0.073*	0.015	0.028***
Equation (9)	Dependent Variable: Participation Rate p_{it}			
Δn_{it}	0.561***	0.138	0.449***	0.029***
Δn_{it-1}	0.103	0.102	0.009	0.026**
e_{it-1}	0.097	0.147	0.031	0.060**
e_{it-2}	0.215	0.120	0.094***	-0.012
p_{it-1}	0.559***	0.532***	0.631***	0.569***
p_{it-2}	-0.090	-0.174*	-0.017	-0.056***

*, **, *** significant at the 10, 5 and 1 percent level

Figure 4
Adjustment of employment, unemployment and participation to a labour demand shock (Place of Residence)



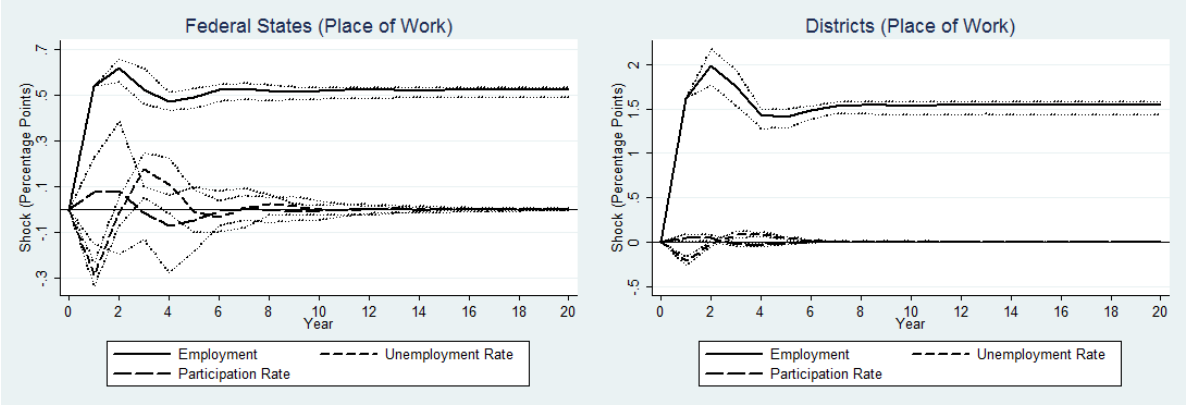
The adjustment process after a shock in labour demand shows that the unemployment as well as the participation rate return fairly quickly to their initial values whereas the employment level is permanently affected. This result holds for both regional levels. For Federal States, a shock of 0.64 percentage points rises the employment level permanently by nearly the same amount (0.62 percentage points). In the initial year, this shock increases the participation rate by 0.36 and decreases the unemployment rate by 0.28 percentage points. In the case of districts, the shock is nearly two times as large as for Federal States (1.11 percentage points) and causes a permanent rise in the employment level of about 1.09 percentage points. Thus, for Federal States as well as for districts, nearly the complete shock remains inside the region. In the first year, the shock increases the participation rate by 0.50 percentage points and causes a decrease of about 0.39 points of the unemployment rate.

Looking at the adjustment process of Federal States (left figure), the unemployment and the participation rate return to their initial value already in the period after the shock and have completely settled after about four years. The employment level in turn remains permanently on a plateau of about 97% of the initial shock which is reached after approximately six years. In the first year, the unemployment rate captures about 43 and the participation rate about 56% of the initial shock. According to the model, only the 1% left is adjusted by interregional migration (immigration in this case). The return to the initial value in the period after the shock and the “overshooting” of both, the unemployment and the participation rate in second and third year after the shock in the presence of a relatively stable employment level means instead that these variables must be overcompensated by substantial immigration in the following years.

For West German districts (right figure) the picture looks quite similar to the one for Federal States: Here, the unemployment rate captures roughly 35% of the initial shock and 45% of the shock are absorbed by an increase of the participation rate. Thus, as already observed for Federal States, in the year of the shock new jobs are mainly filled through people moving into the labour force or out of unemployment, but immigration accounts only little for regional adjustment. But, different to Federal States, migration still accounts for 20% of the shock during the first year. In the years after the shock, the adjustment is again very similar to the one observed already for Federal States, although less pronounced. The conclusion is again that immigration must be extensive in the year after the shock. After about four to five years, the initial shock in relative employment has nearly completely settled in all variables and relative employment remains permanently at about 98% of the initial shock.

The adjustment processes for Federal States and districts for a one-standard-deviation shock in the employment growth rate measured at the place of work are displayed in Figure 5.

Figure 5
Adjustment of employment, unemployment and participation to a labour demand shock (Place of Work)



The size of the shocks at the place of work is quite similar to the shocks measured at the place of residence for each regional level. Again, the unemployment as well as the participation rate return fairly quickly to their initial values whereas the employment level is permanently affected. The adjustment processes instead look differently: for Federal States, a shock of 0.54 percentage points rises the employment level permanently by nearly the same amount (0.52 percentage points). In the initial year, this shock increases the participation rate by only 0.07 and decreases the unemployment rate by 0.28 percentage points. In the case of West German districts, the shock is about three times as large as for Federal States (1.62 percentage points) and causes a permanent rise in the employment level of about 1.54 percentage points. In the first year, the shock increases the participation rate by only 0.05 percentage points and causes a decrease of about 0.21 points of the unemployment rate. The adjustment path of the participation rate is not significant for Federal States and displays only a very small positive significant effect for districts. Thus, for both regional levels, the participation rate contributes almost nothing to regional adjustment in the first year.

In the case of Federal States (left figure), the unemployment rate returns to its initial value already in the period after the shock whereas the participation rate returns in the second period after the shock. The adjustment processes have nearly completely settled after about four to five years for both variables. The employment level in turn remains permanently on a plateau of about 96% of the initial shock which is reached after approximately five years. In the first year, the unemployment rate captures about 52% and the participation rate about 14% of the initial shock. Following the considerations of Section 2, the remaining 34% left must be adjusted by immigration and incommuting. Thus, compared to the estimation for the place of residence, the unemployment rate, migration and commuting activities are responsible for the adjustment of Federal States in the first year. The return to the initial value in the periods after the shock and the overshooting of the unemployment and the participation rate in the second and third year after the shock in the presence of a relatively stable employment level is again characterised by a substantial response of immigration and incommuting.

For West German districts, the unemployment rate captures only roughly 13% of the initial shock and only a negligible part of the shock (3%) results in an increase of the participation rate. Thus, in the year of the shock, 84% of the new jobs are filled through people migrating or commuting into the district, whereas unemployed persons getting a new job account for only a small share and people moving into the labour force do almost not occur. Compared to Federal States the adjustment share of immigration and incommuting in the year of the shock is nearly 2.5 times as high. In the following years, the adjustment processes of unemployment and participation are also characterised by overshooting, but the extent is negligible. The conclusion is that immigration and incommuting react so quickly that nearly the whole shock is already absorbed in the same year when it occurs. The relative employment level remains permanently at about 95% of the initial shock.

The results of the estimations for Germany are summarized in Table 4 according to the structure of Table 2[12].

Table 4
Results for regional adjustment in Germany

Study		Adjustment			Duration	
Country	**Region, time, place of employment**	u_i	p_i	m_i	u_i	p_i
Germany (W)	10 Federal States, 1989-2004 (residence)	0.43	0.56	0.01	1	1
Germany (W)	10 Federal States, 1989-2004 (work))	0.52	0.14	0.34	1	2
Germany (W)	326 districts, 1989-2004 (residence)	0.35	0.45	0.20	1	1
Germany (W)	326 districts, 1989-2004 (work)	0.13	0.03	0.84	1	2

Altogether, the results of the present paper are in line with other studies in this field. Compared to Decressin/Fatás (1995), who stress the participation rate as dominant equilibrating mechanism in Germany and Europe, our estimates suggest that the unemployment rate also contributes a substantial part. If the estimations additionally allow for commuting, the share of adjustment through labour mobility rises to one third of the initial shock whereas only 14% is captured by the participation rate. Similar to Decressin/Fatás (1995), unemployment and participation rates return to their initial values already in the year after the shock. This suggests strong labour mobility in the year after the shock and demonstrates that commuting is an important adjustment mechanism even in the case of larger regional units as Federal States that must be accounted for.

[12] To avoid the effects of relatively small (City) Federal States, we also run our estimations for the same seven regions as in Decressin/Fatás (1995), where figures for the City States Bremen and Hamburg and the relatively small State Saarland were added to larger Federal States to obtain more homogenous regions. The results were similar to the estimations for Federal States. Only the migration share in the year of the shock is a little more pronounced.

The main results of this Section are the following: First, smaller regional units as districts adjust differently than larger regional units, e.g. Federal States. In both estimations – labour demand shocks at the place of residence and at the place of work – interregional mobility accounts for a significantly larger proportion of the adjustment process in the case of districts than on a larger regional level. Unemployment and participation in turn account for lower shares. Second, migration and commuting activities turn out to play an important role for regional adjustment. This observation is especially important and very distinct for districts but holds as well for Federal States. Third, the duration until the initial values of the unemployment and the participation rate are reached again is only about one to two years. Thus, slow working adjustment mechanisms in the aftermath of labour demand shocks are not responsible for persistent unemployment differentials as described in Section 1.

7 Conclusion

The paper shows that migration and commuting activities are distinct for districts as well as for Federal States, but several mobility measures are larger for districts. Regressions of the net migration and the net commuting rate on the regional unemployment rate show a clear negative relationship of net migration and unemployment, whereas net commuting turns out to be largely independent from regional unemployment. This demonstrates that migration streams move from high to low unemployment regions. Commuter streams are instead driven by urban-rural patterns and can rather be interpreted as labour movement across districts to even out sharp structural differences.

The results for the different mechanisms of labour market adjustment according to the model of Blanchard/Katz (1992) obtained for Federal States and districts are in line with other studies in this field. Estimations of shocks to labour demand at the place of residence suggest that adjustment to region specific shocks in the first year is mainly through participation behaviour and unemployment changes, not by migration. But, as unemployment and participation rates return to their initial values already in the year after the shock, this suggests strong migration flows in the year after the shock. These results hold for Federal States as well as for districts. If, however, the estimations additionally allow for commuting as adjustment mechanism, the picture changes considerably: compared to the estimation at the place of residence, the unemployment rate and interregional mobility (i.e. migration and commuting activities) capture the major part of adjustment during the year of the shock. The participation rate in turn accounts for only a very small share. Thus, migration and commuting are highly relevant for the adjustment behaviour of districts as well as for Federal States. Again, the duration until the unemployment and the participation rate return to their initial values is only about one to two years. As this fast adjustment holds for all different estimations, slow working adjustment mechanisms in the aftermath of labour demand shocks are not responsible for persistent unemployment differentials as described in Section 1.

Furthermore, the adjustment processes of districts and Federal States differ substantially with respect to the degree of openness: in both estimations – labour demand shocks at the place of residence and at the place of work – interregional mobility accounts for a significantly larger proportion of the adjustment process in the case of districts than on a larger regional level. Unemployment and participation rates in turn account for lower shares. Thus, the hypothesis that the adjustment process for smaller spatial units is much more reflected in interregional migration or commuting and less in changes in the unemployment and the participation rate, is confirmed.

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