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Does labour mobility reduce disparities between regional labour markets in Germany?

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Abstract

Differences in regional labour market conditions are still pronounced in Germany, especially between the Eastern and the Western part. Traditional neoclassical models imply that labour mobility should reduce such disparities. In contrast, models that include externalities or selective migration suggest that regional differences may well increase due to the interregional migration of workers. We investigate the impact of labour mobility on regional disparities in Germany between 1995 and 2005. Considering the impact of migration as well as commuting, effects on regional wages and unemployment are estimated. Our results suggest that labour mobility tends to reduce disparities; however, we find significant effects on unemployment disparities only.

Key Words: Regional disparities, migration, commuting, Germany

JEL: C23, J61, R23

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1 Introduction

Regional differences in labour market performance are still pronounced in Germany although the economic transformation of East Germany started almost two decades ago. GDP per capita in East Germany amounts to 68% of the West German level in 2009. The East German unemployment rate (13%) is nearly twice the rate in the Western part of the country. The variation in regional unemployment rates at the county level even range up to 16 percentage points in 2009. Whereas some regions in Bavaria display unemployment rates of less than 3%, several East German regions still suffer from unemployment of almost 20%. But disparities are not only marked by systematic differences between East and West Germany. The dispersion is considerable in West Germany as well, where disparities are particularly pronounced when comparing Northern to Southern regions. For example Eichstätt, a county in the South of West Germany, shows an unemployment rate of 2.2% in 2009, whereas it amounted to 15.4 % in Bremerhaven in the North.

Labour mobility is supposed to be important for the development of such regional inequalities, although from a theoretical perspective there is no clear-cut answer to the question whether migration reduces regional labour market imbalances. According to traditional neoclassical models, migration tends respond to and decrease regional disparities. Labour mobility is supposed to be conducive to the convergence of labour market conditions since the impact of mobility on labour supply is dominant, i.e. labour demand should not be affected in a significant way. More recent approaches, however, suggest that labour mobility might as well reinforce differences in regional unemployment and wages. Externalities and selective migration tend to cause such effects of mobility (Kanbur and Rapoport 2005). In corresponding models, the impact of labour mobility is not restricted to labour supply. There are also reper-

cussions on labour demand. According to new economic geography models, migration might result in diverging labour market conditions because labour mobility can, due to externalities, trigger a process of cumulative causation (see Südekum 2005, Epifani and Gancia 2005). As workers move to high-wage/low-unemployment regions, labour market conditions in these prosperous regions further improve relative to the regions of origin since the inflow of labour strengthens economies of agglomeration.

Our analysis aims at providing empirical evidence on the impact of labour mobility on regional disparities in Germany. The striking and persistent disparities in labour market performance across regions and high internal migration between East and West Germany predestine the country for an analysis of the impact of mobility on regional disparities. We consider effects on wages as well as effects on unemployment, whereas most other studies focus on one aspect only, either on income convergence or on the development of unemployment disparities. An investigation of price *and* quantity effects might, however, provide new important insights since the effects of labour mobility on regional wages and unemployment are likely to differ e.g. due to wage rigidities. Moreover, in contrast to the majority of comparable analyses that pay little attention to the role of commuting we consider both the impact of migration and commuting. Finally, we distinguish between in- and out-migration (-commuting) as proposed in Østbye and Westerlund (2007), thereby allowing for asymmetric effects due to differences in the composition of in- and out-going flows.

Our regression results suggest that there are indeed significant effects of mobility in Germany, however robust evidence is restricted to unemployment disparities. Changes in regional labour supply caused by mobility seem to affect unemployment rather than wages. Furthermore, migration as well as commuting matter for unemployment disparities, and their effects tend to be in line with neoclassical reasoning. Evidence on asymmetric effects of in- and out-going

mobility flows suggest that there might also be significant effects on labour demand which could be linked to the structure of mobility flows, externalities or changes in consumption and investment caused by mobility. These labour demand effects are, however, not strong enough to outweigh the labour supply effects.

The paper is organised as follows. The next section briefly outlines empirical findings on regional disparities and labour mobility. Our theoretical framework is discussed in section 3. Section 4 provides information on the data. In Section 5 some descriptive evidence on regional disparities and labour mobility in Germany is presented. Section 6 describes the econometric models and related issues in detail. In Section 7, we present the results of the regression analysis and discuss their robustness. Section 8 concludes.

2 Empirical Evidence

One strand of empirical literature dealing with regional disparities and labour mobility investigates the adjustment mechanisms that region-specific shocks may trigger. Empirical evidence for the US provided in the seminal paper by Blanchard and Katz (1992) suggests that labour mobility, more than any other adjustment mechanism, is decisive in reducing regional disparities. This view is challenged by results in Partridge and Rickman (2006) since they find that less than one-half of changes in migration are in response to asymmetric regional demand shocks. As only mobility flows that are demand driven should reduce disparities, the impact of total mobility on disparities should be rather limited according to this argument. Findings for EU countries and the US tend to differ significantly. Results by Eichengreen (1992) suggest that in Britain and Italy the elasticity of migration with respect to unemployment is only half compared to US. Puhani (2001) concludes that labour mobility is unlikely to act as a suf-

ficient adjustment mechanism to asymmetric shocks in Europe. The findings in Decressin and Fatás (1995) indicate that in Europe adjustment is mainly through labour force participation whereas in the US migration effects dominate.[1] According to Baddeley et al. (2000) it is rather low labour migration than wage inflexibility that explains persistent unemployment disparities in Europe. And finally, Bayer and Jüßen (2007) provide evidence for convergence of unemployment rates in Germany, whereas Möller (1995) and Südekum (2004) point to persistent disparities in regional unemployment. Results by Südekum even suggest that in contrast to the implications of neoclassical models migration tends to reinforce differences in labour market conditions among regions. However, evidence is restricted to West Germany so far.

A second strand of literature focuses on convergence of per capita income departing from the traditional neoclassic growth model, takes a more long-term perspective than the studies mentioned above. Starting with the seminal study of Barro and Sala-i-Martin (1991) an extensive literature has emerged that deals with the question whether poor regions grow faster than rich regions and thus catch-up in terms of per capita income. Within the framework of the neoclassical growth model migration is conducive to faster convergence. Yet, as noted by Kırdar and Saracoğlu (2008), few convergence studies have examined the impact of labour mobility on income disparities. Results in Barro and Sala-i-Martin (2004) and Kırdar and Saracoğlu (2008) suggest that taking migration into account reduces the estimated speed of convergence. Thus, ignoring the contribution of labour mobility to the decline of income disparities gives rise to upward-biased estimates of the convergence rate. Østbye and Westerlund (2007) confirm that migration has an effect on the rate of convergence in Sweden and Norway. However, whereas mobility supports the decline of income disparities in Sweden, it counteracts convergence in Norway.

The majority of empirical results suggests that labour mobility tends to reduce regional disparities, but evidence is not clear-cut. Moreover, the strength of the effect varies considerably between national contexts. Furthermore, most analyses of regional disparities tend to focus on the impact of migration flows and pay little attention to the role of commuting (see Patacchini and Zenou 2007, Elhorst 2003). However, Burda and Hunt (2001) note that migration is only one aspect of labour mobility between East and West Germany. Commuting has acted as a substitute for out-migration for East German workers because the decision to migrate generally involves higher mobility costs. Especially workers living in a region that shares a common border with West Germany tend to commute rather than to migrate. Results by Einig and Pütz (2007) confirm the importance of out-commuting for less prosperous labour markets, notably for regions in East Germany. Empirical evidence in Hunt (2006) suggests that when analysing mobility commuting should not be neglected because of the strong linkages between migration and commuting that base e.g. on the springboard function of commuting for future migration. In line with the discussion about the correlation between the two forms of mobility, Elhorst (2003) argues that commuting should generally not be ignored if administratively defined regions are analysed.

3 Theoretical Framework

There are several theoretical approaches that deal with the question how mobility might affect regional disparities via labour supply and labour demand. According to traditional neoclassical models, labour mobility tends to respond to and decrease regional disparities (Kanbur and Rapoport 2005). Mobility is conducive to the convergence of labour market conditions since its impact on labour supply dominates possible labour demand effects. If workers move from low wage to high wage regions, the growth of labour supply will exert downward pressure on the wage level in the destination region. Assuming that wages are rigid, labour mobility will

affect regional unemployment. The net in-migration will increase unemployment in the region of destination because either the in-migrant displaces another worker or remains jobless. However, as Elhorst (2003) notes if the in-migrant happens to be an out-commuter or a non-participant there will be no increase in regional unemployment.[2]

Due to frictional effects of distance and transaction costs, a migration equilibrium might be compatible with regional disparities even in a neoclassical setting. If mobility costs matter, migration between two regions will cease if the wage (unemployment) gap corresponds with the mobility costs (Niebuhr and Stiller 2006). Moreover, regional wage differences may simply reflect disparities in regional amenities. There might be no labour mobility despite significant wage differentials because workers accept relatively low wages in high amenity areas whereas employees residing in low amenity regions likely require above average wages in order to be compensated for the poor environmental quality (McCann 2002). Similarly amenities might be considered as a compensating differential for higher risk of unemployment (Elhorst 2003).

In contrast to traditional neoclassical reasoning, New Economic Geography (NEG) models suggest that labour mobility might as well increase regional disparities. Südekum (2005), Francis (2009) and Epifani and Gancia (2005) introduce equilibrium unemployment in standard NEG models in order to investigate the impact of migration on regional differences in wages and unemployment. In these models, the impact of labour mobility is not restricted to labour supply. There are also repercussions on labour demand. Migration might result in diverging labour market conditions because labour mobility can, due to externalities, trigger a process of cumulative causation. As workers move to high-wage/low-unemployment regions, labour market conditions in these prosperous regions further improve relative to the regions of origin since the inflow of labour strengthens economies of agglomeration.

Südekum (2005) shows that labour migration might not be an equilibrating force due to localized increasing returns in production. However, full concentration of economic activity will not emerge if a centrifugal force such as disutility from congestion or high housing costs is considered. The main implication of the model is that the agglomerated core region will be marked by a higher wage level and lower unemployment compared to the periphery. Francis (2009) introduces endogenous job creation and destruction in a NEG model. Within this framework, in-mobility reduces unemployment since job creation caused by mobility outweighs job destruction effects. Epifani and Gancia (2005) suggest that mobility might result in divergence of regional labour market conditions due to significant frictions in the job matching process. An increase in labour supply caused by in-migration reduces search costs for firms thereby inducing the opening of new vacancies and improved labour market conditions.

Selective migration can also result in increasing regional disparities (see Burda and Wyplosz 1992, Feser and Sweeney 2003). Mobility of high-skilled workers might set off a process of cumulative causation even within a neoclassical framework. The inflow of qualified employees induces productivity growth and increasing wages of workers in the region of destination, whereas labour market conditions deteriorate in the region of origin.[3] The incentive for skilled workers to move to high-wage regions is reinforced as a result of mobility and regional differences in unemployment and income will increase because of selective migration.

Selective migration might also bring about asymmetric mobility effects. Ostbye and Westerlund (2007) argue that with heterogeneous labour, the usually assumed symmetrical treatment of in- and out-mobility cannot be justified a priori. Due to possible heterogeneity among migrants, gross migration flows may lead to considerable interregional redistribution of human

capital even when net migration is zero. If immigrants possess different skills than the work force in the receiving region significant labour demand effects of immigration might result (Elhorst 2003). However, externalities or changes in consumption and investment caused by mobility might also result in asymmetric effects of in- and out-going mobility flows due to their potential impact on labour demand. Elhorst (2003) and Partridge and Rickman (2006) provide detailed discussions of potential labour demand and supply effects of mobility.

The theoretical arguments so far mainly refer to labour migration, although commuting of workers might also matter for the development of regional disparities. Elhorst (2003) argues that the direction of effects resulting from commuting and migration are the same if commuting acts as a substitute for migration. However, labour supply and direct employment effects of migration and commuting most likely differ. Commuting might, e.g., arise from a spatial mismatch between local job applicants and vacancies. In this case commuters do not compete directly with the local workforce. Therefore the impact on unemployment or wages might be relatively small compared to the effects that migrants have when searching for a job in the new location.[4] In consequence inward migration is supposed to raise regional unemployment (reduce wages) whereas inward commuting not necessarily affects unemployment and wages. Altogether, there are good reasons to expect stronger supply side effects from migration than from commuting.

Demand effects in the region of destination resulting from commuting might also be smaller than those induced by migration, because commuters probably spend most of their income at the place of residence and only a minor part in the county where their workplace is located. Unlike commuters, migrants who live and work in the same region presumably centre their consumption in the region of destination. In line with this reasoning, Elhorst (2003) argues that in the region of destination labour supply effects of commuting more likely dominate

potential labour demand effects than is the case for migration due to different patterns of consumption of commuters and migrants.

To put it in a nutshell, labour mobility can be either an adjustment mechanism towards convergence of regional labour market conditions or give rise to a process of cumulative causation and divergence. Forces for divergence might result from agglomeration effects and selective migration (Kanbur and Rapoport 2005). Chalmers and Greenwood (1985) ague that the sign of the mobility effect is an empirical question because both labour supply and demand likely change, the former directly and the latter indirectly. Demand effects of mobility occur for several reasons. If relative to the receiving population migrants possess differential endowments of human capital they will contribute to local productivity. Moreover, migrants may invest in receiving localities, increase the market size and contribute to agglomeration economies. Thus, whether wages and unemployment increase or decrease due to inward mobility depends upon the relative shifts of labour supply and demand curves. Moreover, the discussion of theoretical arguments indicates that, apart from migration, commuting flows might also matter and that the effects of mobility on labour demand and supply are not necessarily symmetric.

4 Data

Analyzing regional disparities we use annual data that is aggregated at county level. The spatial units of observation in our data are the 439 German counties that correspond with the NUTS3 level. We drop counties that are affected by massive immigration of ethnic German repatriates and in addition we exclude the counties Eisenach and Wartburgkreis due to changes in demarcation. All in all the analysis comprises 430 counties, 320 located in West

Germany and 110 in East Germany. Our data set covers the period from 1995 to 2005. Altogether 3440 observations are available for the unemployment model (we cannot use 2005 data because of the bias resulting form the Hartz-IV legislation[5]) and 3870 observations for the income model.

To investigate the impact of labour mobility empirically we use different data sources. Most variables are extracted from the employment history statistic of the Institute for Employment Research (IAB). The employment statistic covers all employees subject to social security contributions. We exclude observations with part-time employment and missing information on wage and educational attainment from our data set.

The regional wage level – as one important aspect of regional disparities to be analysed – is measured as the 40% percentile of the distribution of daily wages in the corresponding county. This percentile is used to avoid bias due to the fact that individual wage information is trimmed at the social security threshold. We also tested measures like the mean and the median of the regional wage level, but they proved to be inappropriate because both measures coincide with the social security threshold in high-wage regions. Thus, the median and the average wage are censored in at least 40 counties, whereas the 40% percentile is unaffected. In addition to the wage level we also explore unemployment rates using the official unemployment figures of the German Federal Employment Agency.

As the study aims at investigating the impact of labour mobility on regional disparities, commuting is an important explanatory variable. Commuters are identified by comparing the county of residence and the county of workplace. The definition implies that we consider only commuting within Germany.

The second set of independent variables of primary interest refers to migration. Migration is defined as a change of residence location, i.e. migration between counties. As information on migration is not available in the employment statistic until 1999, we use figures provided by the Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR). In contrast to the employment statistic, these figures do not refer to employees only. The migration flows include changes of residence of the entire population. To reduce mis-measurement, we restrict the migration and population data to the age group 25 to 50 years, since most members of this group should belong to the active working population. As the migration data include no information on the educational attainment of workers, we cannot investigate the effects of selective migration.

In detail we use the following mobility variables in the regression model[6]:

Net-migration rate: difference between in-migration into region *i* and out-migration in year *t* divided by population of the region in *t* $\left(nmr_{it} = \frac{im_{it} - om_{it}}{pop_{it}} \right)$

Net-commuting rate: difference between in- and out-commuting in *t* divided by regional employment in *t* $\left(ncr_{it} = \frac{ic_{it} - oc_{it}}{ep_{it}} \right)$

In-migration rate: in-migration into region *i* divided by population of the region in *t* $\left(imr_{it} = \frac{im_{it}}{pop_{it}} \right)$

Out-migration rate (omr_{it}) is defined analogously to the in-migration rate.

In-commuting rate: in-commuting in year *t* divided by regional employment in *t* $\left(icr_{it} = \frac{ic_{it}}{ep_{it}} \right)$

Out-commuting rate: out-commuting in *t* divided by number of employees living in region *i* in *t* $\left(ocr_{it} = \frac{oc_{it}}{epop_{it}} \right)$

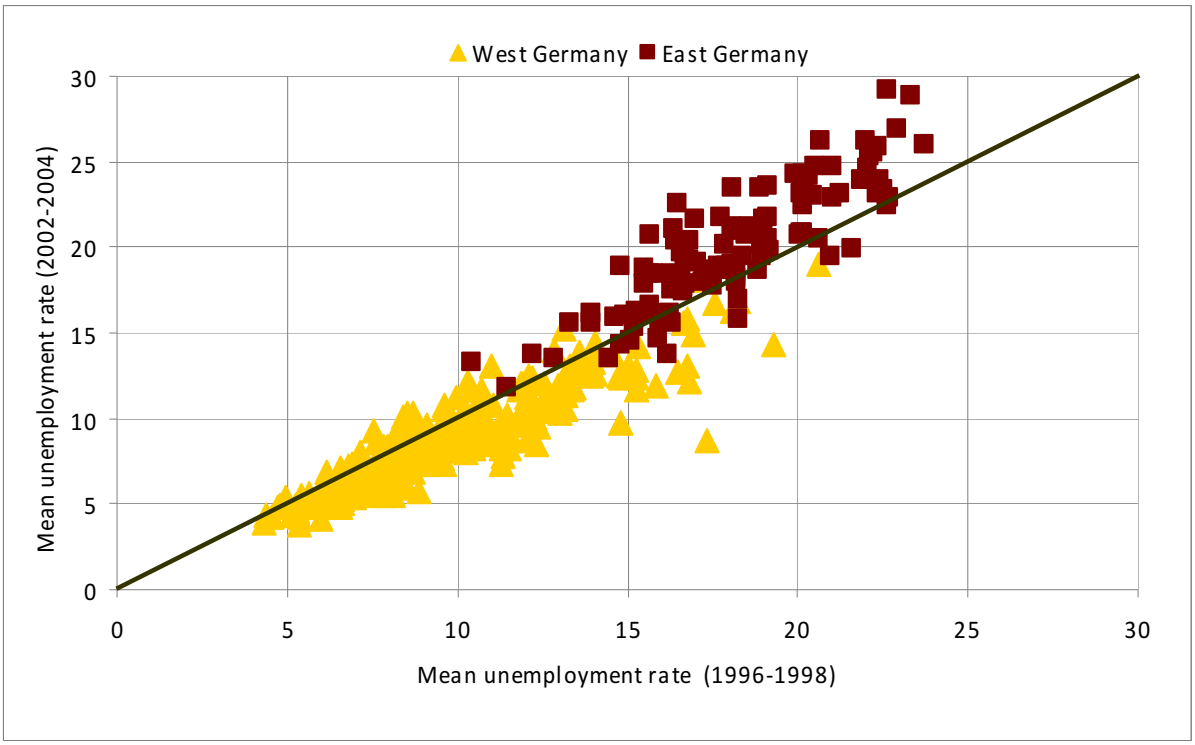
Additionally, we include a number of control variables at county level in the regression model. Population density is used to capture agglomeration effects. In order to account for structural effects on regional disparities we incorporate indicators for the sectoral composition of the region. We measure the specialization of counties by employment shares, i.e. the percentages of regional employment in aggregated branches. We differentiate between agriculture, construction, industry and services. We also control for structural change because a pronounced reallocation of jobs between industries might affect regional labour market conditions. As an indicator for structural change we apply the sum of absolute annual changes in employment shares across 26 industries. The educational attainment of the regional work force might also affect the development of regional labour market conditions. In order to approximate the qualification level, for each county we compute the shares of three different qualification groups (no formal vocational qualification, completed vocational training, university degree) in total regional employment.

To account for possible endogeneity of explanatory variables in our analysis, we apply – apart from GMM-type instruments – two additional external instrument variables. First, we use migration figures for the population older than 65 years. As a second instrument regarding commuting, we apply car density, measured as the number of cars per 1,000 inhabitants (see Section 6 for details). Both variables are provided by the BBSR and are expected to correlate with labour mobility, but should not directly affect labour market conditions, i.e. regional unemployment and wages. Therefore they should be suitable instruments for migration and commuting.

5 Disparities and labour mobility in Germany – some descriptive evidence

Disparities in labour market performance between German counties are substantial and have partly been increasing over recent years. The development of regional unemployment shown in Figure 1 clearly confirms these statements. Comparing East and West German counties two distinct patterns emerge. In the majority of West German counties unemployment rates have declined. In contrast to that, regional unemployment in East Germany has considerably increased over the years included in our analysis. Another very obvious finding is that all in all unemployment tends to be much higher in East Germany during the whole period.

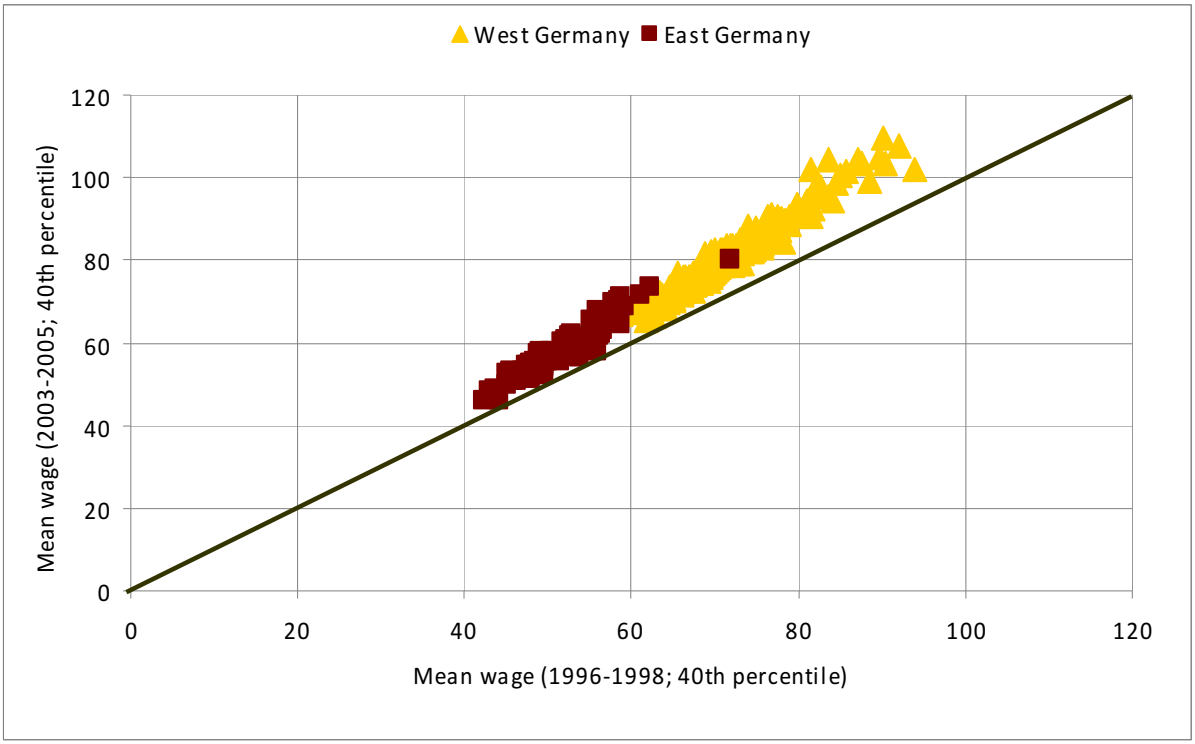
Figure 1: Development of regional unemployment rates



The scatter plot of regional wages (Figure 2) also indicates that labour market conditions in East Germany are less favourable than in West Germany. First of all, the wage level in the

Eastern part of the country tends to be lower than in the West, the only remarkable exception being Berlin. In contrast to unemployment, income levels have developed similarly, i.e. they have risen in both parts of Germany. However, in the Western counties the increase has been more pronounced. Moreover Figure 2 shows that wage dispersion in the West is higher than among Eastern counties.

Figure 2: Development of regional wage levels

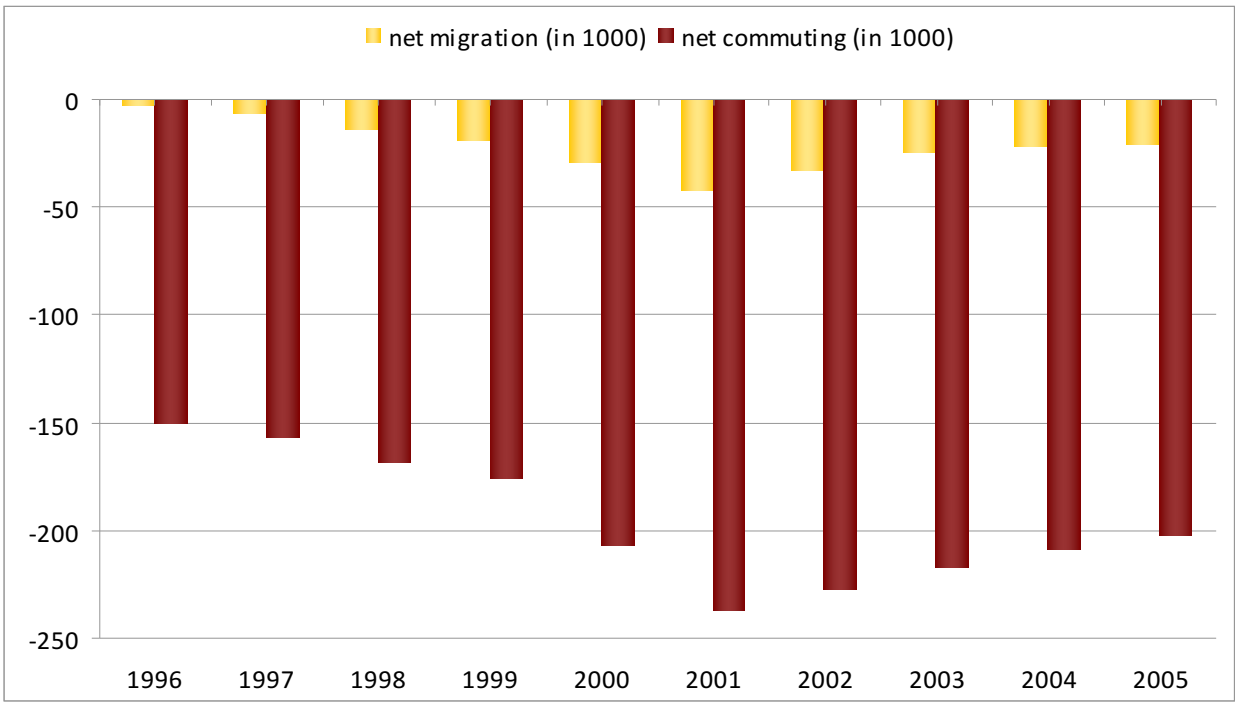


Comparing the development of disparities as indicated by the regional levels of unemployment and income two differences can be observed. First, the coefficient of variation for the regional wage level shown in Figure 3 is much smaller than the respective coefficient for unemployment. And, whereas the variation increases over time with respect to unemployment, it is rather stable with respect to wages. Although a systematic variation in regional levels of wage and unemployment exists in Germany, only the differences between unemployment levels increase over time.

Figure 3: Coefficients of variation for unemployment rate and wage level

How do the sketched developments of disparities relate to the existing mobility patterns in Germany? The picture in Figure 4 is very clear. Between 1996 and 2005 out-migration and out-commuting to Western counties have been constantly exceeding in-mobility into East Germany. Mobility losses intensified until 2001, after that a slight but constant decline starts. This seems to correspond somewhat with the decreasing unemployment disparities after 2001. According to neoclassical models this out-mobility should mitigate labour market conditions in East Germany and consequently reduce regional disparities. On the other hand, new economic geography models and models on selective migration suggest, that disparities might even increase as a consequence of unbalanced mobility flows. Our descriptive findings show an increase of disparities, while mobility losses in East Germany decline but are still considerable. Persistent regional disparities despite significant migration and commuting flows between East and West Germany raise the question whether labour mobility is conducive to convergence at all. To conclude from these descriptive findings that mobility flows do not reduce regional disparities would seem rather rash, however. In order to understand the effect of mobility on regional disparities more elaborate analyses and more sophisticated methods are required.

Figure 4: Development of East-West-mobility in Germany



6 Econometric issues

Our regression analysis focuses on the impact of labour mobility, i.e. migration and commuting, on regional differences in unemployment and wages in Germany. The investigation is based on two basic regression models that differ only with respect to the dependent variable. The data set contains annual observations for all variables for the period 1995 to 2005 on NUTS 3 level. The basic version of the regression model for regional unemployment is given by:

$$u_{it} = \alpha_1 u_{it-1} + \alpha_2 nmr_{it-1} + \alpha_3 ncr_{it} + \sum_{n=1}^{N} \gamma_n x_{nit} + \eta_i + \varphi_t + \varepsilon_{it} \qquad (1)$$

where u_{it} is the relative unemployment rate of region *i* in year *t*. The relative unemployment rate is defined as the ratio of regional to national unemployment rate. nmr_{it-1} and ncr_{it} are the net-migration rate of the previous year and the net-commuting rate respectively (for details see Section 4). Since the focus of this approach is on net-mobility rates we call this model the net-mobility model. If mobility contributes to a decline of regional labour market disparities, the coefficients of both net-mobility rates should be positive in the model given by equation (1).

The coefficient α_1 of the lagged dependent variable measures the persistence of relative unemployment, with the persistence of shocks increasing as α_1 approaches unity. We also consider control variables x_{nit}, which comprise population density to measure agglomeration effects and indicators for the sectoral composition of regional economies. Furthermore, the intensity of structural change and the qualification level of the work force are taken into account (see Section 4). The impact of other regional characteristics should be captured through inclusion of the lagged dependent variable. η_i denotes a region-specific effect, controlling for unobservable regional characteristics that are time-invariant, φ_t captures unobservable time effects and ε_{it} is the remainder disturbance.

The corresponding regression model for wages is given by:

$$w_{it} = \beta_1 w_{it-1} + \beta_2 nmr_{it-1} + \beta_3 ncr_{it} + \sum_{n=1}^{N} \delta_n x_{nit} + \mu_i + \phi_t + \xi_{it} \qquad (2)$$

where w_{it} is the log of the wage in region *i* and year *t* and w_{it-1} is the log of the wage level in *t*–1. The wage level is measured as the 40% percentile of the distribution of wages in the cor-

responding region. In case of neoclassical mechanisms dominating the effects of mobility on disparities, we expect the coefficient of nmr_{it-1} to be negative. If we assume that commuting can be considered a substitute for migration the impact of ncr_{it} on wages should also be negative.

Following Østbye and Westerlund (2007) we modify the models by differentiating between in- and out-mobility. The corresponding gross-mobility model for unemployment is given by:

$$u_{it} = \alpha_1 u_{it-1} + \alpha_4 omr_{it-1} + \alpha_5 imr_{it-1} + \alpha_6 ocr_{it} + \alpha_7 icr_{it} + \sum_{n=1}^{N} \gamma_n x_{nit} + \eta_i + \varphi_t + \varepsilon_{it} \qquad (3)$$

with gross mobility variables imr_{it-1}, omr_{it-1} and ocr_{it} , icr_{it} defined as described in Section 4. Whereas the net mobility variables nmr_{it-1} and ncr_{it} are supposed to mainly capture the result of the quantity effect of labour mobility working via labour supply, results for gross mobility rates might provide additional evidence on qualitative effects of mobility via labour supply and labour demand. Findings might therefore point, e.g., to the importance of agglomeration effects or the significance of heterogeneous labour mobility and a redistribution of human capital between regional labour markets.[7] If traditional neoclassical mechanisms mark the impact of mobility on regional disparities in equation (3) the outward flows (coefficients α_4 and α_6) will have negative effects on the regional unemployment whereas the inward flows (coefficients α_5 and α_7) will increase unemployment. The opposite applies to the corresponding wage model.

Moreover, if there is only a significant impact of mobility on labour supply symmetric effects in terms of absolute size but of opposite sign of in- and out-going labour should prevail. In contrast, asymmetric effects, i.e. differences in size of the coefficients, or signs of the coeffi-

cients that are not in line with neoclassical reasoning might indicate significant labour demand effects of mobility that could result from composition effects, externalities, consumption or investment effects of mobility. In particular, ocr_{it} aims at effects on labour demand released by regional purchasing power and its impact on demand for non-tradables in region *i*. However, this effect might be important for East German regions only, as especially those along the former iron curtain are marked by considerable out-commuting to West Germany and a favourable development relative to the East German average. For this reason we also estimate separate models for East and West Germany.

There are several critical econometric issues in analysing the effects of labour mobility on regional disparities. The first one is the omitted variable bias that can result from the potential correlation between unobserved regional characteristics and the dependent variables, i.e. the regional wage level and unemployment. We can deal with time-invariant regional characteristics by applying a fixed effects model. Moreover, the lagged dependent variable on the right-hand side of the regression model will alleviate potential problems arising from unobserved heterogeneity.

The second econometric issue concerns the simultaneity bias resulting from reverse causality between regional disparities and labour mobility. Due to potential endogeneity of labour mobility the relationships estimated by OLS or panel approaches such as fixed or random effects models might not be interpreted as causal. The simultaneity bias can be addressed using instrumental variable (IV) estimation. In order to identify the causal impact of mobility on our dependent variables, we need a source of exogenous variation in migration and commuting. However, with a lagged dependent variable among the regressors, we have to instrument both the mobility variables and the lagged dependent variable. Therefore, we use Generalized Method of Moments (GMM) estimators to deal with predetermined or endogenous explana-

tory variables in our dynamic panel models. We apply the first-difference GMM estimator proposed by Arellano and Bond (1991).[8] This method is designed for panel data sets with small time dimension and large number of cross sectional observations. It accounts for the presence of unobserved region-specific time-invariant effects and heteroskedasticity.

Applying the Arrelano-Bond GMM estimator implies that we estimate the models given by equations (1) to (3) in first differences to remove unobserved time-invariant county-specific effects. The differences of the endogenous explanatory variables are instrumented with suitable lags of their own levels. The application of the first-difference GMM estimator requires that there is no second order serial autocorrelation in the errors. Instrument validity is tested for by investigating serial correlation in the first-difference equation residuals. First order correlation is expected, but not higher order correlation.

We treat the lagged dependent variable, the mobility variables as well as population density as potentially endogenous variables. Apart from the GMM-type instruments, we use additional instruments for our mobility variables. Determinants of labour mobility that can be expected not to directly affect wages or unemployment, can serve as instruments for migration and commuting. Therefore, we use migration flows of people older than 65 years since these data should reflect determinants of mobility not related to economic performance and regional labour market conditions. Moreover, migration of this age group should not affect unemployment and wages because there is no effect on labour supply. Concerning commuting, car density lagged by two years is used as instrument because it reflects the most frequent means of transport on the journey to work in Germany.

Roodman (2008) notes that a large number of instruments might adversely affect the power of the tests of overidentifying restrictions. In order to guarantee a parsimonious use of instru-

ments, we usually restrict the GMM-type instruments to fourth and deeper lags of levels. Only using the highest lags of the endogenous variables should also reduce potential problems arising from the forward-looking nature of the mobility-disparities-relationship. However, in order to check the robustness of results we also allow for shorter lags of instruments.

The third econometric issue refers to spillover effects among neighbouring labour markets. Labour mobility is most likely an important source of such interaction that might results in spatial dependence of wages and unemployment. However, there could be other forms of interaction such as demand linkages that cause spatial dependence in labour market conditions. In order to account for potential spatial dependence we apply spatial regression models. One possibility to introduce spatial effects is to include a spatially lagged dependent variable. The spatial lag model corresponding to equation (1) is given by:

$$u_{it} = \alpha_1 u_{it-1} + \rho \sum_{j=1}^{R} \omega_{ij} u_{jt} + \alpha_2 nmr_{it-1} + \alpha_3 ncr_{it} + \sum_{n=1}^{N} \gamma_n x_{nit} + \eta_i + \varphi_t + \varepsilon_{it} \qquad (4)$$

Thus we extend the non-spatial model by a spatial lag of the dependent variable $\sum_{j=1}^{R} \omega_{ij} u_{jt}$ where ω_{ij} is an element of the $R \times R$ spatial weights matrix Ω.[9] Taking into account the weighted sum of relative unemployment rates in neighbouring regions implies that spatial autocorrelation of the error term is caused by omission of some substantive form of spatial dependence caused by interaction among neighbouring labour markets.

A second frequently applied method is to allow for a spatially autocorrelated error term. The spatial error model will be the appropriate specification if the misspecification is due to nuisance dependence. Spatial autocorrelation in measurement errors or in variables that are oth-

erwise not crucial to the model might entail spatial error dependence. The spatial error model for unemployment and net-mobility corresponds with equation (1) with the following expression as the spatial autoregressive error term:

$$\varepsilon_{it} = \lambda \sum_{j=1}^{R} \omega_{ij} \varepsilon_{jt} + \nu_{it} \qquad (5)$$

Including a spatial lag of the dependent variable in our regression model generates an additional endogeneity problem because the spatially-lagged dependent variable is correlated with the error term. We deal with this simultaneity by estimating fixed effects models that include a spatial lag by maximum likelihood (ML). According to Mohl and Hagen (2008) it is currently not possible to estimate a spatial lag model and simultaneously control for endogeneity of other variables within a dynamic GMM approach. Moreover, Fingleton and LeGallo (2008) note that ML estimation of a model with a spatial error process and endogenous variables would be difficult to implement. The standard estimation method for a fixed effects model including a spatially lagged dependent variable is to eliminate the region-specific effects by demeaning the dependent and explanatory variables (see Elhorst 2004). We estimate demeaned equations (1) and (4) by ML (and corresponding models for wages).

7 Results

7.1 Basic specifications

Table 1 and 2 summarize the results of the dynamic panel models applying the GMM Arellano-Bond estimator for unemployment and wages. We only report results for the mobility and the lagged dependent variables.[10] In order to investigate whether the impact of mobility on disparities differs between East and West Germany all specifications are estimated for

the entire cross section of counties as well as sub-samples of East and West German regions. The tables include estimates of the corresponding net and gross mobility models.

The first differences of the lagged dependent variables and the mobility variables are instrumented by suitable lags of their own levels. Apart from these internal instruments we also apply external instruments (see Section 6) to deal with the endogeneity of the mobility variables. Since the model is overidentified, validity of overidentifying restrictions is tested for by using the Sargan test and the Hansen *J* test. Moreover, tests on serial autocorrelation are displayed. Altogether these tests indicate that for most specifications the null hypothesis of instrument validity cannot be rejected at the 10% level. Difference-in-Hansen tests (Diff Hansen test) regarding the group of external instruments, suggest that our additional instruments should improve the efficiency of the estimation.

Table 1: GMM results for unemployment

	Germany		West Germany		East Germany	
	Net	Gross	Net	Gross	Net	Gross
u_{it-1}	.5092	.0289	.3456***	.4786***	.0378	.0954
	(.4161)	(.3482)	(.1161)	(.1116)	(.1411)	(.1062)
nmr_{it-2}	.0071**		.0049**		.0039	
	(.0036)		(.0020)		(.0030)	
ncr_{it}	.0015		.0133***		-.0019	
	(.0141)		(.0049)		(.0064)	
imr_{it-2}		-.0006		.0078***		.0058**
		(.0048)		(.0019)		(.0024)
omr_{it-2}		-.0065*		-.0025		-.0058**
		(.0036)		(.0019)		(.0028)
icr_{it}		.0062		-.0051		-.0396**
		(.0341)		(.0094)		(.0182)
ocr_{it}		-.1028*		-.0358**		-.0078
		(.0574)		(.0148)		(.0165)
Observation	2580	2580	1920	1920	660	660
Number of instruments	21	28	49	70	49	70
Sargan (p-value)	0.24	0.14	0.23	0.20	0.11	0.06
Hansen (p-value)	0.17	0.03	0.10	0.26	0.08	0.20
Diff Hansen (p-value)	-	0.08	0.20	0.16	0.11	0.54
AR(1) (p-value)	0.11	0.39	0.02	0.00	0.31	0.14
AR(2) (p-value)	0.48	0.31	0.11	0.37	1.00	0.80
Moran test	44.4**	64.9**	48.8**	48.7**	6.5**	20.3**

Notes: * significant at 10%; ** at 5%; *** at 1%. Robust standard errors are given in parentheses. The estimation procedure is the GMM difference approach based on the two-step version including time fixed effects and control variables (see Section 6). Besides the lagged dependent variable, the mobility variables and population density are treated as endogenous and instrumented with GMM-style instruments. All other variables are assumed to be exogenous. We instrument first differences of the endogenous variables with lags of their levels restricting the lag-limit to 5 (3 for the entire cross section) in order to ensure sparse instrumentation.
The Sargan and the Hansen test are tests of the validity of overidentifying restrictions. The Hansen J test is like Sargan, but robust to heteroscedasticity. Difference-in-Hansen test checks the validity of the subset of additional external instruments. For some specifications the Difference-in-Hansen test is not reported because the number of instruments is not sufficient to calculate the test statistic. The values reported for AR(1) and AR(2) are p-values for first and second order autocorrelation in the first-differenced residuals. The results of the Moran test for spatial autocorrelation are based on a binary weights matrix with a cut-off point of one hour of travel time. The residual are standardized by year.

The regression results in Table 1 indicate that migration indeed acts as an important adjustment mechanism with respect to regional unemployment disparities. The coefficients of the net migration rate are positive and significant for the entire and the West German cross sec-

tion. However, the migration balance does not influence unemployment differences among East German regions. In contrast, the significant coefficients that emerge for the other samples suggest that, migration of workers tends to reduce differences in unemployment rates among East and West German regions and within West Germany. Thus, this result does not solely rest on disparities between East and West Germany and corresponding migration flows since significant effects also mark the West German sub-sample. The estimates suggest that the impact of migration on unemployment disparities is important. The mean annual net migration rate of East Germany amounted to -3.7 between 1995 and 2005. Applying the coefficient of the net mobility model (0.0071) yields a reduction of the average relative unemployment rate in East Germany from 1.74 to 1.48, i.e. a decline by 15% in the period under consideration.

In contrast, commuting seems to matter only for unemployment disparities among West German regions. The corresponding coefficient indicates that commuting contributes to the convergence of regional labour market conditions within West Germany. The positive effect of net commuting on relative unemployment rates is in line with findings in Patacchini and Zenou (2007). The authors conclude that commuting tends to reduce unemployment disparities in the UK. However, interaction among neighbouring labour markets is highly localised. Obviously commuting does not play a crucial role for labour market adjustment between East and West Germany.

Apart from labour mobility there seem to be other important mechanisms of adjustment on regional labour markets, at least in West Germany. The coefficients of the lagged dependent variable are far below unity, indicating a rather swift adjustment after shocks even if effects of labour mobility are controlled for. According to our results the persistence of regional unem-

ployment after shocks is fairly low. However, the effect is significant only for the West German cross section in Table 1.[11]

Next, we consider gross mobility flows as proposed by Østbye and Westerlund (2007) in order to investigate whether in- and out-migration (commuting) work symmetrically. In contrast to the net-mobility model, we get several significant coefficients for the East German sub-sample. The coefficients of the migration rates point to symmetric effects of migration on unemployment disparities whereas for commuting only the inward flow seems to matter. Moreover, the negative sign of the in-commuting effect in Eastern Germany is surprising: in-commuting seems to promote a decline of the relative unemployment rate. However, we do not discuss the results for the East German sub-sample in detail because it turns out that they are not robust with respect to changes of the specification.[12]

The estimates for the entire cross section and West German regions point to asymmetric mobility effects. We detect a dampening effect of out-migration at the 10% level for the entire cross section, but no corresponding impact of in-migration. This constellation of estimates suggests that the significant effect of out-migration might be primarily driven by labour mobility between East and West Germany and its favourable effect on East German labour markets. Turning to West Germany, we do not discover symmetric effects for this sub-sample either. However, whereas out-migration matters in the entire cross section it is in-migration that significantly affects unemployment in the West German counties. The coefficient is again in line with neoclassical reasoning, i.e. in-migration tends to increase the relative unemployment rate. However, we do not find corresponding effects for out-migration. Thus, to sum up there is some evidence on asymmetric migration effects with respect to regional labour market conditions in Germany.

The findings for the commuting variables also indicate that the effects of inward and outward mobility do not necessarily correspond. Again, we detect a significant impact on unemployment only for one flow. Labour market disparities in Germany and among West German regions are influenced by out-commuting which results in a decline of relative unemployment rates. These estimates correspond with our expectations regarding beneficial out-commuting effects in East Germany as e.g. discussed in Einig and Pütz (2007). However, we cannot rule out that the result for the entire cross section is driven by the West German sub-sample only. Moreover, we should not focus too much on the out-commuting effect because it is not completely robust to changes of the specification (see section 7.2).

Table 2 summarizes the GMM estimates for the different wages models. Altogether, evidence of mobility effects is weak for wage disparities. There are almost no significant effects of mobility on wages in Germany. The only exception is a positive influence of out-commuting in the gross mobility model for the East German cross section, however only significant at the 5% level. Therefore, we should not overemphasize this result. There seem to be important adjustment mechanisms other than regional labour mobility at work, since the coefficients of the lagged wage variables do not point to a strong persistence of disparities in regional wages. This applies in particular to the estimates for the entire cross section.

Table 2: GMM results for wages

	Germany		West Germany		East Germany	
	Net	Gross	Net	Gross	Net	Gross
w_{it-1}	.3362**	.5232***	.8302***	.8027***	.0574	.0464
	(.1696)	(.1590)	(.2704)	(.2003)	(.1816)	(.1393)
nmr_{it-2}	-.0002		-.0003		-.0000	
	(.0003)		(.0003)		(.0004)	
ncr_{it}	.0005		.0005		.0006	
	(.0006)		(.0007)		(.0007)	
imr_{it-2}		-.0002		.0001		.0006
		(.0003)		(.0003)		(.0005)
omr_{it-2}		.0001		.0003		-.0002
		(.0002)		(.0003)		(.0004)
icr_{it}		-.0030		-.0012		-.0003
		(.0015)		(.0020)		(.0013)
ocr_{it}		.0024		-.0008		-.0038**
		(.0023)		(.0032)		(.0019)
Observation	3010	3010	2240	2240	770	770
Number of instruments	34	47	34	47	34	47
Sargan (p-value)	0.00	0.19	0.90	0.99	0.00	0.01
Hansen (p-value)	0.02	0.28	0.60	0.74	0.02	0.19
Diff Hansen (p-value)	0.76	0.37	0.97	0.72	0.99	0.85
AR(1) (p-value)	0.03	0.00	0.00	0.00	0.96	0.62
AR(2) (p-value)	0.23	0.01	0.58	0.72	0.10	0.05
Moran test	64.4***	57.4***	58.1***	54.0***	27.6***	24.9***

Notes: * significant at 10%; ** at 5%; *** at 1%. Robust standard errors are given in parentheses. Estimation procedures see notes of table 1.

Table 1 and 2 also display Moran's *I* test statistic for spatial autocorrelation of the GMM residuals. The results point to a significant spatial autocorrelation suggesting that the non-spatial models might not incorporate all channels of interaction between neighbouring regions although we consider effects of labour mobility. However, autocorrelation of the error terms does not seem to be of the substantive form. We do not report results for the spatial lag model as the spatial lag of the dependent variable is not significant in most models.[13] Moreover, log

likelihood indicates that the spatial error model provides a more appropriate specification of spatial autocorrelation than the spatial lag model. This implies that apart from labour mobility there is no interaction among neighbouring labour markets that give rise to spatial dependence of wages and unemployment. This corresponds with evidence in Patacchini and Zenou (2007) who argue that spatial dependence in regional unemployment in the UK can be explained by labour mobility. The spatial autocorrelation of the error term is therefore likely to be caused by measurement errors.

We restrict the discussion of the spatial regression models to unemployment (Table 3) since we found no evidence that mobility affects regional wage disparities. In the spatial error model for unemployment we apply a spatial weighting scheme that allows for spatial autocorrelation if regions are within one hour of travel time of each other.[14] The spatial autoregressive parameter λ is negative and significant in all specifications, including net and gross models. Thus there is evidence for a measurement error that is due to the delineation of regions at the county level, i.e. units of observation that do not correspond with regional labour markets. Apparently we include mobility flows between counties in our analyses that do not directly respond to disparities in unemployment and wages, but rather result from functional linkages within regional labour markets. The negative sign of the parameter λ might point to functional differences between cities and their hinterland that cause commuting flows as a consequence of suburbanization irrespective of differences in unemployment and wages.

Table 3: Spatial panel error models for unemployment

	Germany		West Germany		East Germany	
	Net	Gross	Net	Gross	Net	Gross
u_{it-1}	.6548***	. 6619***	.6832***	.6816***	.5243***	.5193***
	(.0132)	(.0133)	(.0140)	(.0144)	(.0300)	(.0298)
nmr_{it-2}	.0011***		.0007***		.0001	
	(.0002)		(.0002)		(.0005)	
ncr_{it}	.0016***		.0007**		.0016	
	(.0004)		(.0003)		(.0009)	
imr_{it-2}		.0014***		.0011***		.0002
		(.0002)		(.0003)		(.0006)
omr_{it-2}		-.0003		-.0002		.0007
		(.0004)		(.0003)		(.0008)
icr_{it}		-.0019		.0019		-.0055***
		(.0010)		(.0010)		(.0020)
ocr_{it}		-.0069***		.0002		-.0091***
		(.0010)		(.0010)		(.0021)
Observations	3440	3440	2560	2560	880	880
λ	-.1227***	-.1159***	-.1655***	-.1592***	-.1491***	-.1554***
	(.0359)	(.0359)	(.0451)	(.0450)	(.0552)	(.0549)
Wald test $(H_0 : \lambda = 0)$	11.7***	10.4***	13.5***	12.5***	7.3***	8.0***

Notes: * significant at 10%; ** at 5%; *** at 1%. Robust standard errors are given in parentheses.

Overall, most significant mobility effects detected in the non-spatial model are confirmed by the results of the spatial error model. In particular, the results of the net-models turn out to be rather robust. Admittedly, regarding the gross-mobility models several differences between the spatial and the non-spatial model show up with respect to the size and significance of the coefficients. However, the fact that the size of the parameters generally tends to be smaller in spatial error model should be interpreted carefully, because the spatial error model does not account for endogeneity of the mobility variables and might therefore be biased. Compared to the results of the GMM models, we find new significant effects predominantly for commuting variables. Interpreting these results we also have to keep in mind though that they might be

affected by reverse causality. Altogether we tend to rely more on the GMM results regarding evidence on the mobility effects on regional disparities because with spatial dependence confined to the error term the GMM estimates should be unbiased. In contrast, we do not control for endogeneity of explanatory variables in the spatial models. Thus, corresponding results are likely biased. This is confirmed by unreported results from a fixed effects model without instrumentation that are very similar to the estimates of the spatial error model.[15] Therefore the differences between GMM estimates and spatial error models are likely due to endogeneity bias and not caused by spatial autocorrelation not captured in the GMM specifications.

7.2 Robustness checks

We conduct a number of robustness checks in order to examine whether changes of the specification and data seriously affect our previous findings regarding the impact of labour mobility on disparities. We examine whether the weak evidence for mobility effects on wages is robust if we adjust the dependent variable for structural differences among regional labour markets. Furthermore, we estimate different specifications of the dynamic panel models that vary with respect to the lag structure of internal instruments, the inclusion of external instruments and the estimator (one-step versus two-step). Moreover, we use migration data from another data source and for a different period (1999 to 2005).

Firstly, we substitute the 40% percentile of raw wages by “adjusted” regional wages in the regression models. The adjusted wages are detached from various structural characteristics of regional labour markets, such as the educational level of workers, the economic structure of the region and the area type (agglomerated, urbanized and rural regions).[16] The procedure reduces the dispersion of the regional wages compared with raw wage data as indicated by Figure 5 in the appendix. Thus, part of the variance of the raw wages is caused by differences in the qualification structure, the specialisation of regional economies or an urban wage pre-

mium. However, taking into account these disparities does not alter the main findings on mobility effects. The regression results for the adjusted regional wages (not shown in the paper) closely resemble the evidence for the raw wages, i.e. we do not detect any significant impact of migration and commuting at the 5% level.[17] There are only two commuting effects (net-mobility model for the entire cross section and gross-mobility model for West German regions) that are significant at the 10% level. It turns out though that these results are not robust with respect to changes of the specification (one-step versus two-step estimator, changes of the lag structure of instruments). For most specifications we do not find any significant mobility effects at all.[18]

Secondly, we estimate various specifications of regression models for unemployment and wages that differ with respect to instrumentation and the estimator. The corresponding results for unemployment are summarized in Table 4. The focus on unemployment and the entire cross section enables us to examine how different specifications affect the coefficients of the mobility variables in the net- and the gross-model.[19] Column 1 and 2 comprise the results of the one-step estimator with the same lag structure of the instruments as in Table 1. However, findings in Table 1 base on the two-step estimator. The columns 3 and 4 display two-step estimates with slightly increased numbers of instruments, i.e. relaxed lag-limit. The last two models are corresponding two-step results without external instruments and a lag-limit of 3. The estimates of the net-mobility models are more or less unaffected by these variations. The coefficient of the net-migration rate is fairly stable and significant across the applied specifications. As before, we do not detect any important commuting effects. In contrast, the gross-model seems to be slightly more sensitive to changes in the regression setup. Changes in the size and significance of the coefficients are more pronounced. However, especially the dampening impact of out-migration is rather robust and confirms our previous results on asymmetric migration effects. The results of the Sargan and the Hansen tests at the bottom of the table

show, however, that the validity of the results is affected by changes of the instrumentation. In particular, those estimates with an increased number of instruments and removed external instruments tend to fail the test for exogeneity of instruments. Unreported estimates indicate that a continuous reduction of the lag-limit of the instruments further deteriorates the results of the tests. Thus, sparse instrumentation is of utmost importance in order to ensure valid IV estimates.

Table 4: Robust checks for entire cross section- GMM results for unemployment

	Germany					
	One-Step, lag-limit 3, external instruments		Two-Step, lag-limit 4, external instruments		Two-Step, lag-limit 3, no external instruments	
	Net	Gross	Net	Gross	Net	Gross
u_{it-1}	.6898*	.3148	.1540	.1935*	.0998	.0693
	(.3628)	(.3125)	(.1192)	(.1142)	(.1417)	(.1403)
nmr_{it-2}	.0078**		.0070***		.0074***	
	(.0037)		(.0019)		(.0028)	
ncr_{it}	-.0006		.0059		.0018	
	(.0126)		(.0056)		(.0064)	
imr_{it-2}		.0012		.0024		.0092**
		(.0047)		(.0022)		(.0040)
omr_{it-2}		-.0060*		-.0077***		-.0069*
		(.0035)		(.0026)		(.0036)
icr_{it}		.0109		-.0052		.0211
		(.0430)		(.0178)		(.0243)
ocr_{it}		-.0908*		-.0351*		-.0161
		(.0548)		(.0188)		(.0211)
Observation	2580	2580	2580	2580	2580	2580
Number of instruments	21	28	33	46	24	36
Sargan (p-value)	0.24	0.14	0.12	0.00	0.07	0.15
Hansen (p-value)	0.17	0.03	0.03	0.00	0.01	0.01
Diff Hansen (p-value)	-	0.08	0.48	0.02	-	-
AR(1) (p-value)	0.01	0.94	0.31	0.98	0.86	0.14
AR(2) (p-value)	0.77	0.23	0.48	0.08	0.95	0.27

Notes: * significant at 10%; ** at 5%; *** at 1%. Robust standard errors are given in parentheses. Estimation procedures see notes Table 1. For some specifications the Difference-in-Hansen test is not reported because the number of instruments is not sufficient to calculate the test statistic or because the specification does not include external instruments.

Unreported results indicate that the significant migration and commuting effects in the net and gross model for West Germany are rather robust to corresponding changes as well. Only the impact of out-commuting is sensitive to variations of the instrumentation. Estimates for the East German sub-sample are, however, rather disappointing since none of the significant effects detected in Table 1 is robust to changes of the specification. Variations of the lag structure of the instruments, application of the one-step instead of the two-step estimator and exclusion of external instruments result in insignificant coefficients of all mobility variables in most cases. Moreover, the absence of important mobility effects in the net model is confirmed by the robustness checks.

Thirdly, we generate migration data from the employment statistic in order to examine whether the results are influenced by the source of the mobility data. A specific advantage of the information from employment statistics is that we only measure migration that is related to the labour market and thus likely exert important effects on regional wages and unemployment. In contrast, the population based migration flows we used before also include people who are not in labour force. However, a disadvantage of the migration data from the employment statistic is that availability is restricted to the period 1999 onwards.

In the following we only discuss unreported findings for the entire cross section.[20] If we employ the alternative migration data, the coefficients of the migration rates in the net and gross models significantly increase. For instance, whereas the coefficient of the net migration rate is 0.0071 for the population based data in Table 1, we arrive at around 0.03 for the employment based migration rate. The differences in the size of the estimates might result from the change of the time period under consideration. Another explanation might suggests, that the estimates in Table 1 seem to be subject to a downward bias as the migration flows contain movements that are not related to the labour market. This possibly indicates that measurement error's bias

towards zero is rather important in this case. Thus our previous findings regarding the influence of labour migration on regional differences in unemployment are even reinforced by applying the employment based migration data. However, again we detect no important impact on regional wage disparities.

8 Conclusions

Differences in regional labour market conditions are still pronounced in Germany. The disparities are mainly marked by persistent differences between the Eastern and the Western part of the country. Whereas regional disparities in unemployment have increased since the mid of the 1990s, they are rather stable with respect to wages. At the same time there are considerable interregional migration and commuting flows. In the period under consideration mobility losses of East German counties have been the most important features of labour mobility. According to neoclassical models this mobility should reduce regional disparities. This, however, is in contrast to our descriptive findings on the development of disparities since 1995. Thus the question arises whether labour mobility contributes to a convergence of labour market conditions at all.

Our regression analysis aims at investigating the impact of labour mobility on disparities in regional unemployment and wages – taking into account both migration and commuting. The findings suggest that there are indeed significant effects of mobility on unemployment whereas evidence with respect to regional wages is rather weak. One possible explanation for the fact that regional mobility does not contribute to a convergence of wages is the institutional setting of a collective wage bargaining system in Germany. Due to the compression of the wage structure, i.e. relatively small differences in regional wage levels, incentives to move in response to income differentials are likely small. Moreover, regional wages differences

may primarily reflect disparities in amenities and, therefore, not provide any incentive for mobility. Thus, labour mobility could be mainly driven by the more pronounced unemployment disparities and serves to reduce these differences. The effects of mobility are rather quantity than price effects.

The impact of migration on unemployment differences are more or less in line with the implications of the traditional neoclassical approach. Labour mobility seems to reduce regional disparities in unemployment. Moreover, the results suggest that commuting is less important for a reduction of labour market disparities in Germany. Significant effects of net commuting emerge only for the West German sub-sample. As discussed in section 3, relatively small effects of commuting as compared to migration likely arise from a spatial mismatch between local job applicants and vacancies. Thus commuters might not compete directly with the local workforce.

Finally, considering gross mobility flows provides additional insights. Our regression results indicate that in- and outgoing mobility flows do not work symmetrically. These findings suggest that apart from an impact of mobility on disparities via regional labour supply, there are significant effects caused by repercussions on labour demand. However, the latter are not strong enough to outweigh the former. In sum neoclassical mechanisms dominate mobility effects that might be linked to externalities, selective migration or changes in consumption and investment.

Appendix

In order to detach raw wages from different region specific influences we regress the average daily wage of region *i*, sector *j* and year *t* on a number of available control variables. We consider characteristics of the regional workforce as well as the economic structure of the region. Control variables include the employment shares of 3 qualification groups (unskilled, medium- and high-skilled), the proportion of 3 establishment-size categories (< 50, 50 to 250, > 250 employees), the share of male workers and the average age of the employees in the region. Moreover, we consider time effects, annual county specific effects, dummy variables for 28 branches and for 9 area types defined the German Federal Office for Building and Regional Planning (see Goermar and Irmen 1991) that capture the size and centrality of regions. The adjusted wage data is then calculated using the coefficients of the county dummy, the area type dummy and the regression constant.[21] The resulting variable reflects the mean annual wage at county level assuming average educational, economic (industry and firm size), age and gender structure. A detailed description of the wage adjustment procedure is given by Südekum et al. (2006).

Figure 5 illustrates the effect of the adjustment procedure via a scatterplot of raw and adjusted wages for the year 2000.

Figure 5: Regional distribution of raw and adjusted wages, 2000

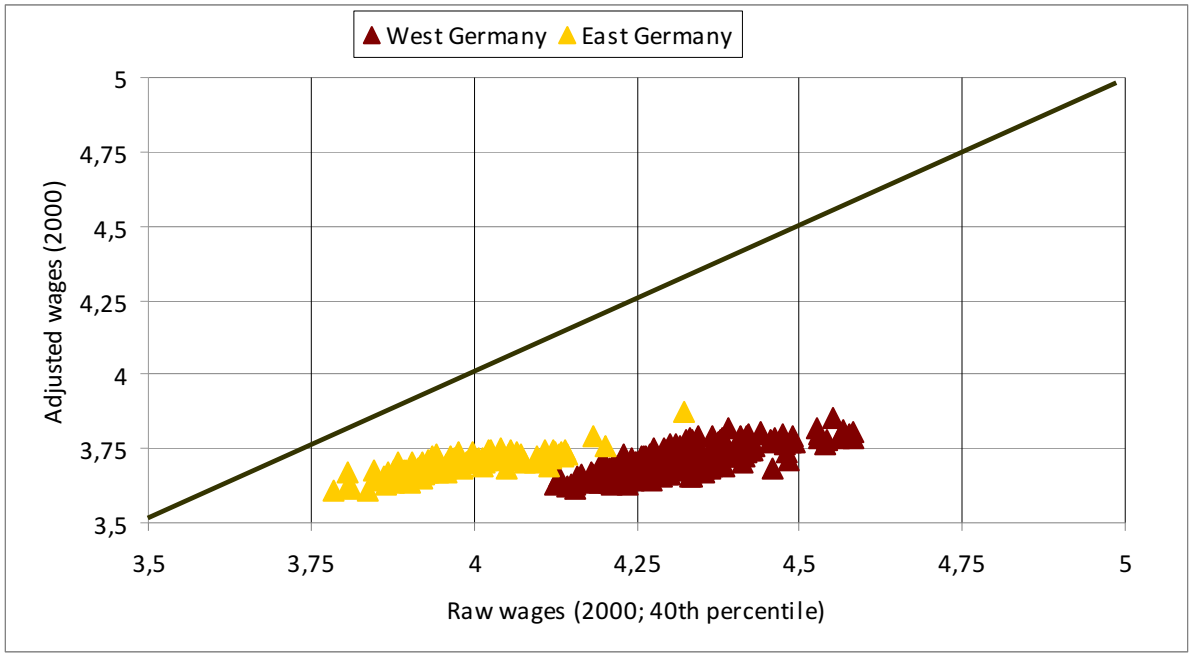


Table A1 Summary statistics: relative unemployment and wage level

	Relative unemployment rate			Log of wage level		
	Total	West	East	Total	West	East
Mean	1.0	0.8	1.7	4.2	4.3	4.0
Std. Dev.	0.5	0.3	0.3	0.2	0.1	0.1
Minimum	0.3	0.3	0.9	3.7	4.1	3.7
Maximum	2.8	1.8	2.8	4.7	4.7	4.4
N	3440	2560	880	3870	2880	990

Table A2 Summary statistics: net-migration and net-commuting

	Net migration rate			Net commuting rate		
	Total	West	East	Total	West	East
Mean	0.7	2.2	-3.6	-13.1	-13.0	-13.5
Std. Dev.	10.7	8.1	15.1	34.0	37.7	19.7
Minimum	-58.2	-47.7	-58.2	-178.5	-178.5	-73.8
Maximum	81.1	40.0	81.1	69.0	69.0	33.6
N	3870	2880	990	3870	2880	990

Notes

[1] This is in line with evidence provided by Bornhorst and Commander (2006) for several transition countries where internal migration flows remained low throughout the 1990s despite pronounced differences in regional labour market conditions. The authors conclude that migration is insufficient to reduce large unemployment differentials in Eastern European countries.

[2] In fact, the unemployment rate will slightly decline if an out-commuter settles in the region under consideration since the denominator of the unemployment rate rises while the number of unemployed remains the same. See Elhorst (2003) for a detailed discussion.

[3] These effects of selective migration are due to complementarities among different factors of production in a neoclassical production function.

[4] We thank an anonymous referee for pointing this out.

[5] Hartz-IV legislation refers to the introduction of the Second book of the German Social Code in January 2005. It combined unemployment benefit and social assistance to form a uniform basic income support scheme. As a consequence of this reform the number of unemployed increased considerably in January 2005. Since the increase in registered unemployment that was caused by Hartz IV is marked by a considerable variation across regions, we restrict the period under consideration to 1995-2004.

[6] See also Appendix for some summary statistics (A1 and A2).

[7] Østbye and Westerlund (2007) note that net-mobility models as given by equations (1) and (2) can be obtained from the corresponding gross-mobility models by imposing the restriction that in- and out-migration (commuting) work symmetrically.

[8] We also use system GMM estimators (Blundell and Bond 1998). However, we focus on the results of the first-difference estimator since the instruments of the system estimator did not pass the Sargan and Hansen tests. Moreover, the system estimator frequently did not meet assumption of no second order serial autocorrelation.

[9] In order to check the robustness of results with respect to variation of the spatial weighting scheme we apply two different weighting schemes. The first specification of Ω is a binary spatial weights matrix such that $\omega_{ij} = 1$ if the regions i and j are within one hour of travel time of each other and $\omega_{ij} = 0$ otherwise. Secondly, ω_{ij} is set to the inverse of travel time between the capitals of regions i and j.

[10] Additional regression results are available from the authors upon request.

[11] However, in most specifications of the robustness checks we get a significant coefficient of the lagged dependent variable for the entire cross section as well.

[12] Changes in the regression setup result in insignificant coefficients of all mobility variables for the East German sub-sample in most specifications.

[13] Regression results for the spatial lag models are available upon request.

[14] Applying a weighting scheme based on inverse distance between the regions does not significantly change our results. Thus, the findings appear to be robust with respect to the choice of the spatial weights matrix.

[15] Corresponding results are available upon request.

[16] This procedure has already been applied in Südekum et al. (2006). A detailed description of the corresponding methodology is given in the appendix.

[17] Results are available upon request.

[18] The regression results are available from the authors upon request.

[19] The results for wages and the two sub-samples are available upon request.

[20] The regression results are available from the authors upon request.

[21] To avoid biased coefficients, the regression models were estimated separately for West and East Germany. Consequently, a constant for the whole cross section is not available. To compute adjusted wages we apply the constant estimated in the model for West Germany.

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