Labour Market Adjustments and Migration in Europe and the United States: How Different?

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1. INTRODUCTION

Since the outbreak of the financial crisis in 2008, high and diverging unemployment rates across European countries and regions have become an increasingly important concern for European policy makers. In 2013 the unemployment rate in Spain was above 25%, but only around 5% in Germany. Heterogeneity is large not only between countries but also within countries. For example, in France, Belgium and Spain the highest regional unemployment rates were twice as high as the lowest. In Italy, as an extreme example, the unemployment rate in Veneto was just a third of the unemployment rates in Campania or Sardinia. Moreover, this regional heterogeneity has increased since 2008 (Marelli, Patuelli, and Signorelli, 2012).

These persistent differences in unemployment rates across regions and countries have put the role of migration in labour market adjustment back on the European policy agenda. Migration can cushion the negative impact of adverse labour demand shocks on unemployment and thereby smooth the adjustment to heterogeneous macroeconomic developments. This is particularly important within a monetary union, in which relative wage adjustments may be slow due to the absence of nominal exchange rate adjustments. In 2013 the Commission adopted a proposal for a directive on new measures to facilitate labour mobility and the European Council agreed on measures to fight youth unemployment aiming, among other things, at increasing the mobility of young workers.

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In this paper we contribute to this policy debate by empirically investigating how labour markets adjust to asymmetric labour demand developments and whether migration contributes substantially to this adjustment, using a modified version of the methodology of Blanchard and Katz (1992). In particular, we compare regional and country labour market adjustment in Europe with state adjustment in the US. The US is a natural benchmark for such a comparison because it is a large monetary union of similar size with a well-functioning, quite homogenous labour market. The US benchmark may therefore give an idea of how much scope there is for increased labour mobility and migration to play a role in labour market adjustment in Europe.

We are not the first ones to make this comparison. In particular, Decressin and Fatás (1995) and Obstfeld and Peri (1998) also applied the methodology of Blanchard and Katz (1992) to compare regional labour market adjustment in Europe and the United States.[1] Overall, they found that the regional adjustment process is faster in the United States due to higher labour mobility. There are at least three reasons why it is important to update and refine this analysis.

First, we have a much longer sample (38 years rather than 13 years in Decressin and Fatás (1995)). This allows us to investigate the robustness of their findings and, more importantly, whether the adjustment process has changed over time. Since the early 1990s European integration has continued to proceed in a number of areas which should facilitate the regional adjustment process. There is, for example, evidence that migration between European countries has increased due to the Schengen Agreement and the introduction of the euro (Beine et al., 2013). Some of these changes have become quite visible since the outbreak of the financial crisis. For example, net migration between Germany and the crisis countries (Spain, Portugal, Italy and Greece) has risen from minus 10.000 in 2009 to 70.000 in 2012. In contrast, interstate migration in the US has been decreasing since the 1980s and has dropped during the crisis to the lowest values since World War II (Frey, 2009). It is therefore interesting to see whether this has led to a convergence of the regional labour market adjustment process in Europe and the United States.

Secondly, when comparing Europe and the United States, Decressin and Fatás (1995) did not make a distinction between regional labour market adjustment within countries and between countries, while Obstfeld and Peri (1998) only focused on adjustment within countries. In this paper, we use the common factor methodology of Greenaway-McGrevy and Hood (2013) to filter out country factors and analyse the adjustment of countries to national labour demand shocks, which is likely to be hampered by bigger cultural, language and institutional differences. This allows us to investigate whether any convergence with the US is due to a smoother working of the adjustment process within or between countries.

Thirdly, a straightforward comparison of the European and US results was hampered by the different data sources being used in those studies. We show that the differences are less pronounced when similar data sources are used.

[1] See Section 2 for a more detailed overview of the literature.

The following findings are worth highlighting. First, looking at the full sample we find that both in Europe and the US labour mobility accounts for about 50% of the long run adjustment to region-specific labour demand shocks. The other 50% is accounted for by a reallocation of jobs across regions. But, in Europe it takes longer (10 years) than in the United States (5 years) for this adjustment process to be completed. And due to the greater rigidity of labour markets, the temporary response of the unemployment rate is more important and more persistent in European regional labour market adjustment.

Second, we show that in Europe labour mobility is a less important adjustment mechanism in response to country-specific labour demand shocks. In this case, both the unemployment rate and the participation rate play a larger and more persistent role in the adjustment process. This underlines the remaining cultural, language and institutional barriers to labour mobility across European countries and provides support to European policy initiatives to further facilitate migration across countries.

Third, in line with Dao, Furceri and Loungani (2014), we find that the role of migration in the regional adjustment process has decreased in the US. In contrast, in Europe migration has become a more powerful adjustment factor in response to both regional- and country-specific labour demand shocks in the second half of the sample (1990-2013 versus 1977-1999). This suggests that the acceleration of the European integration process after the early 1990s has led to more labour mobility across regions and countries.

In the rest of the paper, we first briefly review in Section 2 how migration is typically analysed in the literature. Section 3, presenting the Blanchard-Katz methodology and our modifications, may be skipped by readers only interested in the results. The data is presented and discussed in Section 4 and Section 5 contains the main empirical analysis. Section 6 links our results to Blanchard and Katz (1992) and is not relevant for the main message. Finally, Section 7 discusses some policy implications.

2. Studying Migration

The importance of labour migration in facilitating adjustment to asymmetric shocks in a monetary union has been recognised at least since the seminal research on optimal currency areas of Mundell (1961). The empirical analysis of migration has, however, been hampered by the lack of reliable data. Recently an increasing number of papers have started to analyse migration patterns directly. Molloy, Smith and Wozniak (2011) analyse changes in the US over the last 30 years and detect a widespread decline in movements across all distances and across all population sub-groups. Frey (2009) shows that in 2007 migration rates in the US reached their lowest value since World War II and

that the decline was strongest for interstate migration. Reasons for the decline in mobility remain, however, unclear.[2]

Beine et al. (2013) with a new dataset containing 30 countries and covering the period 1980-2010 come to contrary conclusions regarding migration in Europe. They find that both the Schengen Agreement and the introduction of the Euro have increased migration between the member countries. However, migration between countries covers only a small part of all movements. In Germany, for example, roughly twice as many people move every year within Germany from one state to another than from Germany to another country.

Due to a lack of reliable data to analyse regional labour mobility directly, a large part of the literature has pursued the indirect approach proposed by Blanchard and Katz (1992). In their seminal paper on regional evolutions they develop a small model of regional labour markets (in the following: BK model) and suggest estimating the joint behaviour of the employment growth, the employment rate and the participations rate to analyse regional labour market adjustments to regional labour demand shocks. The respective reduced-form vector autoregression model (VAR) that they derive from their theoretical model offers an indirect approach to study migration because all employment changes unexplained by either the participation or the employment rate must originate from a change in population, which is identified with migration.

Applying the methodology to US states, Blanchard and Katz (1992) find that as of the first year migration plays a dominant role in the adjustment process following a shock to regional labour demand. Decressin and Fatás (1995) analyse large Western European regions and compare them to US states and find that in Europe the participation rate is the major force driving adjustment. Obstfeld and Peri (1998) analyse how regions in the US, Canada, the UK, Germany and Italy react to asymmetric labour demand shocks and show, first, that regional real exchange rates play a minor role in the regional adjustment process and, second, that the US adjustment process is the fastest due to higher labour mobility.

The methodology of Blanchard and Katz (1992) has been applied in many other studies and has become the standard model to analyse regional labour market adjustment mechanisms and to approach migration patterns indirectly.[3] Greenaway-McGrevy and Hood (2013) apply the model to metropolitan areas in the US and find that the adjustment to location-specific and aggregate shocks differ considerably. Our paper shares their main modification, namely the use of a factor structure to separate region-specific from common shocks. Dao, Furceri and Loungani (2014) reassess the

[2] Demographics and an aging of the population, increasing home ownership rates and an increasing share of women in the labour force may matter. Glaesser and Tobio (2007) discuss the role played by very long-term adjustment processes over many centuries that may have been concluded. Dao, Furceri and Loungani (2014) point to a decreasing dispersion of regional labour markets. Earlier papers detecting a decline include Greenwood (1997) and Long (1988). The recent decline in migration in the US may be somewhat overestimated (Kaplan and Schulhofer-Wohl, 2012).

[3] Numerous other papers relied on the BK model: Jimeno and Bentotila (1998) adapt the methodology to study Spanish regions; Fredriksson (1999) looks at Swedish regions; Fidrmuc (2004), Gács and Huber (2005), Bornhorst and Commander (2006) focus on regions in Central and Eastern Europe, and Tani (2003) suggests that migration in Europe is higher than expected.

adjustment of US states and find that the contribution of migration has decreased since 1980 and link it to a declining trend in the dispersion of unemployment rates across states. In addition, they show that migration contributes more in aggregate downturns and sketch some differences between the US and Europe.

For our purposes there is no alternative to inferring migration indirectly as in the Blanchard and Katz (1992) methodology. But we acknowledge that the chosen approach comes with drawbacks, including weak micro-foundations and a debatable identification of the labour demand shocks. Due to the availability of more and better regional data economic geography offers an increasingly feasible alternative. Counterfactual analyses in spatial general equilibrium models – as in Redding (2012), Ahlfeld et al. (2013), or Behrens et al. (2013) – could be used to understand how individuals relocate after a shock and where they move. An alternative approach is to look at how mobility response to well-identified shocks. Both in the US and Germany trade shocks, for example, have been shown to induce relatively small mobility responses (Autor, Dorn, and Hanson 2013; Dauth, Findeisen, and Südekum 2014).

3. EMPIRICAL STRATEGY

3.1 Intuition of the BK Model

In this section, we provide some intuition behind the BK model. For a full model description, we refer the interested reader to the original paper of Blanchard and Katz (1992). Starting from the observation that region-specific labour demand shocks have permanent effects on employment, but only temporary effects on the employment rate, the participation rate and wages, Blanchard and Katz (1992) develop a simple model of regional labour market dynamics that is based on two basic features. First, regions are assumed to produce distinct bundles of goods that are sold in an aggregate goods market and, second, labour and capital are assumed to be perfectly mobile in the long run. In this model, state-specific shocks to labour demand result in short-lived mean deviations of wages, but cause permanent changes of the employment level. An adverse shock to labour demand, for example, increases unemployment and lowers wages, which induces some workers to leave the region. Since workers move out of the region until wages are back to equilibrium, lost jobs after an adverse demand shock are not fully recovered. Similarly, when region-specific labour demand increases, relative wages tend to increase. Thus leads some firms to relocate at least part of their production outside the region and thus reduces employment compensating for some of the newly created jobs. However, higher wages also cause inward migration of workers so that some of the newly created jobs remain permanently in the region. The relative sensitivities of labour demand and supply determine how large the permanent effect of the labour demand shock is on regional employment. In the short run, changes in the unemployment and the participation rate can also contribute to the change in employment.

In order to implement this model empirically and in the absence of reliable regional wage data, Blanchard and Katz (1992) propose to estimate the joint behaviour of employment growth, the employment rate and the participation rate. The short and long run adjustment of the regional labour market can then be analysed by tracing out the impact of a shock to the employment growth equation.

3.2 Region-Specific Variables

Blanchard and Katz (1992) measure region-specific variables as simple differences between the regional variables and their aggregate continental counterpart. Let E_{it} stand for the number of persons employed, L_{it} for the labour force in persons and P_{it} for the population in persons, in region *i,* at time *t*; let $X_{it} = \{\Delta \log E_{it}, \log(E_{it}/L_{it}), \log(L_{it}/P_{it})\}$ contain the regional employment growth, employment rate and participation rate; and let X_t^{Cont} stand for the respective continental data. Then the region-specific variables – denoted by x_{it} – are given by

(1) $x_{it} = X_{it} - X_t^{Cont}$

This definition of a region-specific variable boils down to conditioning each of the variables on one common factor (the continental aggregate variable) and to restricting the loading on that factor to be equal to one.[4] Such a transformation will identify the adjustment to region-specific shocks, only if all regions respond identically to aggregate fluctuations. But in a regression of regional variables on their aggregate counterparts most coefficients are quite different from one, suggesting that regions react quite heterogeneously to aggregate business cycles (see Hamilton and Owyang 2012).[5] In this case, the simple transformation like in equation (1) will estimate a mixture of the adjustment to local and aggregate shocks. One advantage of the simple difference transformation is that one does not need to identify local and aggregate shocks. This may still be justified if the regional dynamics is independent of the local or aggregate origin of the shock.

There may, however, be reasons why regions adjust differently following aggregate versus idiosyncratic shocks. For example, using the BK methodology Dao, Furceri and Loungani (2014) find that the regional adjustment differs depending on aggregate conditions. One explanation may be that job-churnings are pro-cyclical, i.e. they decrease during an economic bust and increase in good times (Fallick and Fleischman

[4] For large cross-sections the idiosyncratic components average out so that the aggregate converges to the common factor (Forni and Reichlin 1998 and Pesaran 2006). For a large sample this is hence identical to including a common time trend. The aggregate most often refers to national variables (as in Blanchard and Katz 1992 or in Obstfeld and Peri 1998) but continental variables can also be used (as in Decressin and Fatás 1995).

[5] Decressin and Fatás (1995) reject a unity reaction of regions to aggregate shocks for most regions as well. They suggest using the estimated coefficients as weights when differencing, so that regions are allowed to react with a different sign and magnitude to aggregate movements. They thus condition on one common factor per variable, but allow for different weights. These variables, so called β-differences, are uncorrelated with aggregate variables and, if there were only one common factor per variable, would indeed enable a separation of regional and aggregate fluctuations.

2004; Caballero and Hammour 2005; Molloy, Smith and Wozniak 2011; Davis et al. 2011). As a result, when a region is hit by an idiosyncratic negative labour demand shock and the labour market in other regions is not affected, it may be easier to find a job there and the incentive to migrate may be higher. In contrast, when the whole country is negatively affected but one region worse than another, it may be more difficult to find a job in the region that is hit less, dampening the incentives for migration.

Greenaway-McGrevy and Hood (2013) show how a factor model can be embedded into the structural innovations of the original BK model in order to distinguish between the adjustment to aggregate and local shocks. Region-specific variables are then defined as residuals of a factor model:

$$(2)\quad \mathrm{x}_{it} = X_{it} - (L_i^1 f_t^1 + \cdots + L_i^{\mathrm{k}} f_t^{\mathrm{k}}),$$

where f_t^{j}, $j = 1, \ldots, k$, are the factors and L_i^{j}, $j = 1, \ldots, k$, are constant but region-specific loadings.

Intuitively, regions are allowed to respond to two different processes, namely a local, idiosyncratic shock process and a set of common or aggregate shock processes, with potentially different responses. The data is modelled as the sum of these two processes. Strong-form dependence in the panel allows consistent identification of the factors justifying their use in linear regressions (Bai and Ng 2006, Bai 2009, Greenaway-McGrevy and Hood 2013). Greenaway-McGrevy and Hood (2013) show that the adjustment processes of MSAs are different after location-specific and aggregate shocks. In the former case migration is rapid but relatively weak. Conversely, the adjustment after common shocks is driven by more prolonged and larger migration.

3.3 Estimation Procedure

Partly following Greenaway-McGrevy and Hood (2013), our estimation proceeds in two steps.[6] In the first step, we decompose the regional variables in three orthogonal components: the contribution of a continent-wide factor, of a country factor and a region-specific variable. This is done by estimating a multi-level factor model. In the second step, we separately estimate a pooled VAR in the region-specific variables and the country factors to investigate and compare the labour market response to region-specific[7] and country-specific shocks respectively.

3.3.1 The Factor Model

We estimate a separate multi-level factor model for Europe and the US. We include one continental factor, one country factor in Europe and one area factor in the US. In Europe, we include a German (G), French (F), Italian (I), Spanish (SP) and British (GB)

[6] Because in this model also the data vector follows a factor structure the factor model can be estimated before the VAR. For more details regarding the augmented BK model refer to Greenaway-McGrevy and Hood (2013).

[7] We use the terms region-specific, idiosyncratic and local shock interchangeably.

factor, and in the US we include the four US areas Northeast (NE), Midwest (MW), South (S), and West (W).[8] We restrict the loadings so that only regions belonging to a particular country (area) are able to load on the respective country (area) factor.[9] Accordingly, the following factor model is estimated for Europe and the United States separately:

(3) $X_{i,c,a,t} = x_{it} + L_i^{\mathrm{c}} f_{c,t} + L_i^{\mathrm{a}} f_{a,t}$

Where *i* denotes the region, *c* the country in Europe the region belongs to or the area the state in the US belongs to, and *a* is the continent (Europe or US). The idiosyncratic component x_{it} contains the region-specific variables. The loadings represent the sensitivity of the regional series to the country, area or continental factors and since they are region-specific, they allow for heterogeneous effects of those factors.

Since principal-components methods cannot account for a hierarchical factor structure, we estimate the factors with the quasi-maximum likelihood approach of Doz, Giannone, and Reichlin (2012). They show that maximum likelihood is suitable to estimate the common factors in large cross-sections of time series. We implement the QML estimator using the Kalman smoother and the EM algorithm.[10]

3.3.2 The Vector Autoregression Model

We then separately estimate the following panel VAR and pool over different subsamples:

(4) $\mathrm{x_{i,t}} = \varphi_{\mathrm{i0}} + \varphi_1(\mathrm{L})\mathrm{x_{i,t-1}} + \varepsilon_{\mathrm{i,t}}$

(5) $\mathrm{f_{c,t}} = \varphi_{\mathrm{c0}} + \varphi_1(\mathrm{L})\mathrm{f_{c,t-1}} + \varepsilon_{\mathrm{i,t}}$

[8] Different factor structures are, of course, possible. The results are not changing importantly for different structures.

[9] We impose a structure on the factors in order to capture the variables' pervasive covariation for the different geographical entities. In Europe it is important to account for country factors. Using the ABC criterion of Alessi, Barigozzi and Capasso (2010), we find indeed strong evidence for more than one common factor per series.

[10] Forni, Hallin, Lippi, and Reichlin (2000) and Stock and Watson (2002) propose to estimate common factors using principal components. Principal components are indeed easy to compute and consistent for any path of the cross-section and sample length (Bai and Ng 2002; Forni, Giannone, Lippi, and Reichlin, 2009). Yet, with principal components it is not possible to restrict the factor structure as we intend. Other authors working with structural factors include: Forni and Reichlin (2001); Bernanke, Boivin, and Eliasz (2005); and Boivin and Giannoni (2006). Also Kose, Otrok, and Whiteman (2003) apply a likelihood based estimator. The QML approach of Doz, Giannone, and Reichlin (2012) assumes that all series are I(0). In our case, however, some series are I(1). Principal components deliver consistent estimates also in this case (Bai and Ng 2004). We re-estimate the three global factors using principal components and the structural factors of the remaining unexplained fluctuations – that all turn out to be I(0) – with the QML approach. The factors are very similar. Doing the factor analysis in two steps underestimates the errors, because the QML estimation uses estimated data. However, in the VAR we treat the factors in any case as observations (Bai 2003, Giannone and Lenza 2009).

where the region- or country-specific constants represent regional or country fixed effects that allow for different long-term averages.[11] Given our large cross-section and modest sample length the two-step procedure does not cause a generated regressor problem (Pagan 1984, Bernanke and Boivin 2003, Bai and Ng 2006) so that we can indeed treat the region- and country-specific variables as observations (Bai 2003, Giannone and Lenza 2009).

The short and long run adjustment of the regional labour market can then be analysed by tracing out the impact of a shock to the employment growth equation on the other variables. The identifying assumption is that this shock captures unexpected changes in regional labour demand meaning that contemporaneous employment growth is weakly exogenous in the other equations of the VAR. The Choleski decomposition implies that current changes in employment affect both employment and participation rates but not vice versa. There are examples that violate this assumption, for example changing fertility rates, but we assume these changes are small relative to the labour demand shocks.[12]

A region-specific labour demand shock is a change in labour demand in a region that is uncorrelated with national and continental labour demand. Think for example of a change in local government spending, the bankruptcy of a big company with many employees in one particular region, or a regional natural catastrophe like a storm tide. Examples of shocks to country-specific labour demand could result from a change in military spending, oil prices, a national banking crisis or changes in national policies.

Note that

$$(6) \quad E_{it} = \frac{E_{it}}{L_{it}} * \frac{L_{it}}{P_{it}} * P_{it}.$$

Changes of the employment level thus stem either from changes of the employment rate, the participation rate or the population. With the VAR we can distil the population response, since any change that is not explained by the employment rate or the participation rates is attributed to a change of the population. Following Blanchard and Katz (1992), we will assume that these changes of the population are due to migration.

[11] We could also estimate (4) using the original regional variables on the left-hand side and augmenting the VAR with the continental and country (area) factors. Results are very similar.

[12] Dao, Furceri and Loungani (2014) in a recent working paper test the assumption for the US and conclude that identification with an instrument reveals a lower contribution of migration. We are not fully convinced that the only effect of the IV identification is a clearer demand shock, as it may also change the type of the adjustment. Because the IV approach is very difficult to implement in Europe also Dao, Furceri and Loungani (2014) rely on our assumption for their European analysis.

4 DATA, DESCRIPTIVE STATISTICS, VARIANCE DECOMPOSITION

4.1 Regional Disaggregation and Data Sources

The regional disaggregation follows Blanchard and Katz (1992) for the US and is similar to Decressin and Fatás (1995) for Europe. For the US, the disaggregation is straightforward: we count each state plus the District of Columbia as a region so that there is a total of 51 US regions. In Europe entities of comparable size refer less strictly to administrative divisions. Yet, all regions in the sample can be understood as consisting of one or more NUTS2-regions. We include eight French, seven German, eleven Italian, seven Spanish, and eight British regions, as well as Belgium, Denmark, Greece, Ireland, the Netherlands and Portugal. While Decressin and Fatás (1995) classify the small countries as regions, they are treated as countries in our set-up. For a list of all regions see Appendix A.

We use data on the population, labour force and employment, from which we compute the employment growth, the (un)employment rate, as well as the participation rate. Our time series starts in 1976 and ends in 2013 so that it covers 38 years. The primary European data sources are the national Labour Force Surveys. We apply some data modifications to fill in missing data points and replace data of obviously bad quality using data from different international and national sources. The data from different sources is linked using adjusted growth rates of the working-age population, the unemployment and the participation rates. They are then used to extend the most recent data backwards. We compared different ways to link the data and found that differences are minor. For European regions we restrict the sample to the working-age population so that all series cover only persons between 15 and 64 years old.

For the US we use the Current Population Survey (CPS) as our main data source because it is comparable to the European Labour Force Surveys. In section 6 below, we also use Local Area Unemployment Statistics (LAUS) from the Bureau of Labor Statistics as an alternative data source for investigating the US adjustment mechanism because these are establishment data that are closer to the data used by Blanchard and Katz (1992). All US series include all persons older than 15 years.

For more details regarding the regional disaggregation as well as data sources and modifications refer to the data appendix.

4.2 Descriptive Statistics

In 2013 the average regional population in the US was 4.8 million with a standard deviation of 5.4 million leading to a coefficient of variation of 1.1. With 30 million California was the biggest region in the US and with less than half a million Wyoming was the smallest. The average regional working-age population in Europe is very similar and equal to 4.6 million but the standard deviation is with 2.4 million smaller, resulting in a smaller coefficient of variation, 0.5. Nordrhein-Westfalen in Germany is the largest region with a working-age population of 12 million in 2013, whereas Abruzzi-Molise in

Italy is the smallest with only 1 million inhabitants. The total working-age population in 2013 was 240 million in the US and 220 million in Europe.

The average unemployment rate in a US region in 2013 was 6.8% with a standard deviation of 1.6%. In Europe the average unemployment rate was nearly twice as high, namely 12.5%, and the regions were much more heterogeneous, as indicated by a standard deviation of 7.9%. Over the whole sample the average unemployment rate was 6% in the US and 10% in Europe.

[Insert Figure1 here]

Figure 1 plots the continental means of employment growth, the unemployment rate and the participation rate over the period 1977 till 2013 in the US and Europe. Employment growth fluctuates strongly, in particular in the US. While employment growth was on average higher in the US than in Europe in the earlier part of the sample, growth rates have become more similar since then. The unemployment rate shown in the middle panel is less volatile and returns to its mean roughly every ten years. During most of the sample the unemployment rate is higher in Europe than in the United States. Finally, the lower panel shows the participation rate, noting that for Europe this only includes persons below the age of 64. The participation rate in Europe shows a clear upward trend throughout the sample, whereas in the US the participation rate increased until 2000, and started to decline afterwards.

[Insert Figure 2 here]

Figure 2 plots the standard deviation of regional unemployment rates over time. In Europe regions diverged until 1998. Following the introduction of the euro in 1999 they converged very fast.[13] However, since 2008 regional unemployment rates are again diverging strongly in Europe. As a result, in 2013 the dispersion reached its maximum over the sample period. In contrast, regional unemployment dispersion is considerably lower in the US than in Europe, confirming that US regions are more homogenous than European ones. Also note that in the US regions diverge particularly in recessions: the three steepest increases of the standard deviation – in the early eighties, the early nineties, and between 2008 and 2010 – all coincide with recessions.[14]

[13] In the same period the standard deviation of unemployment rates of other developed countries decreased as well, but less than in Europe (Estrada, Galí and López-Salido, 2013).

[14] The connection between increasing standard deviations and recessions is also discussed in Greenaway-McGrevy and Hood (2013) as well as in Dao, Furceri and Loungani (2014).

4.3 Variance Decomposition

Next we estimate the multi-level factor model (3) to extract the common factors from the data.

[Insert Table 1 here]

Table 1 reports the proportion of variance explained by each level for each variable. The common European factor explains 28% of the employment growth fluctuations, 41% of fluctuations in the employment rate and 69% of fluctuations in the participation rate. Country factors are nearly as important for the first two series, but matter less for changes in the participation rate. The importance of the country factors in Europe supports our strategy to estimate a multi-level factor model. Together the EU and country factors capture between 57% of the variance in employment growth and 85% of the variance in the participation rate. Idiosyncratic fluctuations are most important (43%) for the employment growth rate.

The greater homogeneity of the US economy is reflected in the fact that the US factor plays a more important role in accounting for both employment growth and employment rate fluctuations. As expected, US states are thus more correlated and their business cycles more aligned than regions in Europe. The area factors, on the other hand, explain less than half of the variance that is captured by the country factors, clearly showing that country factors are more important in Europe. The contributions of region-specific shocks are similar to the ones in Europe with a slightly lower contribution for the employment rate.

5 LABOUR MARKET ADJUSTMENTS

In this section, we compare the labour market adjustment of regions to region-specific shocks in Europe and the US, and analyse as well the country adjustment in Europe. Moreover, we analyse changes in the role of labour mobility over time.

In each case, the figures below report impulse responses of the employment level, the employment rate and the participation rate to a positive one standard deviation shock to labour demand. Note that deviations of the employment rate are approximately equal to negative deviations of the unemployment rate. The responses show percentage deviations from region-specific means. In addition, we include a table below the impulse responses that shows the adjustment in the first five years and in the long run to a normalised initial increase of 100 jobs. Each table reports in the first line the number of newly created jobs and in the lines below it decomposes the new jobs. Some of the new jobs are filled with formerly unemployed, others with people previously not forming part of the labour force and the remaining jobs are filled with people moving into the region.

5.1 Regional Adjustment to Region-Specific Shocks

First we discuss the adjustment of regions to region-specific changes in labour demand and compare the adjustment in Europe and the US. We estimate (4) and allow for two lags.[15] We test for unit roots and confirm that all series are stationary so that the model specification is appropriate.[16]

[Insert Figure 3 here]

Figure 3 shows the impulse responses for Europe in the left and for the US in the right panel. Note, first, that following a positive labour demand shock the employment level increases on impact, then falls back towards its initial level, but remains above it in the long run. The fact that some but not all of the initial increase in employment remains in the long run suggests that both labour migration and job destruction or migration play a role in the adjustment process. If no jobs disappeared, the permanent effect would be the size of the initial increase. If, on the contrary, no migrants were moving into the region, the permanent effect on employment would be zero. Since in the long run the unemployment and participation rates revert to their pre-shock baseline, the permanent change in employment must stem from migration. The permanent change in employment relative to the initial increase thus reveals the relative importance of job migration versus migration of employees. Due to the normalization the number of workers migrating in the long run reported in the tables can be interpreted as the long-run contribution of migration as percentage of the initial increase in employment.

A number of points are worth making. First, the adjustment towards the new steady state is faster in the US than in Europe. Employment reaches its long run level after 10 years in Europe and after five years in the US. After three years both the employment and participation rate continue to contribute substantially in Europe, but not in the US. After four years they still contribute more than 20 per cent in Europe, but only five in the US. The employment rate (or unemployment rate) reacts much stronger in Europe and contributes a lot more to the adjustment than in the US. Migration, on the other hand, contributes a bit less in Europe over the whole adjustment period. Overall, a shock changing employment initially by 100 workers leads to 47 immigrants in Europe and 57 in the US. In other words, due to migration 48% of the initial increase of employment becomes permanent in Europe and 57% remain in the US. While migration is higher in the US, the differences are not large.

Summarizing, there are differences between the regional adjustment mechanisms in Europe and the US – in Europe it is more persistent, employment rates contribute more, and migration less – but the differences are smaller than previous work suggests. Compared to Decressin and Fatás (1995), we find a faster adjustment mechanism, a

[15] Two lags are usually used in the literature. We estimate the model also with only one and four lags and find that the results are very similar.

[16] We use the panel unit root test of Harris and Tzvalis (1999) and reject a unit root for all series at the 1% level.

more important role for job creation (and consequently a less important role for migration), and smaller differences between Europe and the US.

5.2 The National Adjustment Mechanisms in Europe

Next we investigate the role of migration in labour market adjustment across countries. The costs of migrating across countries are likely to be higher than those of migrating between regions due to the larger distance, greater language and other cultural barriers, and other institutional obstacles like the limited portability of pension and other social security rights. We should therefore expect a lower contribution of migration to the adjustment process following country-specific labour demand shocks.

We use the five country factors from (3) and add our small countries so that we have a cross-section of 11 countries. We estimate (5) and due to the smaller cross-section now allow for only one lag. Again we confirm the empirical validity of the VAR specification.[17]

[Insert Figure 4 Here]

The left panel in Figure 4 shows the impulses responses of a one standard error positive labour demand shock as before. Note that the standard errors are now larger as the cross-section is smaller. The employment and participation rate contribute nearly equally in all years and need 15 years to return to their pre-shock level. As a result, the adjustment process takes longer in response to country-specific shocks than in response to region-specific shocks. The right panel compares the number of migrants in the first five years after an initial employment change of 100 workers for the different adjustment mechanisms. From before we know that the number of migrants is somewhat lower after a region-specific shock in Europe compared to the US. Migration is much lower after a country-specific shock, in particular in the first years after the shock. In the first year only 18 workers migrate to a country experiencing an unexpected increase of the employment level by 100 jobs, whereas around 40 workers migrate after a region-specific shock of that size in Europe and the US. These differences become smaller over time. Migration also contributes less to the change in employment relative to the participation and employment rate. In the first three years it contributes on average 51% to the regional employment change in Europe after a local shock but only 21% to the national adjustment after a country shock.[18]

Summarizing, we find that migration plays a less important role in the adjustment to country-specific shocks. Since in section 5.1 we found that the regional adjustment processes in Europe and the US are not very different, it follows that it is mostly lower

[17] Here we test for unit roots using the test developed by Levin, Lin and Chu (2002). A unit root is rejected at the 1% level for the employment growth, the participation rate, and for the employment rate.
[18] We have also estimated the national adjustment mechanism with the country series instead of the factors. Results are very similar.

labour mobility between European countries that slows down adjustment in Europe and may contribute to the large heterogeneity in labour market pointed out in the introduction.

5.3 Changes over time

In the previous sections we reported the full-sample results. Given the evidence of changes in labour mobility discussed in the introduction, in this section we analyse whether the role of migration has changed over time.

To do so, we estimate the VARs of equations (4) and (5) for two subsamples separately (1977-1999 and 1990-2013). While this obviously shortens the sample, we still have 23 observations per subsample and thus nearly twice as many observations as Blanchard and Katz (1992) and Decressin and Fatás (1995). Still, we reduce the lag length to one and focus mainly on the first five years in order to minimize issues related to sample length. Note that our samples overlap so that changes originate in differences in the adjustment in the first and last 13 years.

[Insert Figure 5 here]

Figure 5 shows the changes of the regional migration response in Europe and the US, as well as the national migration response in Europe. The left panel plots the total number of migrants after a shock of 100 workers in the first five years. The dashed lines show the numbers of migrants between 1977 and 1999 and the solid lines the numbers between 1990 and 2013. In addition, we use pie charts to report the average percentage contributions of the employment and participation rate and of migration to the employment change in the first three years. This allows us to see whether migration has become relatively more important or not.

The upper panel reports the changes in the regional adjustment in Europe. The total number of migrants has risen in all years and also the percentage contribution of migration has increased. Molloy, Smith and Wozniak (2011) analyse inter-NUTS2 mobility in Europe using a LFS question asking whether respondents moved in the previous year. In line with our results, they find that mobility rates were either flat or slightly increasing in the early 2000s.

The increase of migration in Europe detected by Beine et al. (2013) refers to migration between countries and not regions. As discussed in the introduction, recent divergence in unemployment rates across European countries has led to increased migration in Europe. It is thus interesting to see whether we can also detect changes in the adjustment to country shocks using our methodology. The middle panel of Figure 4 shows the changes in the country adjustment mechanism. As expected, the total number of migrants in response to an initial increase in employment of 100 has indeed increased. After three years, for example, it decreased from 31 in the first subsample to 45 in the second subsample. And also the permanent effect of a country shock on migration has become more important. Although not directly comparable, our results therefore qualitatively

confirm the findings of Beine et al. (2013). In sum, we find that in the most recent subsample country-specific changes in labour demand set in motion more cross-country movement in workers and that this migration contributes more relative to the employment and participation rate. At the same time, the role of migration between countries remains lower than its role between regions.

Finally, the lower panel shows changes in the role of migration in the US. The total number of migrants after a region-specific shock has notably decreased in all years. Three years after the shock the number of migrants has decreased from 56 to 44. As the pie charts show, the percentage contribution has declined as well and is compensated by a more flexible labour force. For the US our results are thus in line with Dao, Furceri and Ploungani (2014) and relate nicely to the literature on declining labour mobility in the US.

6 Relation to Blanchard and Katz (1992)

In this section, we apply the original methodology of Blanchard and Katz (1992) who defined regional variables as simple differences from the continent-wide mean to our data. This is useful for two reasons. First, our results differ quite importantly from those of Blanchard and Katz (1992) and Decressin and Fatás (1995) who found a much slower adjustment process and a greater role for migration. In this section, we want to investigate whether these differences are mainly due to the change in methodology or also due to use of different data sets. Second, one might argue that the policy maker is interested in the regional adjustment to differences independent of the type of the shock. This may be captured somewhat better by analysing simple mean differences.

6.1 The adjustment with simple differences

[Insert Figure 6 here]

Figure 6 plots the impulse response functions for Europe and the US using simple differences computed as specified in (1). While this specification results in stationary series in the US, in Europe we can reject a unit root neither in the employment rate nor in the participation rate so that that this filtering strategy is not appropriate for European regions.[19] As discussed before, our factor-based methodology of identifying region-specific variables results in stationary series.

In Europe, the employment level exhibits a hump-shaped response and migration is initially lower than for region-specific shocks. The number of migrants in the first years drops from 39 to 25, but is nearly identical in the long run (47 versus 46). The

[19] With Harris-Tzvalis test we reject a unit root in the US for all series at the 1% level. In Europe only the employment growth is stationary – we reject a unit root at the 1% level – but both for the employment and participation rate we cannot reject the unit root at any level.

participation rate is now much more persistent and is considerably above the pre-shock level even 20 years after the shock. The employment rate contributes stronger and is more persistent as well.[20]

Overall, it looks like the original BK methodology mixes the adjustment to region-specific shocks with the adjustment to country-specific shocks. This results in a more persistent adjustment process with a larger role for unemployment and a significantly smaller role for migration.

Accordingly, in the US the differences are smaller and the responses look generally similar to the ones after region-specific shocks. But again the process now takes longer to be completed and in particular the contribution of the participation rate is more persistent. Using simple differences, migration is a little lower initially, in the first year we see 37 instead of 43 migrants, and a little higher in the long run with 63 instead of 57 migrants. The general conclusions from Section 5.1 are thus confirmed.

Next, we repeat the estimation for the same subsamples as before with simple differences. Figure 7 reports again the number of migrants after a shock of 100 workers in the left panel and the average percentage contributions in the first three years in the right panel.

[Insert Figure 7 here]

From 1977-1999 to 1990-2013 the total number of migrants has again gone up in Europe, though only from the third year onwards. The average percentage contribution in the first three years is nearly the same but would increase if we added more years.

As before, the number of migrants has clearly decreased in the US and also the percentage contribution in the first three years has gone down. Our results from Section 5.3 are thus also confirmed.

6.2 Local-Area Unemployment Statistics

While using simple differences brings the US impulse responses closer to the ones in Blanchard and Katz (1992), we still neither observe the strong hump-shaped response that characterises their responses nor the related permanent effect on migration of around 100%. In this section, we analyse whether the different data source may be the reason for this. We estimate the adjustment process (4) for the US using simple differences and the LAUS data set, which is establishment data closer to the data used by Blanchard and Katz (1992). Figure 8 shows the impulse responses to a positive one standard deviation shock.[21]

[Insert Figure 8 here]

[20] We also estimated the regional adjustment with β-differences (see footnote 5) and find very similar results.
[21] The Harris-Tzvalis test rejects a unit root at 1% for employment growth and the employment rate and at 5% for the participation rate.

In this case, the impulse responses look very similar to the responses reported in Blanchard and Katz (1992) and more recently in Dao, Furceri and Loungani (2014). Above all, the impulse response now is strongly hump-shaped and migration is more than twice as important in the long run and above 100%.

We can only speculate about the reasons for the large differences with our results and the larger contribution of migration in the long run. Since migration is identified as the residual of the VAR, i.e. migration is given by the change of the employment level that cannot be explained by changes in either the employment or the participation rate, the quality of the data series may be very important. Inconsistent data series may result in a larger contribution of the residual and hence of migration. Employment data from LAUS is based on establishment data and there are important differences between household and establishment series resulting from different definitions, coverages, and estimation procedures. For example, CPS employment includes self-employed persons, unpaid workers in family-operated businesses, and agricultural workers; establishment-based employment data from the Current Employment Statistics does not. Unpaid absences from work are differently accounted for and persons working in more than one establishment are counted more than once with establishment-based data. The latter inconsistency clearly matters: Blanchard and Katz (1992) overestimate migration because they rely on establishment-based employment data, but on CPS data for unemployment and persons out of labour force so that some of the unexplained employment changes may result from changes in dual job holding and not migration. With LAUS data the same might happen.

7 CONCLUSION

7.1 Summary

In this paper we revisit the role of labour mobility in regional labour market adjustments in Europe and the US. We study 41 European and 51 US regions over a period of 38 years. In line with Greenway-McGrevy and Hood (2013), we use a factor model to distinguish between the regional adjustment to region-specific idiosyncratic shocks and the country adjustment to country-specific shocks. We show that distinguishing between whether migration takes place between regions or between countries matters for the relative importance of both migration and unemployment.

In particular, we find that, once we control for country factors, the regional adjustment process in Europe is not that different from the one in the United States. In both areas, migration plays a relatively important role in the long run, but in European countries the adjustment process takes somewhat longer and is accompanied by larger changes in unemployment reflecting more rigid labour markets.

What makes a difference is the cross-country adjustment process in Europe. Due to remaining differences in language, cultural factors and institutional differences, the role

of migration is much less important when a country is hit by a labour demand shock. At the same time, changes in the employment rate are more important reflecting different national labour market institutions. If one does not account for the country factors, the differences in regional adjustment between Europe and the US become much larger.

Using a much longer data set, we also find that the adjustment processes in Europe and the US have further converged over the past decades. This reflects both a fall in interstate migration in the US and a rise in the role of migration in Europe as European integration proceeds. The latter shows up most strikingly in an increased role of migration in the cross-country adjustment.

Finally, we show that part of the difference between Europe and the US in previous studies may in addition be due to the use of different data sources.

7.2 Policy Implications

Our findings can inform the policy debate in at least two dimensions. First, most of the differences in the role of migration in the regional labour market adjustment process between the US and Europe are due to remaining barriers connected with country borders. It is therefore right for European policy makers to focus on how to facilitate labour mobility across countries in Europe. Our empirical investigation shows that measures taken in the past such as the Schengen agreement, initiatives to bring down cultural barriers through exchange programmes such as the Erasmus programme or efforts like the Bologna process to harmonize educational standards may already have contributed to a greater role for labour mobility in labour market adjustment. And there is scope for additional measures to further reduce the persistence of labour market adjustment to country-specific shocks and alleviate the associated social costs. A variety of measures can be considered including promoting more flexible housing markets, increasing the compatibility of school systems, improving language education, harmonizing pension systems and promoting the portability of pension and other social security rights, and changing the general attitude towards migrants. The recent initiatives of the European Commission and Council may hence help to foster adjustment to country-specific shocks.

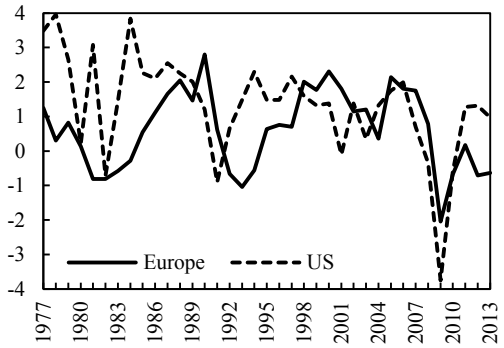
However, our analysis also reveals that the differences with the United States, a monetary union with a quite homogenous culture and a well-functioning labour market, are not that large. Given that cultural and language barriers are likely to persist in Europe, it is therefore important to be realistic about what increased labour mobility can achieve. The differences in the importance of migration in Europe and the US are smaller than has previously been argued, so that labour mobility might not hamper the functioning of the Euro Area as strongly as some argue.

To become more specific is difficult given the positive nature of our analysis. This would require a more structural and normative approach. In this context, one should also recall that there are also costs to migration, in particular when it involves high-skilled migration that may tend to exacerbate rather than alleviate regional disparities.

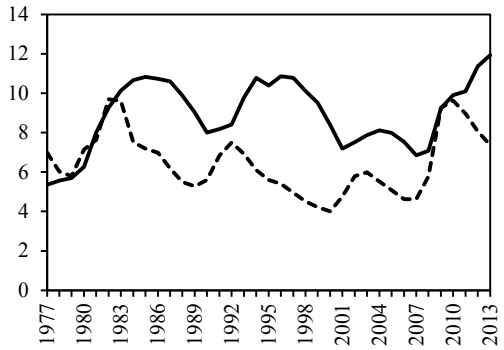
Moreover, large-scale migration in Europe could be socially disruptive (Emerson et al., 1992; Obstfeld and Peri, 1998). Moreover, from a normative perspective it is not clear whether adjustment through workers or jobs is preferable. An acceleration of the labour market adjustment through job creation may in any case often be desirable. It may be achieved by more flexible wages – also increasing workers' mobility – and, equally important, a higher wage elasticity of jobs. In this context, it is also worth mentioning the role of regional policies and a banking union in Europe. Regional policies may be used to encourage job-creation in depressed regions, for example by offering tax deductions to firms moving in. In addition, the implementation of a banking union in Europe will foster adjustment through job creation. Morgan et al. (2004) show that increased interstate banking in the US stabilised fluctuations within states and reduced divergence between them.

I. Figures

Employment Growth



Unemployment Rate



Participation Rate

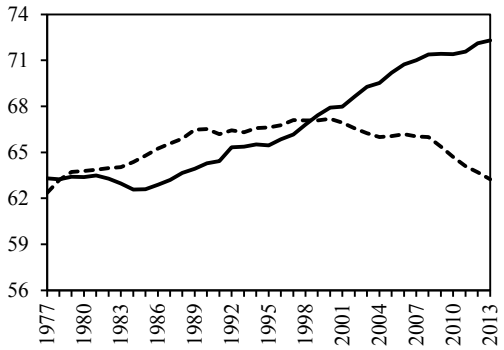


Figure 1. Means of original variables

Note: We plot the means of all European and the means of all US regions over time.
Source: Labour Force Surveys with modification by authors for Europe and CPS for the US.

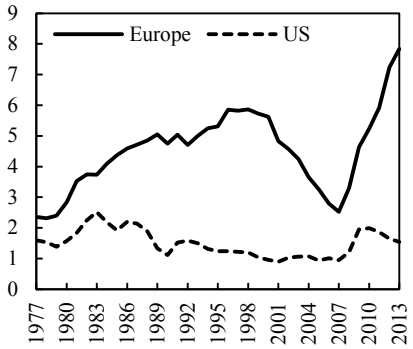
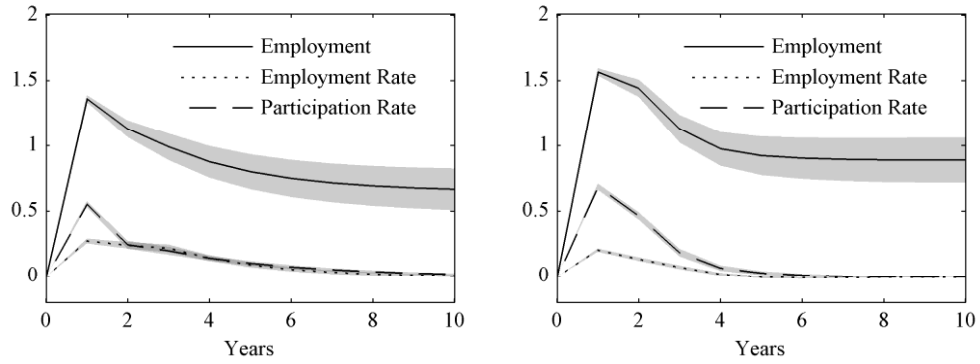


Figure 2. Standard deviation of regional unemployment rates

Note: Standard deviations of unemployment rates shown in the middle panel of Figure 1.
Source: Authors' calculations.



	Europe						US					
Years	**1**	**2**	**3**	**4**	**5**	**10**	**1**	**2**	**3**	**4**	**5**	**10**
Employment	100	83	73	64	59	50	100	92	72	62	59	57
Employment rate	20	18	16	11	7	1	13	9	5	1	0	0
Participation rate	41	18	15	11	8	2	44	30	12	4	2	0
Migration	39	47	42	43	44	47	43	54	56	57	57	57

Figure 3. Adjustment to region-specific shocks

Note: We plot the impulse responses to a one standard deviation shock to labour demand. The y-axis shows the effect of the shock in percentage deviations from steady-state and the x-axis shows years. We allow for two lags and estimate the model with least-squares. The grey area shows confidence bands of 95% bootstrapped with 250 replications. The table normalizes the size of the employment change to 100 and decomposes the employment response into contributions of the employment rate, the participation rate and migration, which is the unexplained part of the employment change.
Source: Authors' calculations.

Years	1	2	3	4	5	20
Employment	100	115	109	99	89	40
Employment rate	42	52	45	35	26	-2
Participation rate	40	41	37	33	28	0
Migration	18	22	27	31	34	43

Figure 4. National adjustment to country-specific shock

Note: As Figure 3 but here we use the country factors and the small countries and allow for only one lag.
Source: Authors' calculations.

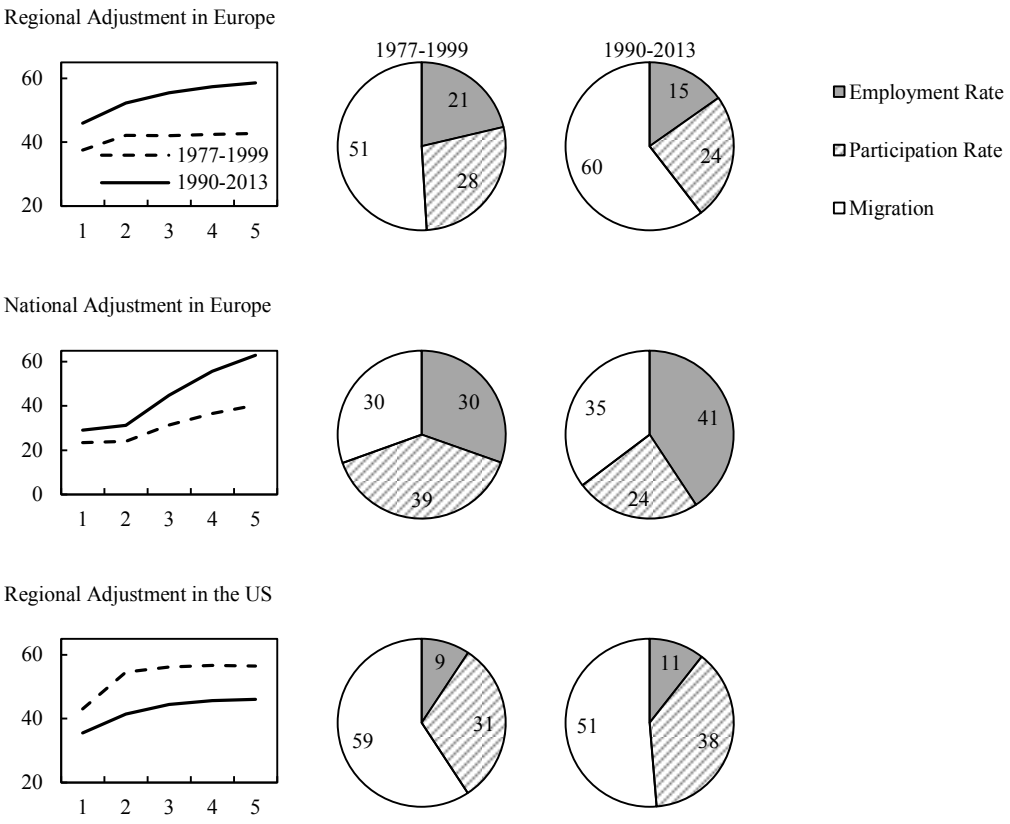
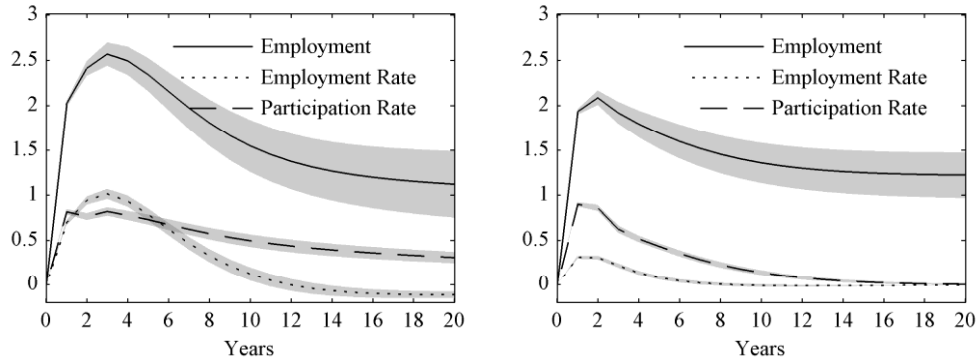


Figure 5. Changes of migration

Note: The left panel plots the number of migrants after a positive shock of 100 new jobs in the first five years. The right panel shows the average percentage contributions of the employment rate, the participation rate and migration to the employment change in the first three years. Note that these three variables together explain the total employment change.
Source: Authors' calculations.



	Europe						US					
Years	**1**	**2**	**3**	**4**	**5**	**20**	**1**	**2**	**3**	**4**	**5**	**20**
Employment	100	120	127	124	116	56	100	108	99	93	88	63
Employment rate	34	47	50	46	39	-5	16	16	11	7	4	0
Participation rate	41	38	41	39	36	15	47	45	32	27	22	0
Migration	25	35	36	39	41	46	37	48	56	59	61	63

Figure 6. Regional adjustment with simple differences

Note: As Figure 3 but here we estimate the VAR in simple differences as in Blanchard and Katz (1992).
Source: Authors' calculations.

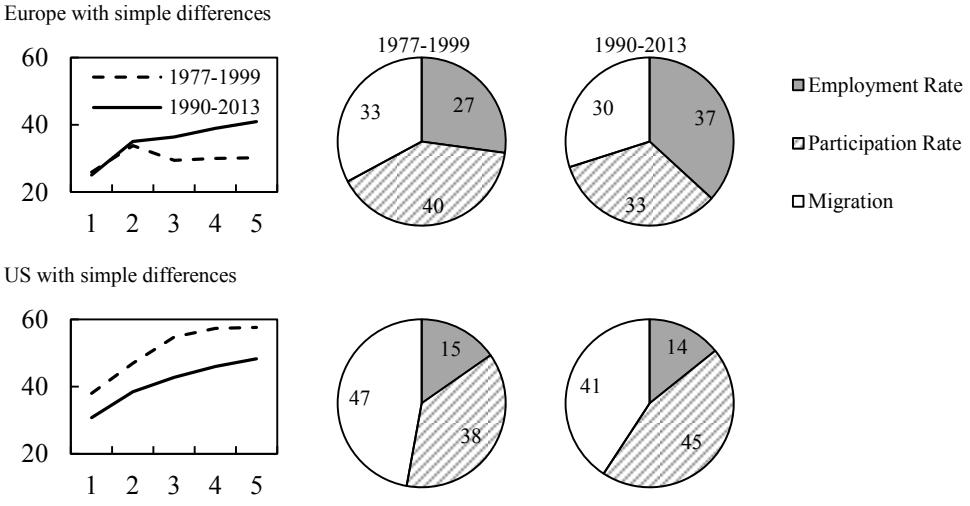


Figure 7. Changes of migration with simple differences

Note: As Figure 5.
Source: Authors' calculations.

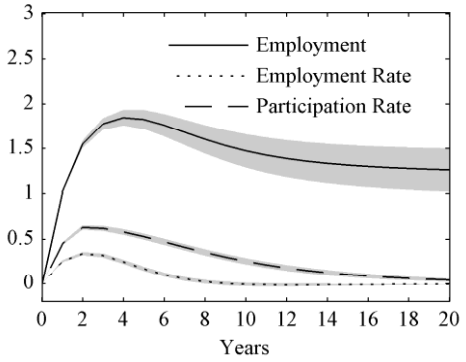


Figure 8. US regional adjustment with simple differences and LAUS data

Note: As Figure 3 but with simple differences and LAUS data.
Source: Authors' calculations.

II. Tables

Table 1. Variance Decomposition

	EU	Country	Region
Employment Growth	28	29	43
Employment Rate	41	36	23
Participation Rate	69	16	16
	US	**Area**	**State**
Employment Growth	41	15	44
Employment Rate	71	17	12
Participation Rate	60	19	21

Note: The squared loading of a variable on a factor measures the explained variance by that factor. We report the explained variance for each variable in Europe and the US by aggregating over the area and country factors.
Source: Authors' calculations.

Appendix

A Regions

Germany	France	Italy	Spain	United Kingdom
Baden-Württemb.	Bassin Parisien	Abruzzi-Molise	Canarias	East Midlands
Bayern	Centre-Est	Campania	Centro	East of England
Hessen	Est	Centro	Este	Northern Ireland
Nieders. & Bremen	Ile de France	Emilia-Romagna	Madrid	Scotland
Nord.-Westfalen	Mediterrane	Lazio	Noreste	South-West
R.-Pfalz & Saarl.	Nord-Pas-de-Cal.	Lombardia	Noroeste	Wales
S.Holst. & Hamb.	Ouest	Nord-Est	Sur	West Midlands
	Sud-Ouest	Nord-Ovest		York and Humb.
		Sardegna		
		Sicilia		
		Sud		

US Northeast	US Midwest	US South	US West
Connecticut	Illinois	Alabama	Alaska
Maine	Indiana	Arkansas	Arizona
Massachusetts	Iowa	DC	California
New Hampshire	Kansas	Delaware	Colorado
New Jersey	Michigan	Florida	Hawaii
New York	Minnesota	Georgia	Idaho
Pennsylvania	Missouri	Kentucky	Montana
Rhode Island	Nebraska	Louisiana	Nevada
Vermont	North Dakota	Maryland	New Mexico
	Ohio	Mississippi	Oregon
	South Dakota	North Carolina	Utah
	Wisconsin	Oklahoma	Washington
		South Carolina	Wyoming
		Tennessee	
		Texas	
		Virginia	
		West Virginia	

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