DISCUSSION PAPER SERIES

IZA DP No. 2674

Still Searching for the Wage Curve: Evidence from Germany and Italy

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March 2007

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Discussion Paper No. 2674
March 2007

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IZA Discussion Paper No. 2674
March 2007

ABSTRACT

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This paper investigates the functioning of regional labour markets in Italy and Germany for different employee groups. In the light of high and persistent differences in unemployment and wage rates between the North and South of Italy and the West and East of Germany, we first derive theoretical hypotheses on group specific correlations between regional unemployment and individual wages. Using micro data on hourly wages properly matched to local unemployment rates, we specify and empirically test different wage equations. On the basis of our results, we find no evidence for the existence of a "wage curve" in Italy. In the case of Germany, results are quite sensitive to the model specification and the employee group considered. In both countries, the reaction of wages to local unemployment varies significantly along the wage distribution, being more sensitive around the median quantiles. We conclude that there is no uniform wage curve and call for a differentiated analysis for various groups, taking into account the respective institutional setting.

JEL Classification: J3, J6, R1

Keywords: wage curve, local labour markets, quantile regressions

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1 Introduction

The existence and persistence of significant differences in economic conditions and in factor prices across areas within a country are common phenomena to most industrialised countries. This evidence might be difficult to reconcile with the "standard" description of the functioning of labour markets. However, when "amenities"[1], the labour market attachment, the composition of the labour force or labour market rigidities vary substantially across areas, dispersion in wages and economic conditions may well characterise a (long run) equilibrium. In this context, the analysis of local labour markets on the basis of micro-economic data can provide useful insights on why large fluctuations in slackness of the local labour markets lead to rather small changes in real wages.

The OECD points to Germany and Italy as prime examples in Europe for large and persistent regional disparities on the labour market (OECD, 2000). In both countries the correlation between net migration and unemployment rates by region is quite strong. However, the scale of movement is not sufficient to act as a rapid adjustment mechanism. Although both countries are similar in their large regional disparities and rather inflexible labour markets, labour market attachment in the "weaker part" of the countries (i.e. the South in Italy and the East in Germany) differs diametrically. While participation in East Germany, especially of females, is higher than in the West and does not respond to changes in the unemployment rate, participation in the South of Italy is lower than in the North and especially female participation reacts to changes in the unemployment rate. As the labour market attachment of particular groups is key to a proper understanding of the adjustment mechanisms on the labour markets, a comparative investigation of both countries seems especially promising.

This paper aims at investigating the functioning of local labour markets in Germany and Italy. In particular, we estimate the relationship linking wage levels to local unemployment rates, the so-called wage curve. There are almost 1000 estimates demonstrating that wage curves differ for sub-groups, regions and countries. Very few tested hypotheses on the variation in the slope of the wage curve across groups of

[1] This term is intended to include all those factors that affect the welfare of individuals living in a certain area and their inclination to migrate. Examples are the environment, prices of non market services, housing prices, social networks etc..

workers and sectors, however (Card, 1995; Nijkamp and Poot, 2005). Our main contribution to the literature therefore is to motivate why the results differ and derive hypotheses on the functioning of the regional labour markets. We also tackle estimation problems such as unobserved heterogeneity (using fixed effects), lags in the transmission of the unemployment effect, and endogeneity of regional unemployment (using instrumental variables). Finally, we test the robustness of our results by splitting the sample into different employee groups and regions and running wage quantile regressions. According to our theoretical hypotheses, we find widely diverging results, depending on the group in focus and the estimation method used.

In light of the aspects mentioned above, we discuss some theoretical considerations on the functioning of the labour market in section 2. Section 3 presents the Italian and German institutional setting, while section 4 offers an overview of the main stylised facts concerning the functioning of local labour markets in the two countries in the last decades. The empirical analysis of the wage - (local) unemployment relationship and the econometric model estimated are presented in section 5. The last section contains the concluding remarks and some policy implications.

2 Unemployment and Wages

The relationship between unemployment and wages has often been object of controversies. According to the textbook analysis of the labour market, local unemployment may result from asymmetric shocks affecting the demand or the supply of labour and from wages failing to adjust to the market clearing level. In this context, the relationship between wage and unemployment is a temporary phenomenon characterising the adjustment process in the labour market. Alternatively, when reference is made to those theories in which the existence of imperfect competition on either product or labour markets (or both) is assumed, unemployment may well be considered as a key feature of the equilibrium. In other words, an “equilibrium” relation between wages and (local) unemployment might exist (Nickell *et al.*, 1991; Blanchflower and Oswald, 1994a).

A vast empirical literature has investigated the different hypotheses suggesting the existence of a relationship between wages and unemployment. Traditionally, empirical

studies have focused on the relation between the *variation* of wages and the *level* of unemployment. The existence of such a trade-off – the Phillips curve - is considered a well established feature of the functioning of labour markets as well as a tool for economic policy (Bean, 1994; Fabiani *et al.*, 1997, Chiarini and Piselli, 1997).

The focus of the present analysis, however, departs from the standard Phillips curve framework, in that it is assumed that there might be a long run "equilibrium" relation between the *level* of wages and the *level* of local unemployment. This relation, after the seminal work by Blanchflower and Oswald, is better known as the "wage curve" (Blanchflower and Oswald, 1990, 1994a, b).

In the remainder of this section, we shall consider some possible theoretical explanations which may help to interpret the features of the wage curve in the Italian and German context for different groups of people.

2.1. Compensating Differentials, Migration Flows, and Equilibrium

According to the compensating differentials hypothesis, individuals living in areas characterised by some unpleasant attributes such as remoteness, high housing prices or high costs for local services, need to be adequately compensated for the disutility they incur by living and working there. In equilibrium, there is a pecuniary compensation associated to disadvantaged areas such that the expected utility is equalised across all the different locations[2].

When local unemployment is high, workers weigh the utility they get out of wages paid in the area by the probability of obtaining a job therein and move across areas responding to the different arbitrage conditions which characterise local wages and unemployment. Costless mobility occurs up to the point at which expected utility is equalised across areas. Note that people have always three different options if the unemployment in one region increases: some people might (temporarily) drop out of the labour force if they lose their job and the unemployment rate is generally rising (discouraged workers), some might move to a region where labour market conditions are better and still others might get unemployed and try to find a new job in the same region. In this context, the (long-run) spatial correlation between wages and

[2] This idea goes back to the compensating differentials hypothesis by Adam Smith and to the more recent version proposed by Harris and Todaro (1970) in the context of developing countries.

unemployment across areas is positive: that is areas with high unemployment also feature higher wages.

However, it has been argued that the hypothesis of costless mobility might be unrealistic and that the existence of fixed costs may well characterise the mobility decisions of individuals. In this case, a move across areas will be an optimal response only when "permanent" conditions vary (long run), while no move will be observed when conditions vary only "temporarily" (short run). Areas with different degrees of amenities will lie in different places along the equilibrium locus satisfying the local wage-unemployment trade-off (with individual wage *w* and regional unemployment *U*, compare Figure 1)[3].

(Figure 1 around here)

In other words, when the hypothesis that location choices are made only at discrete intervals and that mobility costs in the short run are prohibitively high, then a (no mobility) equilibrium without migration flows across areas can be shown to exist even if there are differences in unemployment rates (Blanchflower and Oswald, 1994a).

It can be noted that while "permanent" labour market conditions - across areas - are not generally observed, the trade-off between "current" levels of wages and unemployment - within areas - can be easily investigated. The latter will be the main focus of the present study.

Different hypotheses have been proposed in the literature to explain the co-variation (in equilibrium levels) of wages and unemployment. In terms of efficiency wage models low unemployment requires higher wages to deter workers' shirking (Akerlof and Yellen, 1990; Shapiro and Stiglitz, 1984) and to reduce labour turnover (Salop, 1979).

Alternatively, when wages are determined through collective bargaining, the unemployment rate plays the role of moderating trade unions wage aspirations: the higher the number of jobless individuals the lower the bargaining power of unions (Nickell and Wadhwani, 1990). The main result, in terms of wage-unemployment

[3] For example, assume the existence of two areas, one more appealing than the other one for the presence of a higher degree of "amenities". In order to be in the long run "no migration equilibrium", the first area will present lower wages and higher unemployment as opposed to the other. Otherwise the more appealing area would be completely inhabited. Therefore the two areas, even sharing the same trade-off between wage and unemployment, will take, *ceteris paribus*, different positions on the curve: on the top left for less pleasant areas, on the bottom right for more appealing ones.

equilibria, is that (local) unemployment and the level of wages, within each area, are negatively correlated.

Note that a negative relationship between "current" levels of wages and unemployment is not necessarily in contradiction with the concept of compensating differentials and with the idea that - *ceteris paribus* - "permanent" levels of wages might be positively correlated (in the long run) to unemployment rates across areas. While the former describes deviations of unemployment and wages from the permanent features which characterise each area, the latter describes an equilibrium of such permanent features across different areas.

2.2 Heterogeneous Reactions to Changes in Unemployment

Changes in unemployment and wages may affect the participation and the migration decision of workers differently. A well-researched difference is the labour supply decision of men and women. In addition, there might be differences between workers at a different position in the wage distribution. Finally, there might be institutional differences in the functioning of (regional) labour markets. We discuss the arguments in turn and derive some hypotheses for our countries under consideration.

Female labour participation usually reacts stronger during the business cycle than male labour participation (Killingsworth, 1983). In addition, women frequently follow males in their regional choices of jobs (Faggio and Nickell, 2005). Both effects might lead to a smaller correlation between regional unemployment and female wages (in comparison to male wages) because the female labour market clears on the labour supply side without strong wage impulses. Participation decisions may also be affected by both institutional and cultural factors, with strong differences across regions within a country. This is particularly relevant in the two countries of our analysis. In East Germany before re-unification, employment played a central role in social life. Female participation rates were exceptionally high because the state provided a powerful system of day care for children and stimulated the quick return of mothers to their workplaces (Sinn and Sinn, 1991). It can therefore be expected that at least for the generation of those who worked already before institutional changes in 1991 took place, labour market participation is comparably high. In addition, relatively cheap housing and local services make it rather expensive for many to move from East Germany to other regions with higher wages and better labour market prospects. On the other hand,

in the South of Italy the labour market attachment - especially of females - is low and highly reactive to the strength of the labour market. The lower attachment of women in the South of Italy may be explained both by cultural reasons and by the lack of job opportunities – they prefer not to participate to take care of their family and/or to increase the probability of their husband to find/hold a job. The relatively high attachment of men in the South may then be explained by the fact that they are likely to be the only worker in the household, hence they need to stay in the labour market to sustain the family.

Changes in local unemployment may also produce different effects along the wage distribution. Employees at the lower end of the wage distribution rather leave the labour market than accept lower wages if unemployment increases. This phenomenon is especially prominent in Germany and Italy because the replacement ratio of unemployment or social benefits is rather high for lower wage groups. This means that the correlation between unemployment and wages should be weak for low wage quantiles. An additional argument for a smaller elasticity between regional unemployment changes and wages for people at the lower end of the wage distribution is that economy-wide or industry collective contracts are usually binding for low paid workers, while for employees at the high end of the wage distribution individual or enterprise specific contracts are more widespread (Büttner and Fitzenberger, 1998). This aspect seems particularly relevant in the case of Italy, where wages are mainly set at the industry level and, despite recent reforms in the wage bargaining system, a marginal role is still played by local bargaining aimed at redistributing productivity gains, mainly in small and Southern firms (Casadio et al., 2005)[4]. Another argument for a higher wage elasticity for employees at higher quantiles of the wage curve is the shirking model presented by Blanchflower and Oswald (1994a). If shirking by employees at the high end of the wage distribution incurs higher losses for firms, one might observe a stronger elasticity of the wage curve for this group of employees. Nonetheless, the effect of changes in local unemployment at the high end of the wage distribution is less clear and probably asymmetric. These employees should in fact see their bargaining power increase stronger than that of employees at the lower end if unemployment decreases. On the other hand, employees at the high end of the wage distribution are regionally more mobile and therefore can avoid wage cuts during

regional recessions. In the middle of the wage distribution it is more costly (than for low paid workers) to withdraw from the labour market if wages decline during a recession, while it may not be worth it to move to a different region (compared with employees in the high part of the wage distribution). We therefore assume that the wage curve is strongest for the middle wage quantiles.

Other institutional differences may play a crucial role in influencing the relation between local unemployment and local wages. More specifically, strict labour and product market regulation could induce some firms to operate in the underground economy, where part of the adjustment can take place when local labour market conditions change. In other words, when local unemployment increases some workers may find a (presumably lower paid) job in the irregular sector, thus leaving wages in the formal sector virtually unchanged. More in general, wages in the underground economy may be more sensitive to local labour market conditions than in the formal sector, mainly when the wage bargaining system does not allow for significant wage cuts. Furthermore, a different incidence of the underground economy across regions may explain why the wage curve is more evident in some areas than in other (namely, in those where the underground economy is less relevant). The effect of the underground economy on the wage curve may be particularly important in (the South of) Italy, which is among the OECD countries characterized by the highest incidence of the underground economy (Lucifora, 2003).

Our theoretical considerations suggest that there should be different wage curves for different groups and regions. In the next parts we will demonstrate that indeed the correlation between wages and regional unemployment differs strongly between different groups of the population.

3 The Institutional Setting in Germany and Italy

Germany

In Germany the largest regional differences on the labour market are observed between the former East German states (Mecklenburg-Western Pomerania, Saxony-Anhalt, Brandenburg, Berlin, Thuringia, and Saxony) and the West German states. Also in West Germany there are persistent regional differences, but they are relatively small in

[4] For further details, see section 4 on Italy.

comparison to the East-West divide (OECD, 2000). The persistent differences between East and West Germany are related to several institutional decisions during the re-unification process in 1989 and 1990 (Sinn and Sinn, 1991). After re-unification the closing of the wage gap was more rapid than the improvements in labour productivity in East Germany. This made production in traditional firms too costly (piece rates are currently still almost 10% higher in the East on average) and led to a massive de-industrialisation. Mainly subsidiaries of West German or international enterprises with established brands (and their related market and price setting power), experience in marketing and export survived the first half of the nineties. The main problem of start-ups by local entrepreneurs was a lack of capital. The massive structural break incurred by the bankruptcy of most of the traditional firms and relatively low investments from West Germany and abroad led to a high and persistent unemployment.

Usually two arguments are raised for the rapid wage increases in East Germany. First, unions and politicians argued that without comparable wages in both parts of the country, there would be brain-drain and a dramatic migration from the East to the West. In addition, several commentators predicted the creation of a “German Mezzogiorno” if the living conditions would not converge quickly. In addition, wages and social benefits were seen as crucial parts of the living conditions that should be comparable in all regions of Germany by the constitution. Second, West German firms had no interest in a low-cost competition with comparable institutional rules and infrastructure within the own economy.

In addition to the relatively low labour demand, incentives to look for a new job from unemployment are lower in East Germany than in the West because the relatively generous West German social benefits system was almost fully transferred to the Eastern part of the country, while productivity, labour demand and living costs are lower.

The consequences are that investments and economic growth in East Germany are lower than in West Germany since 1995 and unemployment is persistently higher. Migration from East to West Germany is confined to young and relatively well-educated people and this reduces the attractiveness of the labour force in the East. Productivity is still only 70% of the level in West Germany. The net transfers of more than 80 billion € per year from West to East are mainly spent for consumption and welfare benefits instead of investments. The topical propositions to improve the

situation do not promise a quick fix of the problems, but they could at least reduce the East-West divide somewhat.[5]

Italy

In Italy the debate on the existence of significant differences in local labour market conditions has a long standing tradition and has been associated with a long sequence of policy measures and "special" regimes. In particular, the latter have regarded the more disadvantaged areas of the country (mainly located in the Southern regions), the so-called "Mezzogiorno". The main policies implemented in recent decades were aimed at promoting faster convergence in income levels across areas, through national collective bargaining and (after 1968) through the abolition of the so-called "gabbie salariali" (which were used to set wage differences in collective negotiations across areas). At the same time, faced with increasing gaps in productivity levels and a different degree of competitiveness between Northern and Southern regions, a substantial flow of transfers and subsidies (mainly in the form of cuts in social security contributions) was directed towards firms operating in the more depressed areas. In the political arena the focus has been placed on the rigidities emerging from these institutional arrangements and, in particular, on the constraints imposed on the functioning of local labour markets (in terms of distortions of both relative factor prices and competitiveness with respect to local economic conditions).

The empirical evidence also shows a progressive polarisation of labour market conditions in different areas of the country (the North-South divide) over the last decades, characterized by growing unemployment differentials and the reduction in (internal) migration flows - from the South to the North of Italy (Attanasio and Schioppa, 1992). In a number of previous studies, the relationship between wages and unemployment was rather weak, with significant differences existing between small and large firms and between Northern and Southern regions (Bodo and Sestito, 1994; Faini, 1995; Casavola *et al.*, 1995; Maida et al., 2005).

[5] First, it is proposed to reduce regulations and over generous social benefits. Second, subsidies should be concentrated on regions and sectors with the highest future potential such as the automotive industry and the high technology sector in the regions of the cities of Dresden and Leipzig. Third, workfare programmes such as the so-called "Magdeburger Alternative" should push unemployed into low-paid jobs at the level of regional productivity with additional public transfers in order to secure a decent standard of living.

In the early Nineties a significant wave of reforms (i.e. elimination of the wage indexation mechanism - the *scala mobile* - and seniority premia; the tripartite incomes policy agreement in July 1993) were introduced to allow both employment and wages to be more flexible and reactive to productivity and business conditions. In particular, the 1993 Income Agreement introduced a two-tier bargaining system (instead of the previous fragmented and uncoordinated system) aimed at preserving the purchasing power of wages without creating inflation pressure. Wages are in fact bargained at the industry level, taking into account inflation targets set by the Government. Further productivity gains can than be redistributed through additional wage bargaining at the local/company level, mainly through performance related pay schemes.

Together with the progressive reduction of public transfers and subsidies to firms operating in the South, these reforms may have contributed to make wages more sensitive to local labour market conditions, although this was not their main objective (Dell'Aringa et al., 2005).

Further contractual flexibility introduced by recent labour market reforms (such as temporary help employment with the so called "Treu Package" in 1997 and other forms of temporary contracts – including staff leasing, job sharing and on call jobs – with the "Biagi law" in 2003) should also produce similar effects (i.e., a closer link between wages and unemployment) at the local level.

4 Some Stylised Facts

In this section some stylised facts concerning the functioning of local labour markets in Germany and Italy are presented. We pay specific attention to the evolution of wages, labour market participation, and unemployment differentials between Northern and Southern regions in Italy, as well as Western and Eastern regions in Germany.

A caveat, already mentioned at the end of section 2 and particularly relevant in the Italian case, is related to the presence of a large share of the labour force employed in the underground economy. Whilst the effective size of this non-regular form of employment is not known, its effect on the functioning of local labour markets might be relevant. This is an obvious limit in any analysis of the wage-unemployment relationship which the present study shares with previous work and which should be born in mind in the interpretation of the results.

In both Italy and Germany, unemployment rates show considerable differences across regions. Besides the traditional divide between unemployment rates in the North of Italy (3-8%) and the South of Italy (about 15-20%), and Western Germany (6-12%) and Eastern Germany (14-21%), there are noticeable differences also among neighbouring regions. Those differences underline the existence of a very low geographical worker mobility and exhibit a significant persistence over time (Faini *et al.*, 1996).

Figures 2a-2c depict the evolution of regional unemployment rates in Italy (1991-2004) and Germany (1995-2000). More specifically, in Figure 2a each point represents a specific region, whose coordinates are given by its unemployment rate differential (with respect to the corresponding national average) at the beginning and the end of the period considered. The Figure clearly shows the above mentioned North-South and West-East divides: all Italian Northern regions and German Western regions (with the exception of Bremen) are characterized by unemployment rates below the national average in both years, while the opposite is true for the regions in the South of Italy and East of Germany. In Italy, despite the relative improvement of labour market performance in Southern regions in the late 1990s and early 2000s, differences among regions are still wide and very persistent, with a very stable regions' ranking over time. The same emerges in the case of Germany, where differences are less relevant than in Italy but still growing over the period considered. These trends are confirmed considering every year in the entire period (see Figure 2b for Italy and Figure 2c for Germany).

(Figures 2a-2c around here)

In the previous sections we have already noted that there might be large and persistent differences in the labour market attachment between Italy and Germany and especially between the two economically weaker parts of the countries, South Italy and East Germany. Indeed we find a relatively high labour market participation in East Germany, regardless of the higher relative unemployment rates, while the situation is quite the contrary in South Italy (see fig. 3). In both countries, male and female participation rates are highly correlated: a region with a high male participation rate usually also exhibits a high female participation rate. In East Germany female labour participation is

higher than in all West German regions, while male labour participation is comparable in both parts of the country.

If we regress[6] regional participation on regional unemployment controlling for region and year, we find a negative and significant correlation in Germany. This is mainly driven by regions in the West. In East Germany the correlation is positive (and significant for females). In Italy there is only a positive and significant correlation for males in the South, all other correlations are insignificant. From these stylised facts we may conclude that people in East Germany (and here especially females) do not react by a withdrawal from the labour market in a depression but still try to get a job. In West Germany the discouraged worker effect seems to be strong, however. In Italy participation seems to be correlated with (local) job opportunities: where the unemployment rate is higher, job opportunities are lower and people have a lower incentive to participate. Only males in the South deviate from this pattern: even if unemployment increases, their labour market participation remains high. Participation is then an important piece in explaining the functioning of (local) labour markets; the differences in labour market attachment between Italy and Germany provide us with a useful variation that allows us to cast additional light on the following econometric results.

(Figure 3 around here)

Turning to wages, Figure 4 reports the structure and the evolution of regional wage differentials in Italy (1991-2004) and Germany (1996-2000). Wage differentials have been computed as deviations of regional wages from national averages, once again at the beginning and at the end of the period considered. The scattered diagrams indicate that the structure of wage differentials is much more stable but more dispersed in Germany than in Italy.

In general, most Northern Italian regions pay higher wages than the national average, but relatively high wages are registered at least in one of the years considered also in some Southern regions (such as Calabria and Sardegna). Over time no clear-cut trends

[6] These regressions are not shown here. They include 76 observations in Italy (19 regions times 4 years) and 128 observations in Germany (16 regions times 8 years). For descriptive purposes, we simply regress (using OLS) regional participation on time dummies, region dummies and the regional unemployment rate.

seem to emerge (since both some Northern and Southern regions have been improving their relative position), even if for most of the South (mainly Campania, Molise, Puglia and Sicilia) wage differentials have been widening in the last decade.

In Germany wage levels were more than 15% lower than the national average in the Eastern parts and there was almost no cohesion process between 1996 and 2000. The only exception is the federal capital Berlin. Its former western part belongs to the western collective bargaining area. This is important because most wages belong or at least are oriented at the collective bargaining accord struck separately for different regions. While it was originally planned to increase the Eastern collectively bargained wages quickly to the Western level, still Eastern contractual wages are lower than Western ones (albeit higher than the relative productivity in most firms in East Germany). In addition, a much higher share of establishments does not take part in collective bargaining in the East and pays wages lower than the bargained wage or opts out of paying the full wage on the basis of an acute economic emergency.

(Figure 4 around here)

At this point it would be interesting to study more closely the relationship between wages and unemployment at the local level. One obvious feature of the previous analysis is that some “permanent” characteristics appear to shape the long term structure of both wages and unemployment levels across areas. However, when the focus is placed on flexibility issues and on the ability of local labour markets to adjust to specific shocks, then what is really necessary for the identification of the wage curve is how variations in current unemployment are related to variations in current wages across areas. In other words, for the correct determination of wage curves it is important to purge the analysis from the long term features (observable and unobservable) that characterise local labour markets such as the quality of the infrastructure, amenities, the costs of living or the emergence of industry clusters and specific economic characteristics of regions (the so-called “fixed or permanent effects”).

As a first approximation for the wage curves presented in the next section, in Figure 5 we plot first differences in regional wages and unemployment. On inspection of the cloud of points in the diagram, no clear cut negative relationship – as implied by the theoretical framework - between unemployment and wages appears in either country. In

addition, first differences of wages are much more heterogeneous in Italy than in Germany (probably also due to the longer time span considered).

(Figure 5 around here)

5 Empirical Analysis

In the empirical literature the wage curve has often been specified (and estimated) as a reduced form assuming the (local) unemployment variable as exogenous. However, if the wage curve is interpreted as a structural relation, it is necessary to introduce some assumptions concerning how the market equilibrium is determined: namely, a relation written either in terms of a price equation or of a labour demand curve is necessary.

The model can be written as follows:

$$w_j = \phi[f(U_j), \rho_i | \mathbf{X}_j] \quad [1]$$

$$U_j = \varphi(w_j, \rho_i, \sigma_j | \mathbf{Z}_j) \quad [2]$$

$$E(\Gamma_j) = \Gamma^* \quad [3]$$

where j indexes the area (ρ), w is the wage level, U the local unemployment, σ a demand shock, and X and Z are two vectors of control variables (i.e. respectively for the wage curve [1] and the price/labour demand curve [2]). The model is closed by the "no-migration condition" according to which, in equilibrium, expected utility should be equalised across areas.

The identification of equation [1] can be obtained either by assuming that only variations in σ occur (i.e. idiosyncratic shocks affect only the demand), or using Instrumental Variables techniques to instrument local unemployment[7]. A further option is to consider a recursive model, in which wage levels only depend on past unemployment.

[7] Note that less than 10% of the studies on wage curves use instrumental variables to control for endogeneity of the unemployment rate and employ OLS as the estimation technique instead (Nijkamp

Empirical estimates of the wage curve are usually based on highly disaggregated data, in order to control for the heterogeneity present in local labour markets both in terms of workers' (i.e. age, education, work experience, etc.) and firms' characteristics (i.e. size, level of unionisation, profitability, sector etc.). However, the unemployment rate is usually referred to the area where individuals work (or firms are located). The use of variables at different levels of disaggregation may lead to biased estimates if all the individuals who work in the same region share some common factors. More precisely, the estimates of the more aggregated variable (i.e., the unemployment rate) present lower standard errors. From a statistical point of view, this can overestimate the importance of local unemployment in influencing individual wages.

To tackle the problem there are a number of options available. First, estimates can be obtained using cell means (conditional or not on a given set of characteristics) for the more disaggregated variable, where the actual degrees of freedom are determined by the more aggregated variable. Second, a "two stage" procedure has been proposed by Moulton (1986, 1990). In the first step, estimates of area wage differentials (using regional or provincial dummies) conditional on a given set of individual and firms' characteristics are obtained for each period. In the second step, the estimated wage differentials are regressed against local unemployment as well as both time and area fixed effects. This model is estimated using standard errors from first stage regression as weights[8].

5.1. An Econometric Specification for the Wage Curve

The specification adopted in most empirical studies of the wage curve is as follows:

$$w_{ijt} = \rho_i + \tau_t + \phi f(U_{jt},) + \boldsymbol{\beta}' \boldsymbol{X}_{ijt} + \varepsilon_{ijt} \qquad [4]$$

where w_{ijt} is the (log) wage paid to individual i in the region j at time t; $f(U_{it})$ is a non-linear transformation of the local unemployment rate; ρ_i and τ_i are, respectively,

and Poot, 2005).

[8] Equation [3] assumes that mobility flows are equal to zero and that there is no spatial correlation between areas (i.e., cov (w^k, w^h)=0 if k≠h, where k and h are regions) (Anselin, 1988). However, the existence of spill-over effects between areas close to each other cannot be excluded *a priori*. We tried to assess spill-over effects by taking out migrants between regions from the sample in Germany. The results did not change, however, compare Ammermüller et al. (2006).

area and time fixed effects, while X_{ijt} is a vector of additional factors that may influence wages; finally, ϕ and β are the parameters to be estimated and ε_{ijt} is the error term.

Equation [4] assumes the existence of a long run equilibrium relation between wage levels and local unemployment rates. The expected sign of this relationship - as discussed in a previous section - is negative ($\phi < 0$). However, if there is some inertia in the adjustment process a re-parameterisation of [4] - as in equation [5] below - might be preferable:

$$\Delta w_{ijt} = \rho_i + \tau_t + \gamma_1 f(U_{jt-1},) + \gamma_2 \Delta f(U_{jt},) - \alpha w_{ijt-1} + \beta' X_{ijt} + \varepsilon_{ijt} \qquad [5]$$

In the above specification the long run equilibrium – between the *level* of wages and the *level* of local unemployment - is embodied in an Error Correction Mechanism (ECM).

Furthermore, some interesting assumptions can be tested. When $|\alpha| \approx 1$ and $\gamma_1 = \gamma_2$, equation [5] reduces to [4]. Also, if $\alpha \approx 0$ the relationship becomes a more traditional augmented Phillips curve; alternatively, when $0 < |\alpha| < 1$ we get a more standard partial adjustment wage equation[9].

The coefficient α measures the stickiness of wages to variations of the local unemployment rate: the closer α is to unity (in absolute value), the faster is the adjustment of wages to variations in local unemployment.

It is worth stressing, however, that obtaining unbiased estimates of α can be problematic. Blanchard and Katz (1997) show how inappropriate wage measures (for example, a measure influenced by the number of days worked, such as average annual earnings) or the presence of sampling errors can lead to an upward biased estimate of that coefficient[10]. An important reason for the inappropriateness of annual earnings is that working hours tend to decline in depressions (Card, 1995). Nevertheless, most empirical estimations of the wage curve are on the basis of annual or monthly data (Nijkamp and Poot, 2005). We demonstrate the size of this effect by using both hourly and monthly wages.

[9] In this case the long run elasticity of wages to local unemployment is $\eta_{w,U} = \gamma_1 / a$.

[10] This kind of bias can be avoided paying particular attention to the measure of wage levels adopted in the empirical analysis: one effective way is to control for the number of hours/days worked (for example, using hourly earnings instead of annual ones).

5.2. Data

In the empirical analysis for each country we use a matched data set obtained by merging – at the regional level - individual records on wages, personal and firm characteristics as well as geographical location with unemployment rates and other local labour market features reported in the Labour Force Survey (LFS). Given the aim of our analysis, we restrict our sample to non-agricultural employees working in the private sector, thus excluding self-employed and public sector employees.

In the case of Italy, we use micro-data from different waves of the Bank of Italy's Survey on Households Income and Wealth (SHIW), focusing our attention on the last decade[11]. Detailed information on personal and job characteristics of a representative sample of around 4000 private employees (for each wave) is available. Personal characteristics include gender, age, years of education and marital status, while job characteristics include economic sector, years of work experience, tenure, occupation (blue collars, white collars and managers), type of contract (whether full or part-time) and number of hours worked. Individuals are located according to their administrative region of residence (19 regions), covering the entire national territory[12].The survey provides direct information on annual net wages, number of months worked and usual weekly hours (including overtime): on the basis of this information, both hourly and monthly wages could be retrieved.

Regional unemployment rates and other local labour market indicators are derived from the Labour Force Survey, as they are periodically published by the National Statistics Office (Istat).

For Germany, our main data source is the German Microcensus (MC). The microcensus is the official representative statistic of the population and the labour market, involving 1% of all households in Germany every year. The total number of households participating in the microcensus is about 370,000 (encompassing 820,000 persons), including about 70,000 households (about 160,000 persons) in the new *Länder* and the eastern part of Berlin. All households have the same probability of selection for the microcensus. Within the territory of the Federal Republic of Germany, sampling

[11] Since the survey is usually run every two years, we used the 1991, 1993, 1995, 1998, 2000, 2002 and 2004 surveys.

[12] Italy is actually divided into 20 administrative regions, characterized by quite different size. Given the relatively low number of observations in SHIW for the smallest regions (less than 50 observations per year), the empirical analysis was based on 19 regions, with Valle d'Aosta aggregated with Piemonte.

districts are selected in which all households and persons are interviewed. Every year, a quarter of all households included in the sample are replaced. This means that every household stays in the sample for four years. Household numbers are not included in the Scientific Use File. Hence, the microcensus cannot be used as a panel.

The annual standard programme of the microcensus includes characteristics on persons (age, sex, citizenship, etc.), the family and household context. In addition, we know the main and the secondary place of residence, whether the individual is employed, on job search, unemployed or out of the labour force. There is information on the number of children at pre-primary age, pupils, students in the household and information on individual general and vocational level of qualification and on the level of the individual and household net incomes. The microcensus is the data set which is most adequate for our research purpose because it combines two advantages: a huge sample size and a large number of covariates on the individual level. The following variables from the microcensus are used in our estimations: net income[13], working time, qualification, job tenure, federal state (*Land*) the individual lives in, and personal characteristics (age and gender).

Besides the microcensus, we use the INKAR (an acronym for indicators and maps of regional development) database and data provided by the German Federal Statistical Office. The INKAR database is published yearly by the Federal Office for Building and Regional Planning in co-operation with the Federal Statistical Office and the Statistical Offices of the German states (*Länder*). It regularly and topically describes the situation of the regional development in Germany and Europe. It includes about 20 indicators on topics such as age and population structure, employment or unemployment. From the INKAR database, the variable "average yearly unemployment rate on state-level" is used.

For both Italy and Germany, we derive hourly income by dividing net income by working time.[14] We construct the variable "years of education" by using the information on the highest degree of schooling and professional education, taking the standard

[13] In micro-data for Germany net income is given in intervals. We take midpoints of the categories. The problem of earnings information given in categories is less severe than it first seems. First, categories are quite small (e.g. 24 income categories). Second, individuals usually don't know exactly the monthly income and therefore, measurement error should not be much higher than in other data sets.

[14] For Germany we restrict hourly earnings to a maximum of 154 € and a minimum of 1.02 €. The upper limit affects only very few observations due to the categorical income variable and the lower limit affects less than 0.5 percent of the sample.

lengths of all primary, secondary, and tertiary qualifications and add them up accordingly for each person. The variable "labour market experience" is constructed by subtracting the years of education plus six from age. Hence, we actually use a proxy for potential labour market experience[15].

6 Results

The main objective of our paper is to demonstrate that certain groups of employees react differently from others to changes in regional unemployment and therefore wage curves differ between groups. In addition we show that wage curves are quite sensitive with respect to the estimation technique chosen.

Table 1 presents some estimates of the wage curve for Italy (first panel) and Germany (second panel) using different estimation techniques. The dependent variable used to obtain the estimates reported in Table 1 is derived from area fixed effects (i.e. conditional mean hourly earnings at the regional level) computed in a first stage regression in which, for each year, controls for individual characteristics were also included[16].

In models 1 and 2 we report estimates obtained by fitting the traditional specification of the wage curve – as described in equation [4] – while in the remaining models we report estimates of the ECM specification of equation [5] with the dependent variable in first differences and a lagged term on the right-hand-side[17].

In models 1 and 3 we assess the extent of the potential bias due to the omission of regional fixed effects on the estimate of the elasticity of local unemployment; the latter are included in the remaining models. In models 4 and 6, the change in local unemployment is added[18]. It is worth noting that in model 4 the current unemployment rate is used instead of the lagged one. Finally, given the potential simultaneity between wages and local unemployment, in the last model we use an Instrumental Variables (IV) estimator.

[15] In the Italian data-set we have also a direct measure of work experience. Using the latter instead of potential experience does not significantly change our main results.

[16] More specifically, we control for gender, education, experience and tenure.

[17] It is important to stress that the re-parameterisation of equation [4], given the presence of a lagged dependent variable on the right-hand-side, still implies that the equation is in levels – as the theory of the wage curve suggests – and that the error term is not altered by the transformation.

(Tables 1a and 1b around here)

In general, results show no evidence for a statistically significant negative relationship linking unemployment rates to wages at a regional level in Italy. Only those specifications without regional fixed effects have a spurious negative correlation This confirms the results by Canziani (1997) and Lucifora and Origo (1999). Using a different data set, a different definition of wages (weekly gross wages) and focusing on a different time period (1985-1999) Devicienti et al. (2006) have recently found some evidence of a wage curve in Italy, while the estimated elasticity is rather small (less than 0.03 in absolute value).

In Germany results are quite sensitive to our model specification: while no evidence for a wage curve seems to emerge from the traditional specification in levels, ECM re-parameterisation points out the existence of a (weakly) significant negative effect of local unemployment on wages, even if the size of the effect is much smaller than what the mainstream empirical evidence predicts (in absolute value, the long run elasticity is around 0.06, lower than the "empirical rule" of 0.1 proposed by Blanchflower and Oswald, 1994a). We get a slightly stronger (weaker) impact of regional unemployment on wages in Italy (Germany) if we use monthly instead of hourly wages (Table 1b). At least for Germany, this can explain why previous studies using monthly earnings find more evidence in support of a wage curve. The differences in the estimated wage curves are for both countries smaller than those shown by Card (1995) for US data. If we compare the results of model (7) with those of model (6) we see that exogenising the contemporary unemployment rate using the lagged unemployment rate as instruments does not change the results. One possible explanation is that the changes in regional unemployment from year to year might be so small that we do not gain a lot of additional information by this procedure.

Focusing on the dynamics of wages, it is shown that the coefficient α on the lagged dependent variable is generally significantly different from both 0 and 1, suggesting that there might be substantial inertia in the adjustment process of wages.

In a next step we empirically estimate if our theoretical hypotheses on different wage curves for certain sub-groups on the labour market are supported. Table 2 presents the main results for different sub-groups of our samples, paying specific attention to the

[18] In column 6, the specification reported in equation [5] is estimated.

role of gender and education[19]. Even after disaggregating the sample, we were unable to detect any statistically significant relationship between wages and local unemployment in Italy for the sub-groups considered. Only the low educated in Italy have a positive and slightly significant correlation.

In Germany, the situation is quite different. Here mainly the females, people in East Germany and the low educated exhibit a significantly negative wage curve. This is in accordance with the results for the different groups by Baltagi and Blien (1998) for West Germany and Baltagi et al., (2000) for East Germany.[20] In the meta-analysis by Nijkamp and Poot (2005) also a higher wage elasticity is found for East Germany than for West Germany.

It is especially stunning that in South Italy the correlation is positive (albeit insignificant) while it is significantly negative for males and females in East Germany. We interpret these results as follows: In South Italy, increases in the (local) unemployment rate - whilst having a negligible effect on wage levels - significantly increase the flow of discouraged workers, mainly of the low paid ones, out of the labour market. In East Germany, labour attachment is traditionally high, however, and most people still want to participate even when their chances to find a job decrease. This leads to a strong pressure on wages when unemployment rises.

(Tables 2a and 2b around here)

We also tested whether the reaction of wages to local unemployment varies along the wage distribution. In Table 3 we present estimates of the wage curve based on first-step quantile regressions in correspondence with the relevant deciles of the wage distribution in both Italy and Germany[21]. Reported estimates refer to the usual wage curve specification, both without and with regional fixed effects (model 1 and 2 in Table 1), and to the ECM re-parameterisation (model 6 in Table 1).

[19] We estimated the wage curve also for different age groups. Results are similar to those obtained at the aggregate level. Estimates are available upon request.

[20] Their results also differ strongly depending on the estimation approach. They use different data sets with a much finer regional classification, different time periods, and a slightly different estimation approach always aggregating wages and individual characteristics on the regional level instead of estimating individual wage regressions in the first step.

[21] More specifically, the dependent variable of the second stage is now made of the regional fixed effects obtained from the first step quantile regressions on individual micro-data, in which for each decile we controlled for the same worker characteristics used in the previous OLS estimates.

According to our hypotheses, results for both Italy and Germany show some evidence in favour of a stronger wage curve relationship for the middle part of the wage distribution, but also in this case our conclusions depend on the model specification adopted. In the case of Italy, with the ECM specification we obtain a significant negative relation between regional unemployment and wages at the median and at the 6th decile, while the effect of unemployment is significantly positive for the lowest decile. This pattern is mainly driven by the males and the North (compare Tables 3b and 3c)

For Germany the relation between regional unemployment and wages is only significant for the fourth quantile and higher. This is also found by Büttner and Fitzenberger (1998). German males in the middle of the wage distribution do have higher significant correlations while for females also the extreme quartiles exhibit a sizeable negative correlation. While in West Germany comparably to Italy the wage curve is only measurable at the 5th and 6th quartile, there is a negative and significant effect for almost all quartiles in the East.

(Table 3 around here)

7 Concluding Remarks

This study shows based on theoretical considerations that wage curves differ for different groups and countries. Despite the large gaps in unemployment rates among different areas (mainly between Northern and Southern regions in Italy and East and West in Germany), geographical wage differentials have remained relatively stable over time and fairly insulated from local labour market conditions. This suggests that the traditional negative relationship linking wage levels to local unemployment rates - the wage curve - does not appear yet to be a stylised fact for all employee groups in all OECD countries. Especially in the Italian labour market the relevant coefficients often show the wrong sign and they are in general not statistically significant. In the case of Germany, results are instead quite sensitive to the model specification and the group considered. We find that especially the labour market in East Germany, as well as females and the low educated encounter a relatively high wage elasticity to changes in regional unemployment. In both countries, the reaction of wages to local unemployment

varies significantly along the wage distribution, being more sensitive around the median quantiles.

The data used reveal also the existence of inertia in the wage adjustment process: more specifically neither a wage curve, nor a Phillips curve specification seem to provide an adequate description of wage determination in both Italy and Germany. These results thus provide additional evidence which casts some doubts on studies based on either of the above specifications.

Based on theoretical considerations we try to explain the differences between groups in the estimated wage curves. The structure of collective bargaining in Italy, where national agreements appear to be still effective in ensuring little dispersion in wage levels across areas may be a reason. Furthermore, if the large size of the informal sector in Italy is taken into account, then these findings might simply indicate that adjustment does not occur in the regular sector of the economy, but rather outside of it. This interpretation seems particularly suggestive, though the lack of detailed information on the informal sector makes it only tentative.

In East Germany and for employees in the middle of the wage curve it might not be financially interesting to react to unemployment changes by migrating to other parts of the country or leaving the labour force. Therefore, wages react to changes in unemployment for these groups giving rise to a wage curve.

Concluding, our estimations cast doubt on the applicability of a universal empirical law that the unemployment elasticity of pay is around -0.1 (Blanchflower and Oswald, 1994a; Card, 1995). The striking likeness of hundreds of regressions on this subject may be based on the small variance in estimation techniques, publication bias, and a disregard of some basic econometric problems, such as the endogeneity of the unemployment variable, time lags in the transmission and data on wages that do not take into account cyclical movements of hours worked.

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Figure 1 - The wage curve

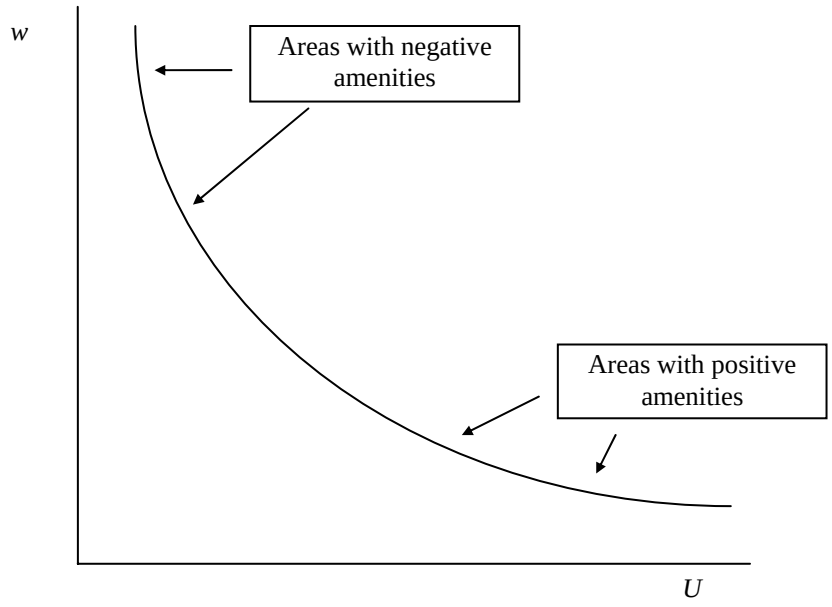
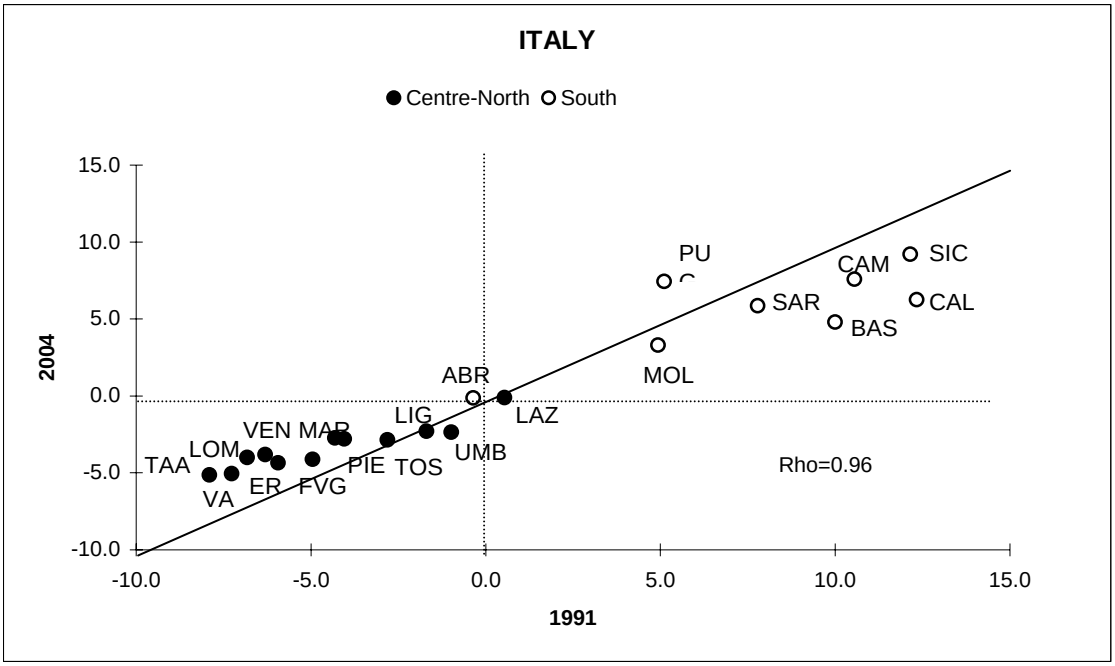
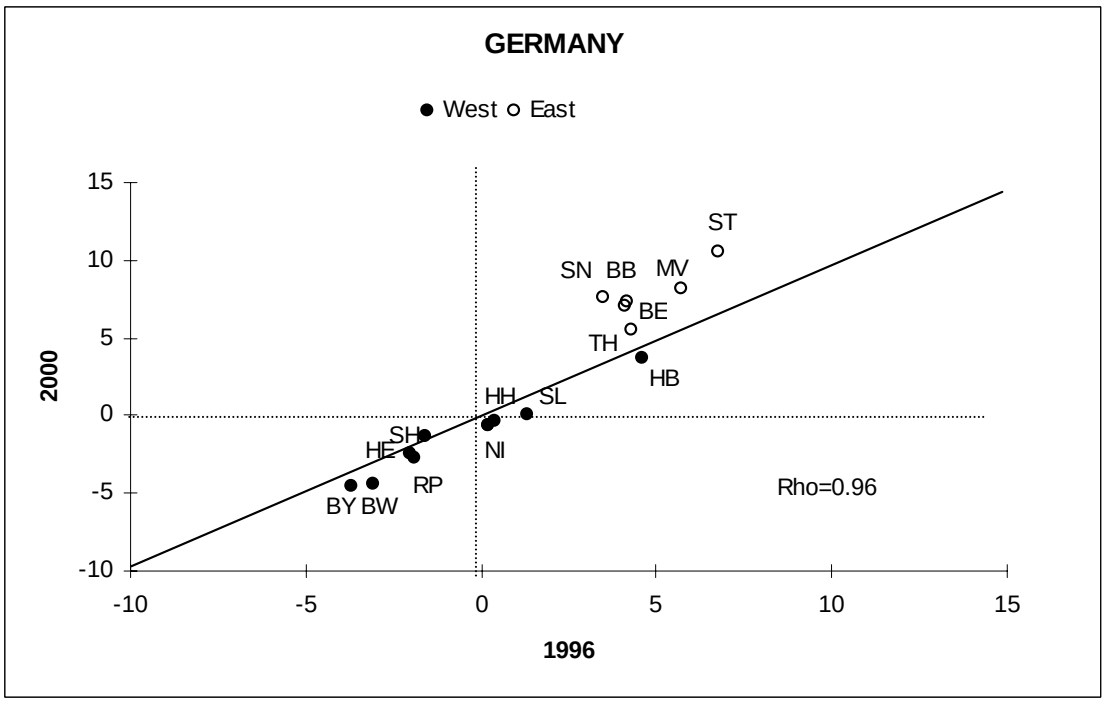


Figure 2a: Evolution of regional unemployment differentials (deviations from national means)





Source: Istat (Italy), INKAR (Germany)

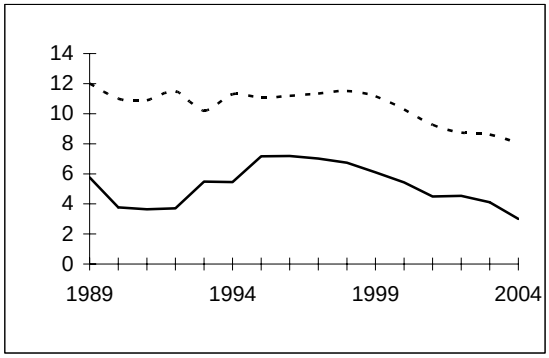
Notes: For each year, per cent deviation of regional unemployment rate from national average (Regional U - National U), Rho = correlation coefficient,

Key for Italian regions: ABR = Abruzzo, BAS = Basilicata, CAL = Calabria, CAM = Campania, ER = Emilia Romagna, FVG = Friuli Venezia Giulia, LAZ = Lazio, LIG= Liguria, LOM = Lombardia, MAR = Marche, MOL = Molise, PIE = Piemonte, PUG = Puglia, SAR = Sardegna, SIC = Sicilia, TAA = Trentino Alto Adige, TOS = Toscana, UMB = Umbria, VA = Valle d'Aosta, VEN = Veneto

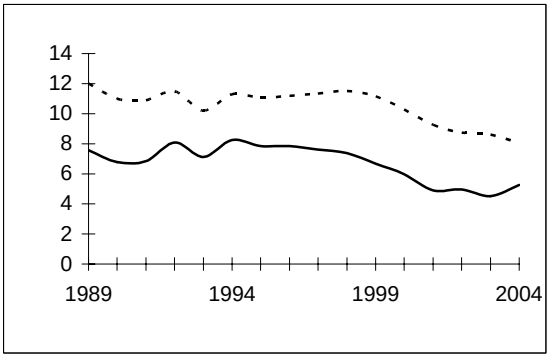
Key for German regions: BW = Baden-Wuerttemberg, BY = Bavaria, BE = Berlin, BB = Brandenburg, HB = Bremen, HH = Hamburg, HE = Hesse, NI = Lower Saxony, MV = Mecklenburg-Western Pomerania, NW = North Rhine-Westphalia, RP = Rhineland-Palatinate, SL = Saarland, SN = Saxony, ST = Saxony-Anhalt, SH = Schleswig-Holstein, TH = Thuringia.

Figure 2b: Evolution of regional and national unemployment in Italy: 1989-2004

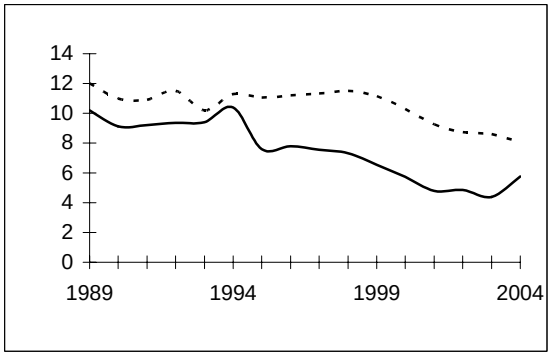
Valle d'Aosta



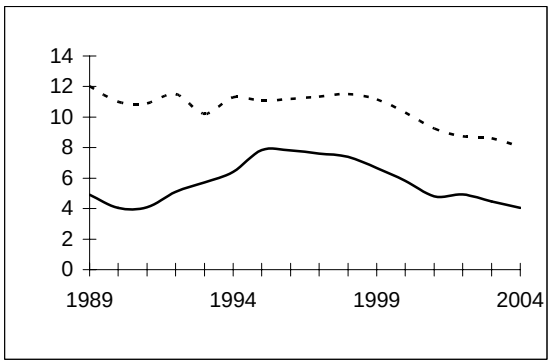
Piemonte



Liguria

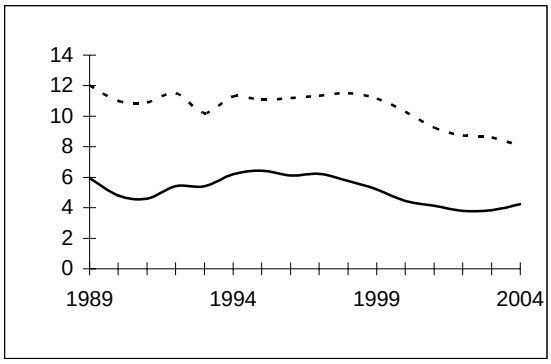


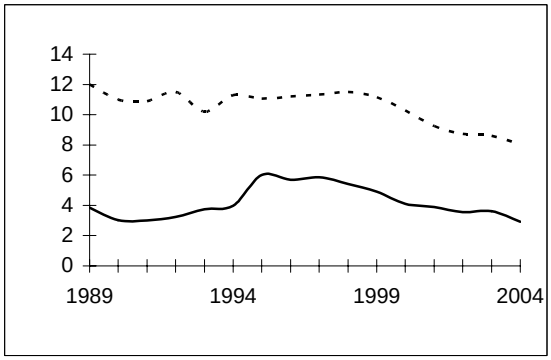
Lombardia



Veneto

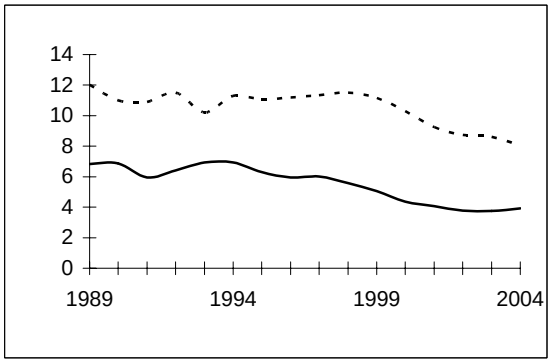
Trentino A. A.





Friuli V. G.

Emilia Romagna



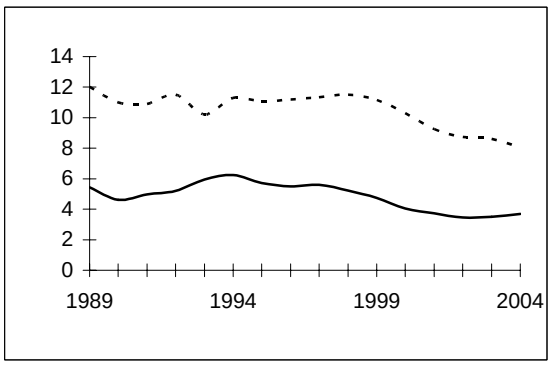
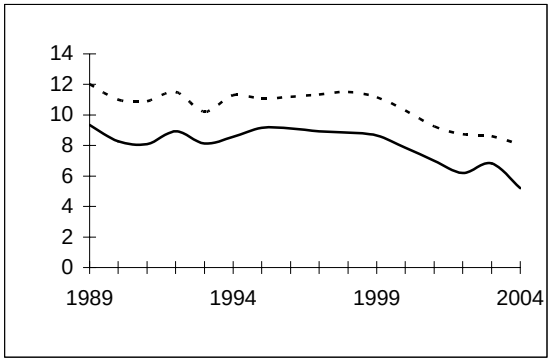
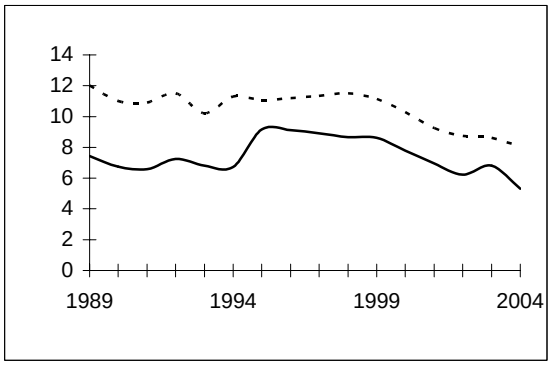


Figure 2b (continued)

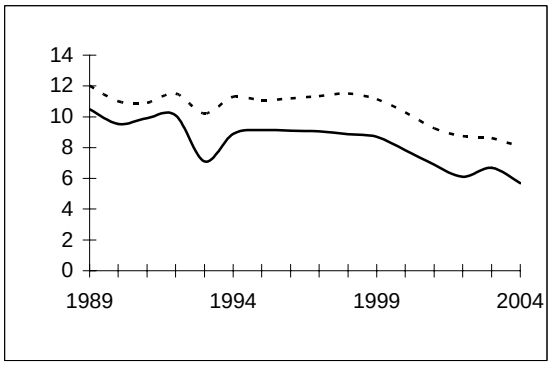
Toscana



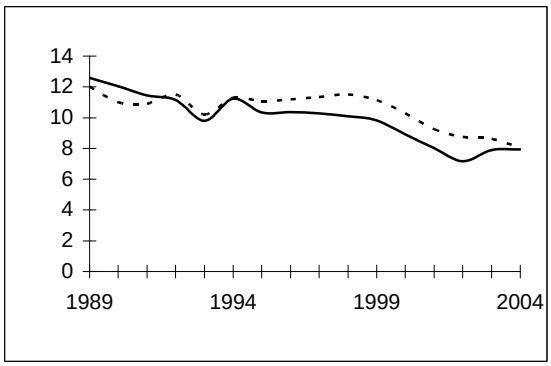
Marche



Umbria

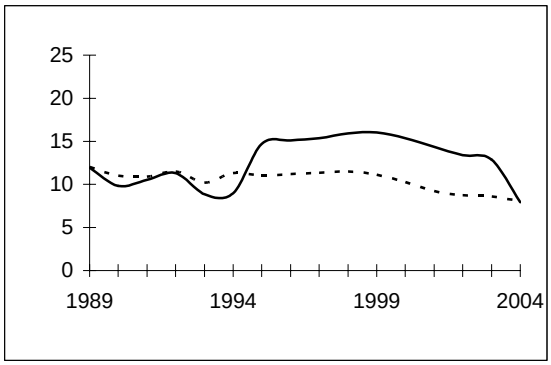


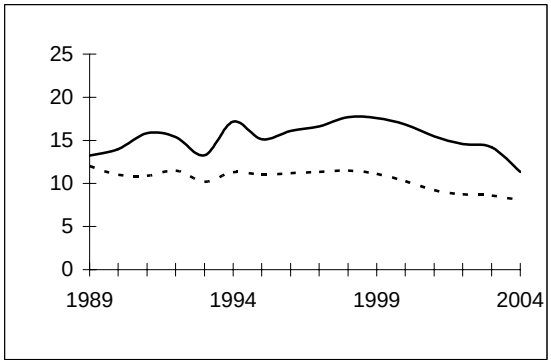
Lazio



Abruzzo

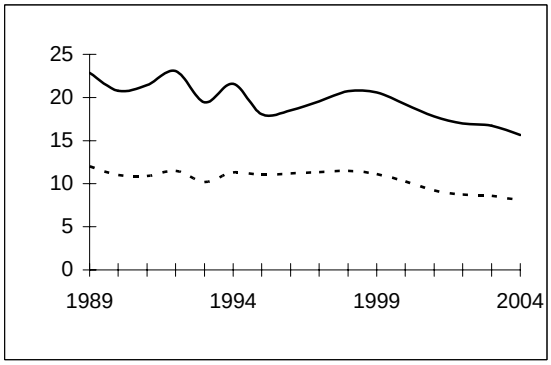
Molise





Campania

Basilicata



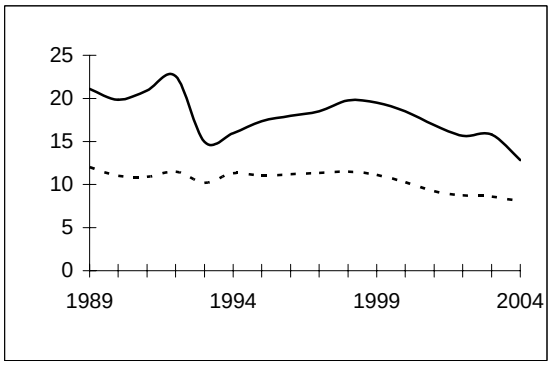
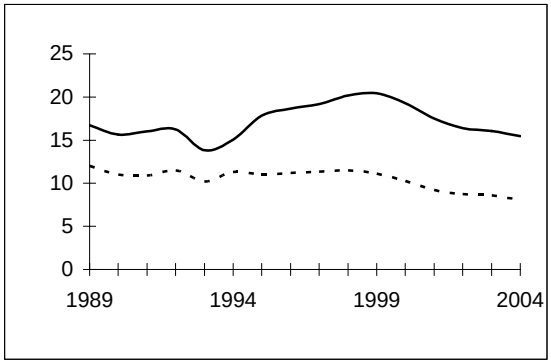
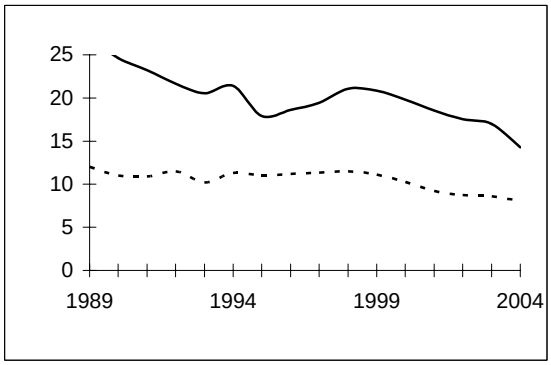


Figure 2b (continued)

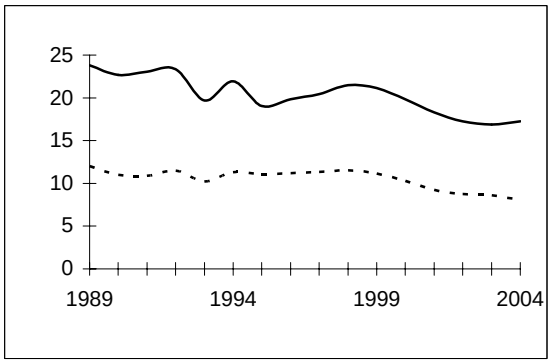
Puglia



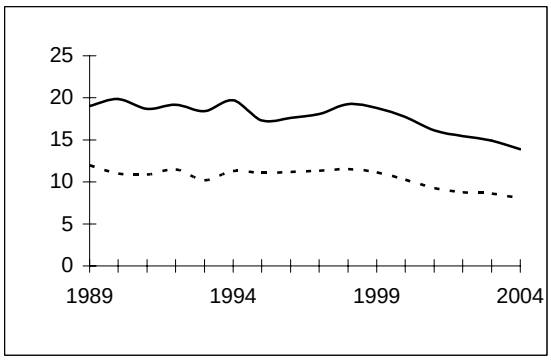
Calabria



Sicilia



Sardegna



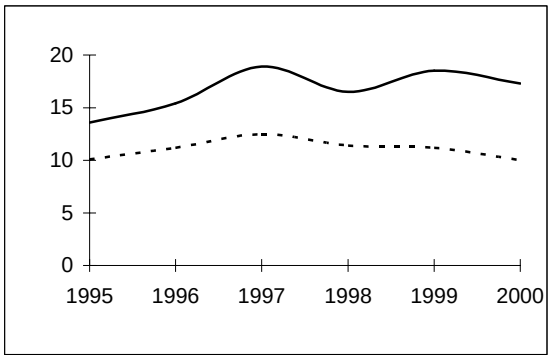
regional unemployment rate

national unemployment rate

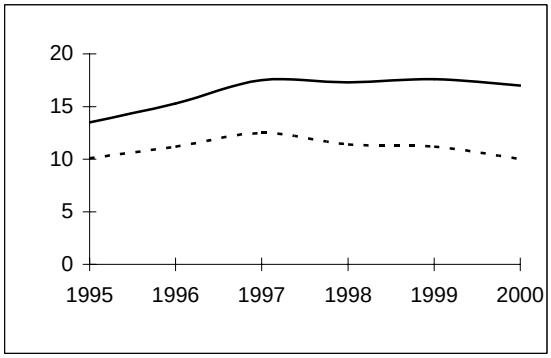
Source: Own calculation on the basis of Istat data

Figure 2c: Evolution of regional and national unemployment in Germany: 1995-2000

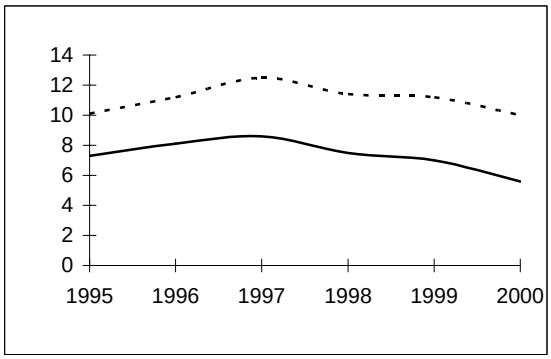
Brandenburg



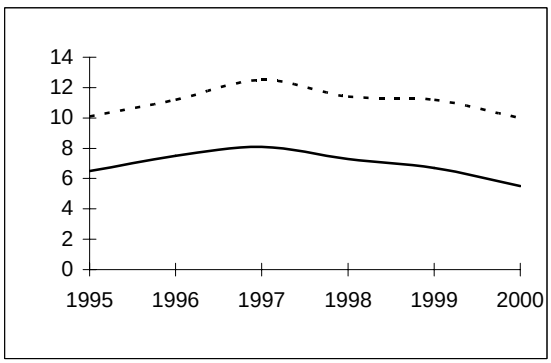
Berlin



Baden-Wuerttemberg

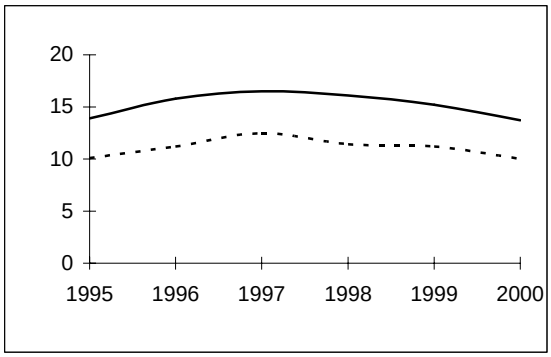


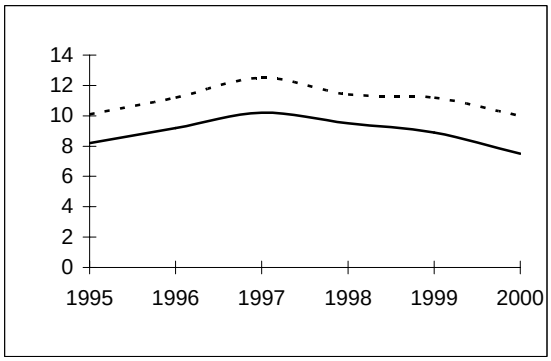
Bavaria



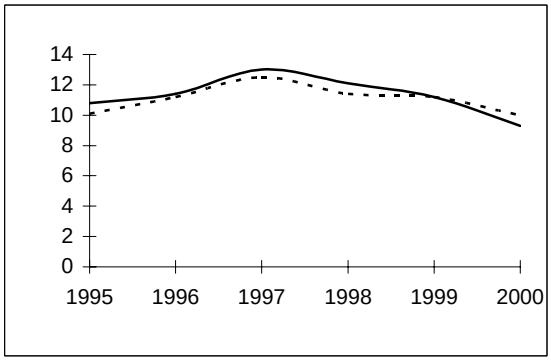
Bremen

Hesse





Hamburg



Mecklenburg-Western Pomerania

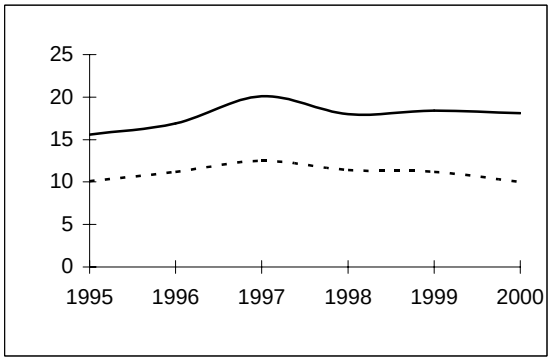
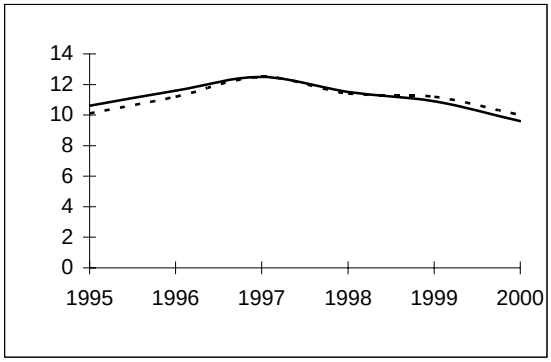
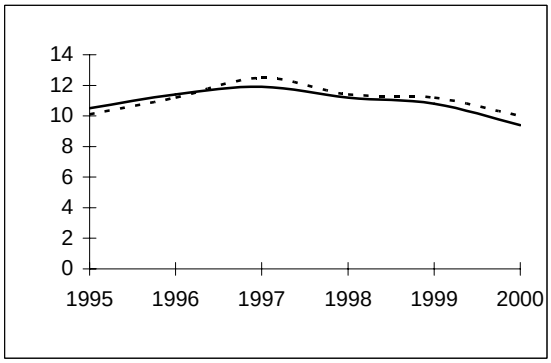


Figure 2c (continued)

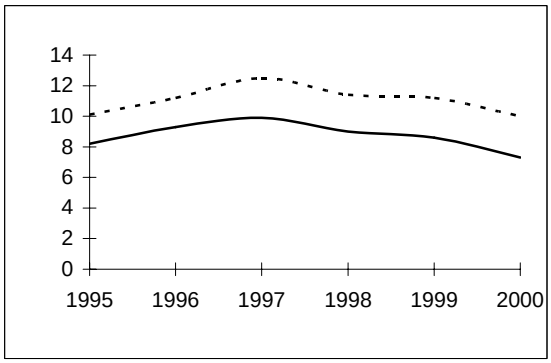
Lower-Saxony



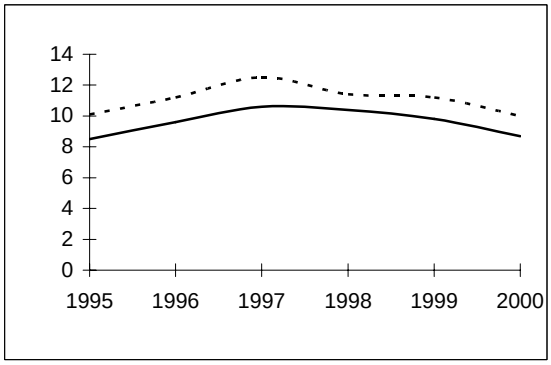
North Rhine-Westphalia



Rhineland-Palatinate

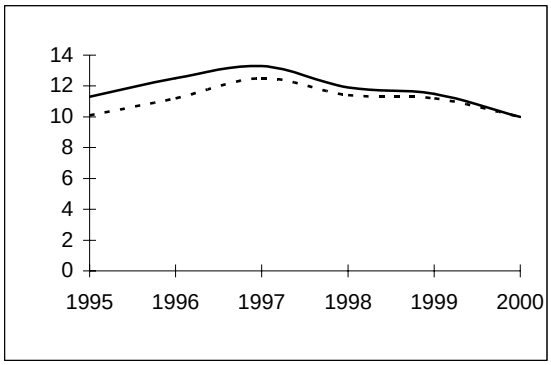


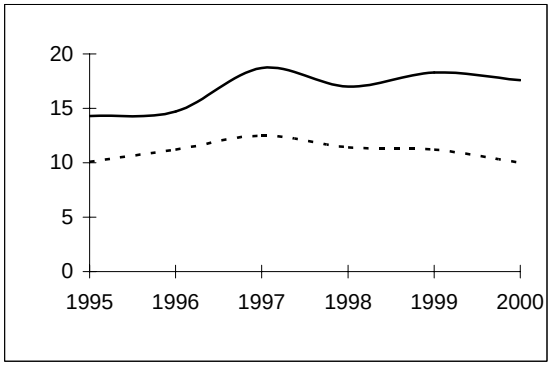
Schleswig-Holstein



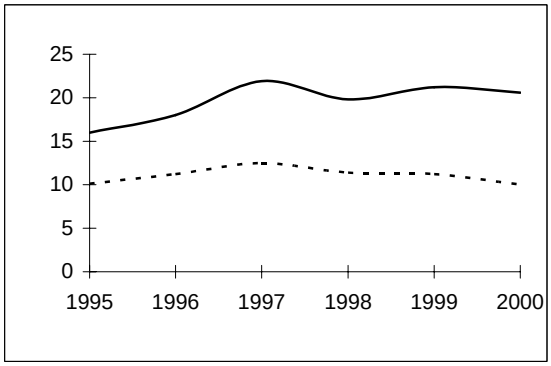
Saarland

Saxony

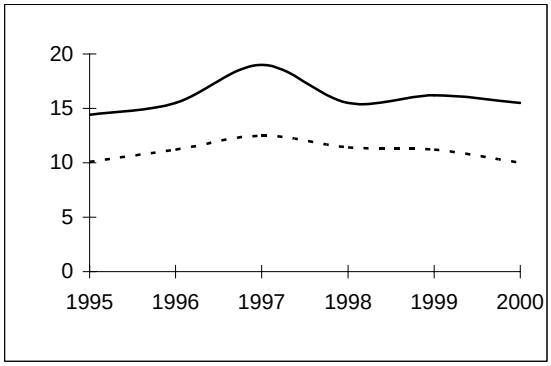




Saxony-Anhalt



Thuringia



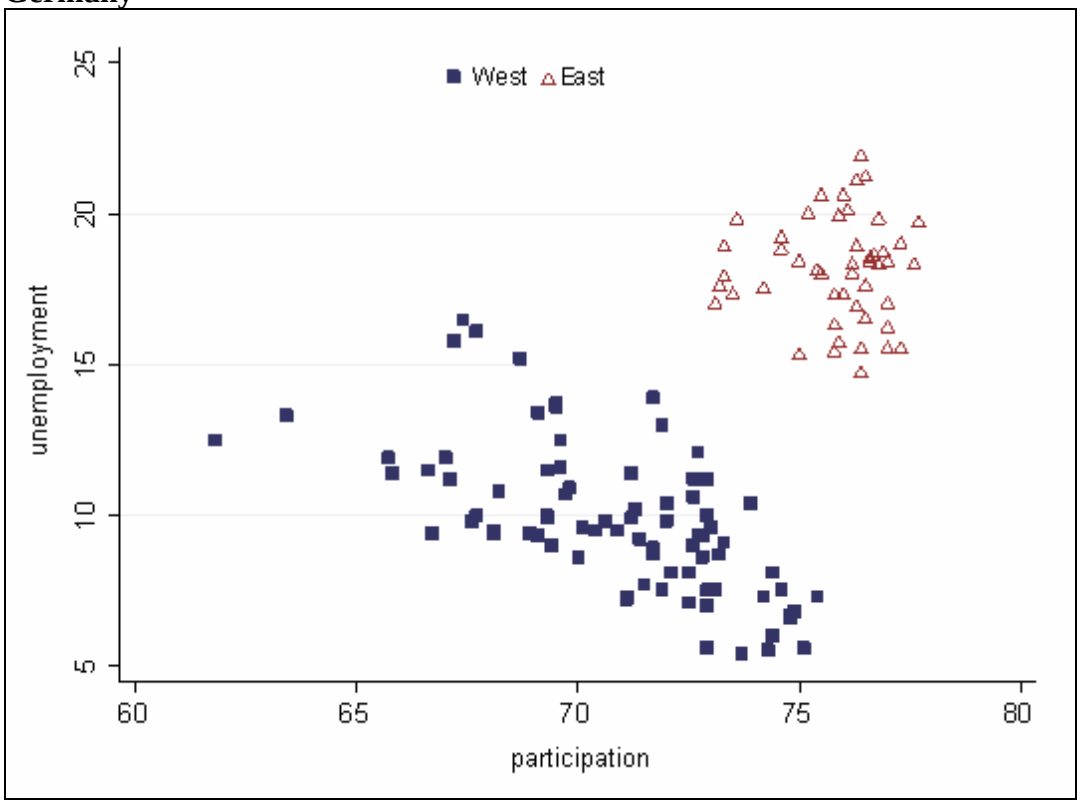
——————— regional unemployment rate

- - - - - - - - - - - national unemployment rate

Source: Own calculation on the basis of INKAR data

Figure 3: Evolution of regional wage differentials in non agricultural private sector

Germany



Italy

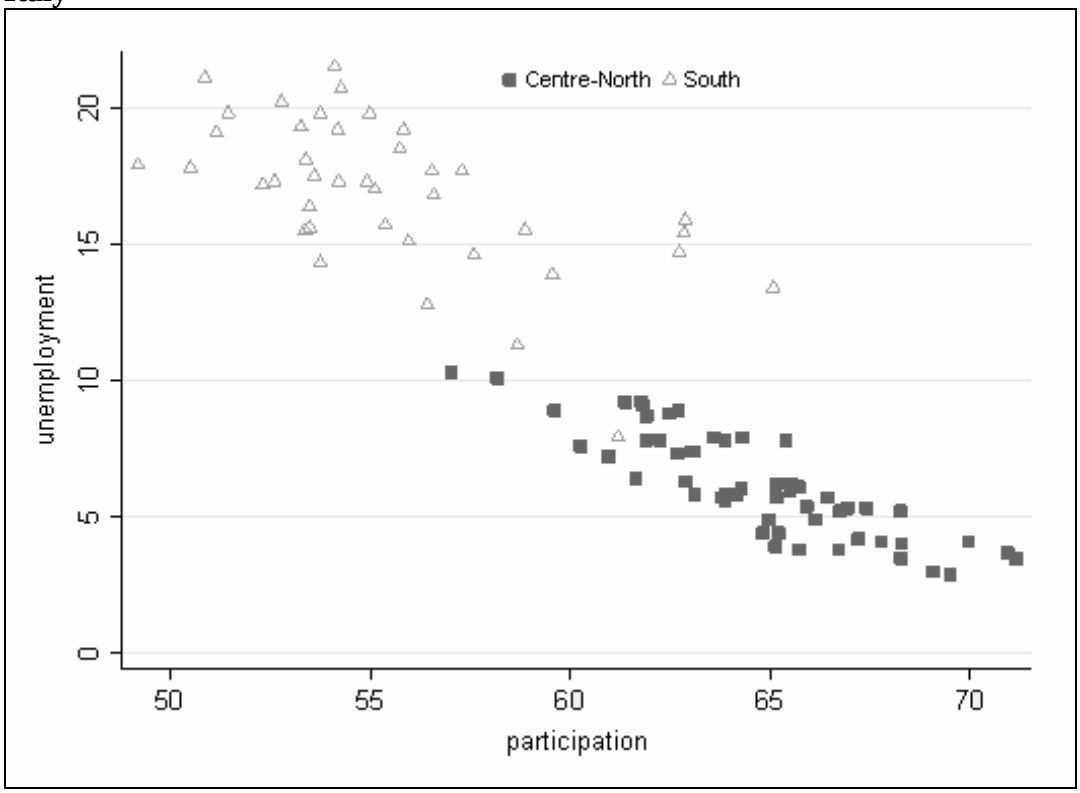
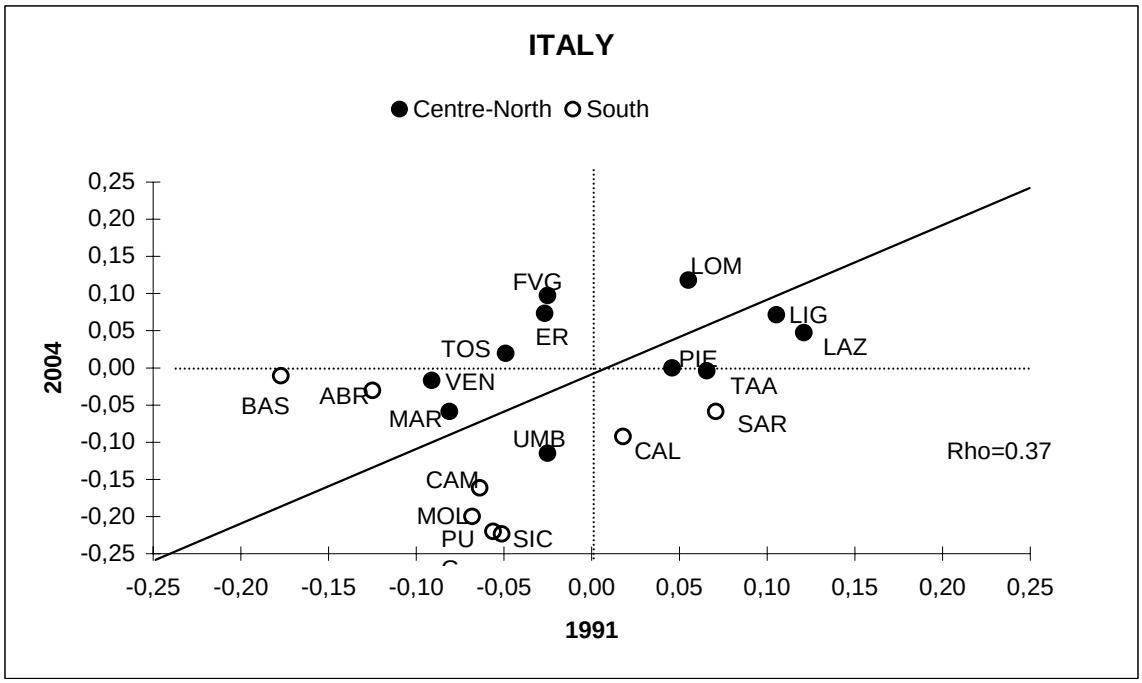
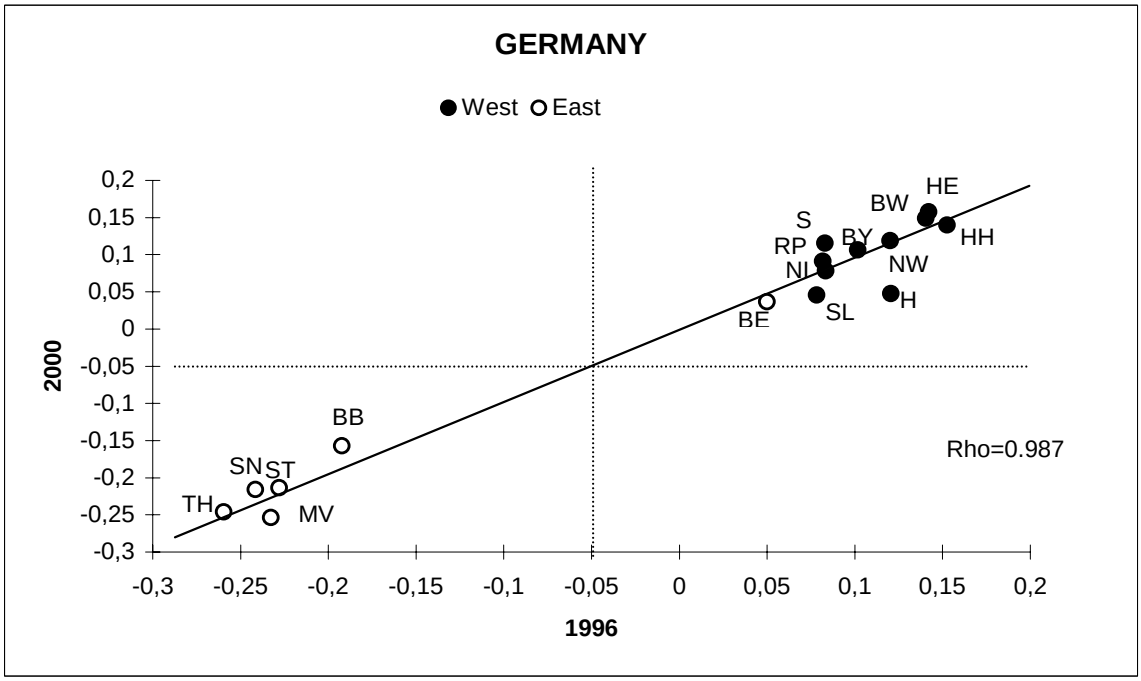


Figure 4: Evolution of regional wage differentials in non agricultural private sector

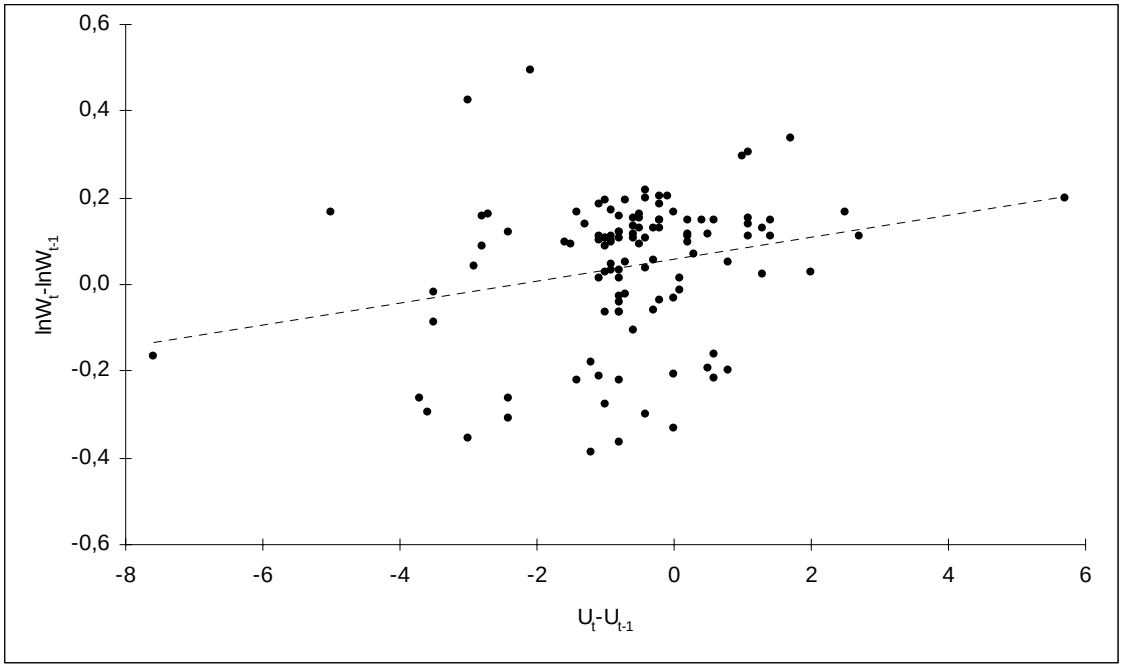


Source: Bank of Italy
For each year, difference between regional log wage and national average (Regional logw - National logw)
Rho = correlation coefficient



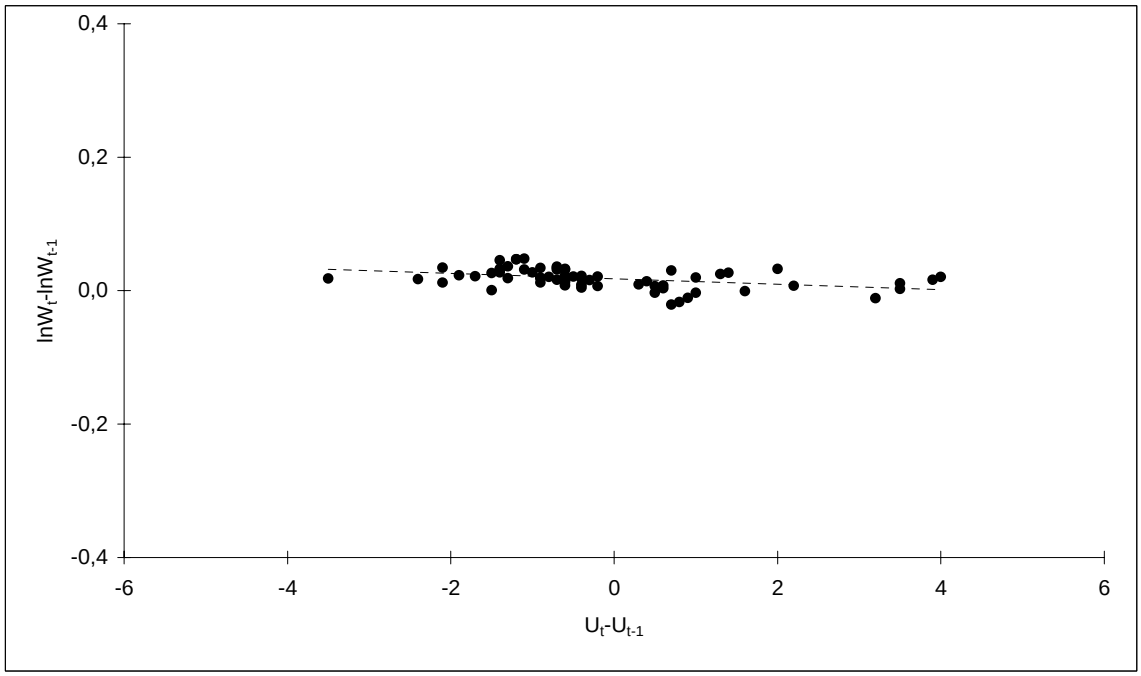
Source: Micro census 1996, 2000, own calculations
Rho = correlation coefficient

Figure 5a: Unemployment and wages dynamics at the regional level, Italy



Source: Bank of Italy and Istat
Notes: each point is determined by annual variations of wage and unemployment in a given region

Figure 5b - Unemployment and wage dynamics at the regional level, Germany



Source: Statistisches Bundesamt; Micro census 1996 - 2000, own calculations
Notes: each point is determined by annual variations of wage and unemployment in a given region

Table 1a: Estimates of the wage curve, non agricultural employees in private sector, hourly wages

ITALY							
	GLS						IV*
	Dep var $logW_t$		Dep var: $logW_t$-$logW_{t-1}$				
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$logU_t$	-0.096	0.097	-0.118	0.013			-0.005
	(8.0)	(2.2)	(6.7)	(0.2)			(0.1)
$logU_{t-1}$					-0.025	-0.005	
					(0.5)	(0.1)	
DeltaU						0.030	0.036
						(0.5)	(0.7)
$logW_{t-1}$			-0.816	-1.252	-1.249	-1.259	-1.251
			(6.7)	(13.0)	(13.1)	(13.0)	(13.0)
Fixed effects							
time	yes	yes	yes	yes	yes	yes	yes
regions	no	yes	no	yes	yes	yes	yes
N	133	133	114	114	114	114	114
R^2	0.749	0.828	0.806	0.864	0.864	0.864	0.864
GERMANY							
	GLS						IV*
	Dep var: $logW_t$		Dep var: $logW_t$-$logW_{t-1}$				
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$logU_t$	-0.332	-0.051	-0.016	-0.063			-0.062
	(15.3)	(1.3)	(1.3)	(1.8)			(1.7)
$logU_{t-1}$					-0.039	-0.062	
					(1.5)	(1.7)	
DeltaU						-0.065	-0.003
						(1.3)	(0.08)
$logW_{t-1}$			-0.04	-0.235	-0.240	-0.235	-0.235
			(1.4)	(2.5)	(2.5)	(2.5)	(2.5)
Fixed effects							
time	yes	yes	yes	yes	yes	yes	yes
regions	no	yes	no	yes	yes	yes	yes
N	128	128	112	112	112	112	112
R^2	0.823	0.977	0.923	0.941	0.940	0.941	0.941

Note: periods for Italy, 1991-2004; for Germany 1996-2003, absolute t statistics based on robust s.e. are reported below each coefficient, dependent variable: regional fixed effects from a set of first step OLS regressions with individual micro-data (for each year, wage equations with controls for region, gender, years of educa-tion, experience, experience squared, tenure and tenure squared).

*U lags (Ut-1 and Ut-2) were used as instruments for Ut.

Table 1b: Estimates of the wage curve, non agricultural employees in private sector, monthly earnings

ITALY							
	GLS						IV*
	Dep var $logW_t$		Dep var: $logW_t$-$logW_{t-1}$				
Model							
$logU_t$	-0.109	0.077	-0.097	-0.039			-0.027
	(9.5)	(1.9)	(5.8)	(0.8)			(0.5)
$logU_{t-1}$					0.003	-0.027	
					(0.1)	(0.5)	
DeltaU						-0.052	-0.024
						(0.9)	(0.5)
$logW_{t-1}$			-0.512	-0.984	-0.975	-0.986	-0.986
			(5.5)	(8.9)	(8.9)	(8.9)	(8.9)
Fixed effects							
time	yes	yes	yes	yes	yes	yes	yes
regions	no	yes	no	yes	yes	yes	yes
N	133	133	114	114	114	114	114
R^2	0.808	0.869	0.906	0.929	0.929	0.929	0.929
GERMANY							
	GLS						IV*
	Dep var: $logW_t$		Dep var: $logW_t$-$logW_{t-1}$				
Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$logU_t$	-0.243	-0.016	-0.011	-0.039			-0.037
	(16.8)	(1.2)	(2.5)	(3.0)			(2.8)
$logU_{t-1}$					-0.015	-0.037	
					(1.6)	(2.8)	
DeltaU						-0.059	-0.023
						(2.5)	(1.37)
$logW_{t-1}$			-0.056	-0.756	-0.741	-0.753	-0.753
			(3.5)	(6.7)	(6.5)	(6.7)	(6.7)
Fixed effects							
time	yes	yes	yes	yes	yes	yes	yes
regions	no	yes	no	yes	yes	yes	yes
N	128	128	112	112	112	112	112
R^2	0.802	0.996	0.978	0.988	0.987	0.988	0.988

Note: for Italy, 1991-2004; for Germany 1996-2003, absolute t statistics based on robust s.e. are reported below each coefficient, dependent variable: regional fixed effects from a set of first step OLS regressions with individual micro-data (for each year, wage equations with controls for region, gender, years of educa-tion, experience, experience squared, tenure and tenure squared).

* U lags (Ut-1 and Ut-2) were used as instruments for Ut.

Table 2a: Estimates of the wage curve by groups: gender, education and region

	Males	Females	Low edu	Mid edu	High edu	North	South
ITALY							
	Dep var: $logW_t$-$logW_{t-1}$						
$logU_{t-1}$	-0.009	0.034	0.126	-0.089	-0.075	-0.028	0.190
	(0.2)	(0.2)	(1.7)	(0.7)	(0.4)	(0.5)	(1.0)
DeltaU	0.025	0.197	0.137	-0.141	0.040	-0.031	0.181
	(0.4)	(1.3)	(1.8)	(1.2)	(0.2)	(0.6)	(1.1)
$logW_{t-1}$	-1.182	-1.118	-1.216	-1.045	-1.015	-1.159	-1.312
	(11.9)	(9.4)	(12.8)	(9.5)	(8.9)	(9.0)	(8.4)
Fixed effects							
time	yes	yes	yes	yes	yes	yes	yes
regions	yes	yes	yes	yes	yes	yes	yes
N	114	114	114	114	114	66	48
R^2	0.916	0.602	0.854	0.414	0.522	0.913	0.946
GERMANY							
	Dep var: $logW_t$-$logW_{t-1}$						
	Males	Females	Low edu	Mid edu	High edu	West	East
$logU_{t-1}$	-0.050	-0.103	-0.064	-0.047	-0.006	0.006	-0.309
	(1.4)	(2.3)	(1.7)	(0.8)	(0.1)	(0.1)	(1.9)
DeltaU	-0.073	-0.057	-0.022	-0.149	-0.077	0.005	-0.170
	(1.5)	(0.9)	(0.4)	(1.8)	(1.0)	(0.1)	(1.4)
$logW_{t-1}$	-0.229	-0.303	-0.203	-0.397	-0.771	-0.248	-0.256
	(2.5)	(3.0)	(2.2)	(3.8)	(6.5)	(1.7)	(2.4)
Fixed effects							
time	yes	yes	yes	yes	yes	yes	yes
regions	yes	yes	yes	yes	yes	yes	yes
N	112	112	112	112	112	70	42
R^2	0.95	0.846	0.887	0.750	0.996	0.940	0.933

Note: for Italy, 1991-2004; for Germany 1996-2003, absolute t statistics based on robust s.e. are reported below each coefficient, dependent variable: regional fixed effects from a set of first step OLS regressions with individual micro-data (for each year, wage equations with controls for region, gender, years of educa-tion, experience, experience squared, tenure and tenure squared).

Table 2b: Estimates of the wage curve by groups: gender by region

ITALY				
	Dep var: $\log W_t - \log W_{t-1}$			
	North		South	
	Males	Females	Males	Females
$\log U_{t-1}$	-0.047	-0.018	0.131	0.258
	(0.9)	(0.2)	(0.6)	(0.7)
DeltaU	-0.037	-0.048	0.081	0.656
	(0.7)	(0.5)	(0.4)	(2.0)
$\log W_{t-1}$	-0.954	-1.177	-1.459	-0.968
	(8.3)	(7.6)	(9.4)	(5.3)
Fixed effects				
time	yes	yes	yes	yes
regions	yes	yes	yes	yes
N	66	66	48	48
R^2	0.868	0.770	0.927	0.917
GERMANY				
	Dep var: $\log W_t - \log W_{t-1}$			
	West		East	
	Males	Females	Males	Females
$\log U_{t-1}$	-0.068	0.081	-0.412	-0.378
	(0.8)	(0.7)	(2.2)	(1.7)
DeltaU	-0.033	-0.007	-0.282	-0.137
	(0.3)	(0.1)	(2.0)	(0.9)
$\log W_{t-1}$	-0.280	-0.294	-0.295	-0.484
	(1.8)	(2.1)	(2.1)	(3.0)
Fixed effects				
time	yes	yes	yes	yes
regions	yes	yes	yes	yes
N	70	70	42	42
R^2	0.948	0.843	0.943	0.894

Note: for Italy, 1991-2004; for Germany 1996-2003, absolute t statistics based on robust s.e. are reported below each coefficient, dependent variable: regional fixed effects from a set of first step OLS regressions with individual micro-data (for each year, wage equations with controls for region, gender, years of educa-tion, experience, experience squared, tenure and tenure squared).

Table 3a: Estimates of the wage curve along the wage distribution

					ITALY				
	Dep var: $\log W_t$								
Deciles:	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Model without regional fixed effects									
$\log U_t$	-0.216	-0.174	-0.137	-0.117	-0.097	-0.078	-0.065	-0.050	-0.034
	(11.0)	(12.5)	(11.1)	(10.5)	(9.2)	(7.8)	(5.9)	(4.4)	(2.0)
Model with fixed regional effects									
$\log U_t$	0.196	0.078	0.045	0.036	0.014	0.014	0.037	0.027	0.012
	(2.7)	(1.5)	(1.0)	(0.8)	(0.4)	(0.4)	(0.9)	(0.7)	(0.2)
	Dep var: $\log W_t - \log W_{t-1}$								
Error Correction Model									
$\log U_{t-1}$	0.241	0.055	-0.017	-0.050	-0.090	-0.093	-0.045	-0.059	-0.041
	(2.3)	(0.8)	(0.3)	(0.9)	(1.8)	(2.1)	(0.8)	(0.9)	(0.4)
DeltaU	0.223	0.050	0.000	-0.007	-0.030	-0.045	-0.023	-0.123	0.009
	(2.3)	(0.8)	(0.0)	(0.1)	(0.6)	(1.0)	(0.4)	(0.2)	(0.1)
$\log W_{t-1}$	-1.260	-1.151	-1.175	-1.098	-1.129	-1.125	-1.127	-1.050	-1.337
	(13.9)	(13.2)	(13.4)	(11.8)	(11.4)	(11.9)	(11.6)	(9.1)	(9.9)
$\eta_{w,U}$	0.191	0.048	-0.014	-0.046	-0.080	-0.083	-0.040	-0.056	-0.031
					GERMANY				
	Dep var: $\log W_t$								
Deciles:	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Model without regional fixed effects									
$\log U_t$	-0.291	-0.305	-0.316	-0.321	-0.334	-0.339	-0.348	-0.360	-0.408
	(16.1)	(16.4)	(16.3)	(16.8)	(16.7)	(16.7)	(17.0)	(17.0)	(15.5)
Model with fixed regional effects									
$\log U_t$	0.021	0.006	0.028	-0.051	-0.030	-0.030	-0.035	-0.049	-0.115
	(0.9)	(0.4)	(1.5)	(4.3)	(2.2)	(1.9)	(1.9)	(2.0)	(2.1)
Error Correction Model									
$\log U_{t-1}$	-0.030	-0.014	-0.019	-0.056	-0.030	-0.047	-0.045	-0.069	-0.099
	(1.4)	(0.8)	(1.3)	(4.2)	(2.3)	(4.0)	(3.1)	(3.2)	(1.8)
DeltaU	-0.013	-0.033	-0.006	-0.034	-0.030	-0.048	-0.037	-0.086	-0.116
	(0.4)	(1.2)	(0.2)	(2.2)	(1.9)	(2.7)	(1.8)	(3.0)	(1.7)
$\log W_{t-1}$	-0.592	-0.597	-0.439	-0.576	-0.429	-0.386	-0.481	-0.397	-0.257
	(5.9)	(5.3)	(3.8)	(6.0)	(4.5)	(5.3)	(5.1)	(4.6)	(1.2)
$\eta_{w.U}$	-0.051	-0.023	-0.043	-0.097	-0.070	-0.122	-0.094	-0.174	-0.385

Note: for Italy, 1991-2004; for Germany 1996-2003, absolute t statistics based on robust s.e. are reported below each coefficient, models specification as in Table 1, dependent variable: regional fixed effects from a set of first step quantile regressions with individual micro-data (for each year, wage equations with con-trols for region, gender, years of education, experience, experience squared, tenure and tenure squared).

Table 3b: Estimates of the wage curve along the wage distribution by gender, ITALY

MALES									
	Dep var: $\log W_t$								
Deciles:	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Model without regional fixed effects									
$\log U_t$	-0.202	-0.158	-0.137	-0.103	-0.087	-0.067	-0.043	-0.055	-0.034
	(7.5)	(10.9)	(10.9)	(9.6)	(8.6)	(6.6)	(4.5)	(4.7)	(1.8)
Model with fixed regional effects									
$\log U_t$	0.199	0.061	0.01	0.043	0.018	0.017	0.095	0.007	-0.002
	(1.8)	(1.1)	(0.2)	(1.0)	(0.5)	(0.4)	(2.3)	(0.2)	(0.1)
	Dep var: $\log W_t - \log W_{t-1}$								
Error Correction Model									
$\log U_{t-1}$	0.299	-0.008	-0.073	-0.053	-0.087	-0.116	-0.040	-0.090	-0.038
	(1.8)	(0.1)	(1.1)	(1.0)	(1.7)	(2.2)	(0.7)	(1.3)	(0.4)
DeltaU	0.272	0.008	-0.068	-0.037	-0.061	-0.070	-0.033	-0.055	-0.052
	(1.7)	(0.1)	(1.1)	(0.7)	(1.2)	(1.4)	(0.6)	(0.8)	(0.5)
$\log W_{t-1}$	-1.333	-1.229	-1.156	-1.136	-1.112	-1.009	-1.132	-1.179	-1.221
	(13.3)	(13.1)	(11.9)	(11.5)	(11.4)	(10.0)	(10.9)	(10.3)	(8.3)
$\eta_{w,U}$	0.224	-0.007	-0.063	-0.047	-0.078	-0.115	-0.035	-0.076	-0.031
FEMALES									
	Dep var: $\log W_t$								
Deciles:	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Model without regional fixed effects									
$\log U_t$	-0.272	-0.204	-0.184	-0.151	-0.124	-0.112	-0.071	-0.070	-0.070
	(7.2)	(6.1)	(7.6)	(6.6)	(5.5)	(5.3)	(3.5)	(3.4)	(2.9)
Model with fixed regional effects									
$\log U_t$	0.293	0.186	0.098	0.051	0.038	-0.002	0.017	-0.002	0.003
	(2.0)	(1.4)	(1.0)	(0.6)	(0.4)	(0.1)	(0.2)	(0.3)	(0.3)
Error Correction Model									
$\log U_{t-1}$	0.375	0.143	0.016	-0.024	0.029	-0.062	-0.062	-0.113	-0.027
	(1.7)	(0.6)	(0.1)	(0.2)	(0.2)	(0.5)	(0.5)	(0.9)	(0.2)
DeltaU	0.430	0.273	0.145	0.004	0.165	0.118	0.065	0.019	0.149
	(2.0)	(1.3)	(1.0)	(0.1)	(1.3)	(0.9)	(0.6)	(0.2)	(1.2)
$\log W_{t-1}$	-0.741	-1.129	-1.040	-1.055	-1.232	-1.369	-1.287	-1.338	-1.401
$\eta_{w.U}$	0.506	0.127	0.015	-0.023	0.024	-0.045	-0.048	-0.084	-0.019

Note: for Italy, 1991-2004, absolute t statistics based on robust s.e. are reported below each coefficient, models specification as in Table 1, dependent variable: regional fixed effects from a set of first step quantile regressions with individual micro-data (for each year, wage equations with controls for region, gender, years of education, experience, experience squared, tenure and tenure squared).

Table 3b: Estimates of the wage curve along the wage distribution by gender, GERMANY

MALES									
	Dep var: $\log W_t$								
Deciles:	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Model without regional fixed effects									
$\log U_t$	-0.349	-0.353	-0.363	-0.371	-0.390	-0.398	-0.409	-0.415	-0.444
	(18.63)	(19.29)	(18.94)	(19.11)	(18.81)	(18.79)	(18.51)	(17.94)	(16.3)
Model with fixed regional effects									
$\log U_t$	0.023	-0.039	0.001	-0.051	-0.051	-0.064	-0.060	-0.039	-0.070
	(0.84)	(2.33)	(0.0)	(3.5)	(3.46)	(3.33)	(2.77)	(1.27)	(1.44)
	Dep var: $\log W_t - \log W_{t-1}$								
Error Correction Model									
$\log U_{t-1}$	-0.023	-0.037	-0.030	-0.046	-0.042	-0.055	-0.045	-0.039	-0.041
	(0.8)	(1.9)	(1.9)	(3.2)	(3.2)	(3.4)	(2.3)	(1.6)	(0.8)
DeltaU	0.005	-0.030	-0.240	-0.029	-0.028	-0.045	-0.058	-0.088	-0.134
	(0.1)	(1.1)	(1.0)	(1.5)	(1.6)	(2.1)	(2.1)	(2.4)	(2.0)
$\log W_{t-1}$	-0.655	-0.563	-0.435	-0.512	-0.422	-0.468	-0.551	-0.419	-0.292
	(6.9)	(5.3)	(5.2)	(6.9)	(4.9)	(4.9)	(6.2)	(5.2)	(2.2)
$\eta_{w,U}$	-0.035	-0.066	-0.069	-0.090	-0.100	-0.118	-0.082	-0.093	-0.140
FEMALES									
	Dep var: $\log W_t$								
Deciles:	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Model without regional fixed effects									
$\log U_t$	-0.157	-0.203	-0.210	-0.222	-0.227	-0.234	-0.249	-0.276	-0.360
	(7.1)	(10.0)	(10.9)	(12.1)	(12.3)	(13.0)	(13.6)	(13.9)	(11.3)
Model with fixed regional effects									
$\log U_t$	-0.049	0.068	-0.035	-0.037	0.006	-0.041	-0.041	-0.073	-0.219
	(1.6)	(2.6)	(1.3)	(1.9)	(0.3)	(1.9)	(2.0)	(2.7)	(2.1)
Error Correction Model									
$\log U_{t-1}$	-0.108	0.042	-0.096	-0.037	-0.040	-0.076	-0.080	-0.114	-0.246
	(2.8)	(1.5)	(3.1)	(1.6)	(2.0)	(4.4)	(4.1)	(3.8)	(2.5)
DeltaU	0.015	0.001	0.006	-0.027	-0.007	-0.041	-0.018	-0.011	-0.027
	(0.2)	(0.0)	(0.1)	(0.9)	(0.2)	(1.5)	(0.6)	(0.3)	(0.2)
$\log W_{t-1}$	-0.929	-0.927	-0.713	-0.752	-0.670	-0.487	-0.558	-0.486	-0.420
	(6.8)	(8.5)	(5.8)	(5.9)	(6.9)	(6.0)	(5.4)	(4.1)	(1.5)
$\eta_{w.U}$	-0.116	0.045	-0.135	-0.049	-0.060	-0.156	-0.143	-0.235	-0.586

Note: for Germany, 1996-2003, absolute t statistics based on robust s.e. are reported below each coefficient, models specification as in Table 1, dependent variable: regional fixed effects from a set of first step quantile regressions with individual micro-data (for each year, wage equations with controls for region, gender, years of education, experience, experience squared, tenure and tenure squared).

Table 3c: Estimates of the wage curve along the wage distribution by region, ITALY

NORTH									
	Dep var: $\log W_t$								
Deciles:	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Model without regional fixed effects									
$\log U_t$	-0.111	-0.12	-0.092	-0.089	-0.092	-0.092	-0.074	-0.065	-0.061
	(4.0)	(4.6)	(4.2)	(4.2)	(4.0)	(3.8)	(2.9)	(2.3)	(1.8)
Model with fixed regional effects									
$\log U_t$	0.029	0.053	0.044	0.036	0.033	0.019	0.047	0.029	0.027
	(0.6)	(1.1)	(1.1)	(1.1)	(1.0)	(0.6)	(1.3)	(0.7)	(0.6)
	Dep var: $\log W_t - \log W_{t-1}$								
Error Correction Model									
$\log U_{t-1}$	0.094	0.050	0.042	-0.009	-0.051	-0.068	-0.043	-0.089	-0.084
	(1.2)	(0.6)	(0.7)	(0.2)	(0.9)	(1.3)	(0.6)	(1.4)	(0.3)
DeltaU	-0.027	0.019	0.0340	0.001	-0.023	-0.006	0.008	-0.034	-0.027
	(0.4)	(0.3)	(0.6)	(0.1)	(0.4)	(0.1)	(0.1)	(0.6)	(0.3)
$\log W_{t-1}$	-1.317	-1.207	-1.138	-1.222	-1.158	-1.082	-0.996	-0.882	-1.171
	(10.5)	(8.9)	(8.9)	(8.6)	(8.7)	(8.1)	(6.8)	(6.5)	(6.9)
$\eta_{w,U}$	0.071	0.041	0.037	-0.007	-0.044	-0.063	-0.043	-0.101	-0.072
SOUTH									
	Dep var: $\log W_t$								
Deciles:	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Model without regional fixed effects									
$\log U_t$	-0.097	-0.067	-0.057	-0.024	-0.001	-0.018	0.062	-0.002	-0.001
	(0.7)	(0.8)	(0.7)	(0.4)	(0.1)	(0.3)	(1.1)	(0.1)	(0.1)
Model with fixed regional effects									
$\log U_t$	0.317	0.114	0.081	0.069	0.050	0.046	0.160	0.068	0.106
	(1.4)	(0.7)	(0.6)	(0.5)	(0.4)	(0.4)	(1.5)	(0.6)	(0.4)
Error Correction Model									
$\log U_{t-1}$	0.256	0.084	0.022	-0.078	-0.005	-0.055	-0.055	0.118	-0.025
	(0.7)	(0.3)	(0.1)	(0.4)	(0.1)	(0.3)	(0.3)	(0.6)	(0.1)
DeltaU	0.399	0.229	0.075	0.025	0.020	0.009	-0.076	0.047	0.032
	(1.3)	(1.2)	(0.4)	(0.2)	(0.2)	(0.1)	(0.5)	(0.3)	(0.1)
$\log W_{t-1}$	-1.314	-1.309	-1.125	-1.189	-1.248	-1.131	-0.981	-1.300	-1.410
	(7.3)	(8.4)	(6.5)	(6.9)	(7.9)	(6.2)	(5.3)	(6.6)	(4.3)
$\eta_{w.U}$	0.195	0.064	0.020	-0.066	-0.004	-0.049	-0.056	0.091	-0.018

Note: for Italy, 1991-2004, absolute t statistics based on robust s.e. are reported below each coefficient, models specification as in Table 1, dependent variable: regional fixed effects from a set of first step quantile regressions with individual micro-data (for each year, wage equations with controls for region, gender, years of education, experience, experience squared, tenure and tenure squared).

Table 3c: Estimates of the wage curve along the wage distribution by region, GERMANY

WEST									
	Dep var: $\log W_t$								
Deciles:	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Model without regional fixed effects									
$\log U_t$	-0.013	-0.032	-0.046	-0.052	-0.061	-0.067	-0.075	-0.083	-0.074
	(0.93)	(2.52)	(3.42)	(4.06)	(4.93)	(5.11)	(5.63)	(5.19)	(1.9)
Model with fixed regional effects									
$\log U_t$	0.009	-0.01	-0.009	-0.004	-0.005	-0.020	-0.015	-0.023	0.267
	(0.23)	(0.34)	(0.4)	(0.12)	(0.21)	(0.6)	(0.47)	(0.47)	(1.22)
	Dep var: $\log W_t - \log W_{t-1}$								
Error Correction Model									
$\log U_{t-1}$	-0.041	-0.053	-0.025	-0.032	-0.045	-0.054	-0.020	-0.020	0.247
	(1.0)	(1.7)	(0.9)	(1.2)	(2.1)	(1.9)	(0.6)	(0.4)	(1.2)
DeltaU	0.024	0.015	0.021	0.009	-0.026	-0.036	-0.021	-0.057	0.010
	(0.5)	(0.4)	(0.6)	(0.3)	(0.9)	(0.9)	(0.5)	(1.0)	(0.1)
$\log W_{t-1}$	-0.634	-0.734	-0.562	-0.568	-0.439	-0.452	-0.526	-0.393	-0.247
	(3.8)	(4.3)	(2.7)	(3.7)	(2.7)	(3.2)	(3.3)	(2.9)	(1.1)
$\eta_{w,U}$	-0.065	-0.072	-0.044	-0.056	-0.103	-0.119	-0.038	-0.051	1.000
EAST									
	Dep var: $\log W_t$								
Deciles:	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
Model without regional fixed effects									
$\log U_t$	-0.044	-0.125	-0.128	-0.102	-0.175	-0.171	-0.164	-0.215	-0.304
	(0.3)	(0.9)	(1.0)	(0.8)	(1.2)	(1.2)	(1.1)	(1.4)	(1.6)
Model with fixed regional effects									
$\log U_t$	-0.166	-0.098	-0.137	-0.149	-0.147	-0.197	-0.197	-0.275	-0.479
	(2.3)	(2.2)	(3.3)	(3.4)	(4.1)	(4.2)	(3.4)	(3.2)	(3.5)
Error Correction Model									
$\log U_{t-1}$	-0.236	-0.158	-0.143	-0.108	-0.125	-0.105	-0.085	-0.236	-0.329
	(2.6)	(4.5)	(3.9)	(2.8)	(3.6)	(2.5)	(1.4)	(2.1)	(1.6)
DeltaU	-0.097	-0.078	-0.095	-0.091	-0.058	-0.085	-0.051	-0.098	-0.182
	(1.3)	(2.1)	(2.6)	(2.6)	(1.6)	(3.2)	(1.2)	(1.3)	(1.3)
$\log W_{t-1}$	-0.782	-0.534	-0.532	-0.527	-0.503	-0.502	-0.402	-0.526	-0.389
	(4.4)	(5.1)	(3.9)	(5.2)	(4.0)	(3.3)	(2.8)	(3.7)	(2.7)
$\eta_{w.U}$	-0.302	-0.296	-0.269	-0.205	-0.249	-0.209	-0.211	-0.449	-0.846

Note: for Germany, 1996-2003, absolute t statistics based on robust s.e. are reported below each coefficient, models specification as in Table 1, dependent variable: regional fixed effects from a set of first step quantile regressions with individual micro-data (for each year, wage equations with controls for region, gender, years of education, experience, experience squared, tenure and tenure squared).