# REGIONAL WAGE DIFFERENTIATION AND WAGE BARGAINING SYSTEMS IN THE EUROPEAN UNION

Athanasios VAMVAKIDIS*
International Monetary Fund
Washington, D.C.

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*Abstract*

*The theoretical literature has argued that a centralized wage bargaining system may result in low regional wage differentiation and high regional unemployment differentials. The empirical literature has found that centralized wage bargaining leads to lower wage inequality for different skills, industries and population groups, but the evidence on its impact on regional wage differentiation is scant. Empirical evidence in this paper for European Union regions for the period 1980-2000 suggests that countries with more coordinated wage bargaining systems have lower regional wage differentials, after controlling for regional productivity and unemployment differentials. Estimates from wage curves for Germany and Italy based on panels of regions also suggest some links between the estimated elasticities and the level of coordination in wage bargaining.*

*Key words: regional wage differentiation, wage bargaining system*

## I Introduction

According to the theoretical literature, a centralized and coordinated wage bargaining system may cause low wage differentiation and high unemployment differentials across different skill levels, population groups, industries and regions. Under such a system, wages across all groups will converge to the market equilibrium for the high productivity

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group, or will be determined by the medium group. However, though the theoretical predictions are clear, empirical evidence is scant, especially for the effects on regional wage differentiation, with analysis hampered by data limitations at the regional level.

The issue is of particular interest for the EU. Average unemployment is higher in many of the European Union (EU) countries than in the rest of the industrial world. Some have argued that this is often a regional problem.[1] Indeed, many EU countries have high regional unemployment differentials. Relatively low regional wage differentials in many EU countries suggest that regional wages do not adjust to equilibrate regional labor markets. Italy, for example, has the highest regional unemployment differentiation in the EU, but one of the lowest regional wage differentials.[2] Unemployment in the South is almost four times higher than in the North, and while productivity in the South is only 80 percent of that in the North, wages are about 90 percent. Taking into account that the cost of living is most likely lower in the South, real wage differentiation between the two regions may be even lower than nominal wage differentiation. Italy's centralized wage bargaining system may be one of the reasons for its low wage differentiation across regions, which could partly explain its high regional unemployment imbalances.

This paper argues that coordinated wage bargaining systems and low regional wage differentiation may be linked. Empirical evidence for regions in 10 EU countries for the period 1980-2000 suggests that countries with less coordinated wage bargaining systems have higher regional wage differentials after controlling for regional productivity and unemployment differentials. The results are robust to estimation with instrumental variables, suggesting that the causality runs from the wage bargaining system to regional wage differentiation. Moreover, the results turn out to hold only for countries with high regional productivity differentials. Therefore, the empirical evidence suggests that a more flexible wage bargaining system could increase regional wage differentiation, reflecting regional productivity differentials. Furthermore, results from wage curves estimated for panels of regions in Germany and Italy suggest some links between the estimated elasticities and the level of coordination in wage bargaining. The paper proceeds as follows: section II discusses the previous literature; section III proceeds with the empirical evidence; and Section IV concludes.

## II Previous Literature

The literature on the costs and benefits of various wage bargaining systems has primarily focused on the impact of each system on total unemployment and inflation. Bruno and Sachs (1985) found that centralized wage bargaining systems result in lower unemployment. Calmfors and Driffil (1988), Flanagan, Moene and Wallerstein (1993), and Cukierman and Lippi (1999) found that centralized or very decentralized (firm level) bargaining systems result in lower unemployment and lower wages, while intermediate systems, with negotiation at the industry level, result in higher unemployment and higher

[1] Pench, Sestito, and Frontini (1999) find that unemployment in Germany, Belgium, and Italy is primarily a regional problem.

[2] For a discussion of the Italian wage bargaining structure see Demekas (1995), Erickson and Ichino (1995), Vamvakidis (2002), and Guiso, Pistaferri, and Schivardi (2005).

wages. According to this evidence, extremes work better – a centralized bargaining system leads to lower wage demands to internalize unemployment externalities, while a decentralized bargaining system leads to the same outcome because of high competition at the firm level. Both factors are absent when negotiations are at the industry level, as industry unions do not internalize the externality of their wage demands to the rest of the economy and competition is low across industries. However, this evidence is not robust as the review of the literature in OECD (1997 and 2006), Flanagan (1999) and Aidt and Tzannatos (2002) has shown, and the debate is still open.

It has been argued that centralized and coordinated wage bargaining tends to reduce wage dispersion. In a coordinated wage bargaining system, in which wages are negotiated at the national level, unions may tend to favor the median voter. Uncertainty about how wages will evolve after the negotiations could result in the compression of wage differentials by unions. Pench, Sestito, and Frontini (1999) present a model and some empirical evidence for EU countries suggesting that in countries with centralized labor markets and large interregional productivity differentials decisions are tailored for the median region, resulting in a wage floor consistent with high unemployment in the less productive regions. Furthermore, unions may show solidarity and call for average productivity to determine wages.

If in addition to a centralized wage bargaining system a country has regional economic asymmetries, then it is in the interest of the union members in the more developed regions to have wages above equilibrium in the less developed regions. Saint-Paul (1997) argued that wages in Italy and Germany are determined by the leading regions, North in Italy and West in Germany, and that the union members in the leading regions have an incentive to keep wage differentiation low to slow down migration flows.[3] Brunello, Lupi, and Ordine (2001) and Vamvakidis (2002) presented evidence for Italy suggesting that the wage in the South, the high unemployment region, is significantly affected by the unemployment rate in the North, the low unemployment region, while the unemployment rate in the South does not have a statistically significant impact.

The parties with decision power in a centralized wage bargaining system may prefer a low regional wage differentiation. Workers and employers in the leading regions may feel threatened from low wages in the lagging region, while the employed in the lagging regions prefer high wages. On the other hand, employers in the leading regions would prefer lower wages in the lagging regions if this would also keep wages in the leading regions down. However, the latter would require high regional factor mobility, which is not always the case in Europe. The groups who would benefit from higher regional wage differentiation include the group of unemployed in the lagging regions, who, however, do not have a bargaining power, and the employers in the lagging regions, who, although may participate in the decision process, may be less powerful than the employers in the leading regions.

In a country with a centralized and coordinated wage bargaining system and with wages determined by the leading region, low wage dispersion could coexist with high

[3] Although Decressin and Decressin (2002) found no compelling evidence for wage floors that constrain the adjustment of wages of the less well paid in Germany.

unemployment variation. A negative economic shock will increase unemployment in the lagging region without affecting wages, while the same shock in the leading region will reduce wages. As a result, the impact of a negative shock on employment will be smaller in the leading region and will not last as long as in the lagging region. If local wages were determined by local economic conditions, then temporary asymmetric economic shocks would not cause permanent regional unemployment disparities.[4] Empirical evidence support this argument, finding negative shocks in a centralized wage bargaining system to have a larger impact on poor regions (see Pench, Sestito, and Frontini, 1999). Thomas (2002) finds similar evidence at the industry level.

The empirical literature on wage bargaining systems reviewed in OECD (1997, 2004 and 2006) finds a strong link between higher centralization and coordination of wage bargaining and lower earnings inequality for different skill levels and wage dispersion across different industries, but also across different population groups, such as for young or older workers and women. Furthermore, this seems to be the only robust result of this literature (see Flanagan (1999) Aidt and Tzannatos (2002)).[5] One would expect this result to hold for regional wage disparities as well.

The investigation for the links between local labor market conditions and wages has been primarily in the context of unionization. The literature has found that the elasticity of wages with respect to regional unemployment depends on the presence and strength of labor unions (see Blanchflower and Oswald (1994)). Although this relationship is not always robust, evidence in Erling, Bratsberg, Naylor and Raaum (2002) for the USA, the U.K and Norway confirm that the response of wages to local unemployment is stronger for nonunion workers (the relationship is not statistically significant for union workers). The authors argue that unionization is often linked to coordination and centralization in wage negotiations, which suggests that the latter will also lead to a weak response of wages to local unemployment.

## III Empirical Evidence

### *A Evidence from a panel of regions in EU countries*

This section provides estimates of the links between the degree of coordination in the wage bargaining system and regional wage differentials in EU countries. As the previous section concluded, the literature has found strong empirical evidence that centralized and coordinated wage bargaining systems lead to low wage inequality across different skills, industries and population groups. Theoretical arguments suggest that the same result should hold for regional wage differentials.

Most EU countries have relatively high unemployment rates and low labor market participation rates (Table 1). Moreover, they have high regional unemployment variati-

[4] See Brunello, Lupi and Ordine (2001).

[5] Dell'Aringa and Pagani (2007) find that in countries with relatively centralized wage bargaining systems (Italy, Belgium and Spain) wages of workers covered by only a multi-employer contract are no more compressed than those of workers covered by both multi-employer and single-employer contracts. This implies that where workers are not covered by single-employer bargaining, they receive wage supplements paid unilaterally by their employers.

*Table 1 Unemployment and Participation Rates in Selected OECD Countries, 1980-2007*

| | Unemployment Rate | | | | Participation Rate | | | |
|---|---|---|---|---|---|---|---|---|
| | **1980** | **1990** | **2000** | **2007** | **1980** | **1990** | **2000** | **2007** |
| Euro area | 4.9 | 7.2 | 7.9 | 6.8 | 65.1 | 65.7 | 69.1 | 71.9 |
| Australia | 6.1 | 6.6 | 6.3 | 4.3 | 70.6 | 74.4 | 75.1 | 77.8 |
| Austria | 1.4 | 4.1 | 4.6 | 5.3 | 79.9 | 78.1 | 79.7 | 79.1 |
| Belgium | 6.7 | 6.6 | 6.9 | 7.7 | 63.7 | 62.9 | 66.1 | 68.0 |
| Canada | 7.5 | 8.2 | 6.8 | 6.0 | 72.6 | 77.7 | 77.2 | 79.9 |
| Germany | 1.7 | 4.5 | 6.9 | 6.4 | 68.3 | 72.4 | 75.2 | 77.8 |
| Denmark | 5.2 | 7.2 | 4.3 | 3.5 | 80.7 | 82.3 | 81.1 | 83.0 |
| Finland | 4.6 | 4.6 | 9.8 | 6.6 | 75.2 | 76.7 | 74.5 | 75.4 |
| France | 5.6 | 7.7 | 8.1 | 8.0 | 67.2 | 65.0 | 68.3 | 68.5 |
| Greece | 2.8 | 7.0 | 11.7 | 8.6 | 56.9 | 60.2 | 63.0 | 65.6 |
| Ireland | 7.5 | 13.1 | 4.3 | 4.8 | 63.5 | 63.4 | 69.7 | 74.3 |
| Italy | 5.6 | 9.1 | 10.2 | 5.9 | 61.3 | 60.0 | 60.0 | 63.1 |
| Netherlands | 3.9 | 5.7 | 3.0 | 3.3 | 66.5 | 68.8 | 77.4 | 79.8 |
| Norway | 1.7 | 5.2 | 3.4 | 2.5 | 75.3 | 78.0 | 80.7 | 80.5 |
| Portugal | 8.3 | 4.8 | 4.0 | 7.9 | 68.9 | 72.1 | 75.1 | 78.2 |
| Spain | 9.3 | 12.1 | 10.8 | 8.1 | 58.7 | 59.0 | 64.9 | 73.2 |
| Sweden | 2.0 | 1.6 | 4.7 | 4.6 | 81.5 | 84.5 | 77.8 | 79.5 |
| Switzerland | 0.2 | 0.5 | 2.5 | 3.3 | 77.8 | 86.6 | 86.6 | 88.2 |
| UK | 6.8 | 7.1 | 5.5 | 5.5 | 74.6 | 77.4 | 75.7 | 76.2 |
| United States | 7.2 | 5.6 | 4.0 | 4.6 | 63.8 | 66.5 | 67.1 | 66.1 |

*Source: OECD, Economic Outlook*

on (Table 2) – with Italy having the largest regional unemployment disparities in the EU. Although the regional mix of industries may contribute to this result, OECD (2000) finds a very low correlation between regional unemployment rates and the proportions of employment in agriculture, manufacturing, and services in OECD countries.

The collective bargaining structure is usually assessed based on indices for the level of wage bargaining and the level of coordination among employers and trade unions. A wage bargaining system is characterized as centralized or decentralized, depending on the extent that wages are decided at the national level, or at the firm level respectively – negotiations at the industry or the sector level is the intermediate case. National level bargaining does not necessarily result in a uniform wage, since it often includes negotiations for wages by sector, or region. A wage bargaining system is characterized as coordinated if wage negotiations between unions, employers, and the government are coordinated, either through national bargaining, or through other formal or informal mechanisms when

*Table 2 EU Unemployment Rate (Regional Coefficient of Variation)*

| | 1990 | 1995 | 2000 |
|---|---|---|---|
| EU | 65.5 | 60.1 | 65.9 |
| Belgium | 43.8 | 41.1 | 57.8 |
| Denmark | 22.2 | 28.2 | 22.5 |
| Germany | 43.7 | 33.1 | 47.7 |
| Greece | 27.4 | 24.3 | 17.3 |
| Spain | 36.0 | 28.4 | 44.0 |
| France | 24.8 | 22.3 | 29.4 |
| Ireland | 12.9 | 11.8 | 23.2 |
| Italy | 70.8 | 63.9 | 75.3 |
| Netherlands | 26.9 | 19.3 | 33.2 |
| Austria | ... | 36.0 | 33.8 |
| Portugal | 50.6 | 30.3 | 32.5 |
| Finland | 51.7 | 16.0 | 34.7 |
| Sweden | 41.1 | 17.8 | 31.8 |
| UK | 47.1 | 35.8 | 53.0 |
| United States | 25.5 (1993) | 27.0 | 27.5 |

*Source: Eurostat and U.S. Department of Labor*

wage negotiations are taking place at the sector, regional, or firm level. The indices in Table 3 from OECD (1997; 2004) take values from 1 to 5, with 1 for the lowest level of centralization or coordination. Many European economies have centralized and highly coordinated collective bargaining systems, as well as high bargaining coverage and trade union density. The overall trend in the OECD countries is towards more decentralized wage bargaining systems, although at a slow pace (see OECD, 2004; 2006).

In the analysis that follows, the degree of coordination is chosen as an indicator of the centralization of the wage bargaining system. The literature has argued that even in decentralized wage bargaining systems, the wage outcome will be the same as in centralized bargaining system when there is a high degree of coordination (see Flanagan (1999), OECD (2004), and Nickell, Nunziata, Ochel and Quintini (2003)). Even if wages are determined at the firm or industry level, high coordination between unions, employers' organizations and the government produces the same outcome as in a system of wage bargaining at the national level (OECD, 1997). As noted by Flanagan (1999), "…(the) bargaining level is then the form but not the substance of the bargaining system…empirical work stemming from the bargaining level literature misclassifies (as decentralized) those countries with company-level negotiations in which bargaining outcomes are in fact highly coordinated across bargaining pairs…" and "given the many ambiguities in measures of bargaining centralization,…measures of bargaining coordination seem preferable to measures of bargaining level."

*Table 3 Collective Bargaining Characteristics of Selected OECD Countries, 1980-2000*

| | Bergaining coverage | | | Trade Union Density | | | Centralization | | | | Coordination | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1980 | 1990 | 2000 | 1980 | 1990 | 2000 | 1980-84 | 1985-89 | 1990-94 | 1995-00 | 1980-84 | 1985-89 | 1990-94 | 1995-00 |
| Australia | 80 | 80 | 80 | 48 | 40 | 25 | 4.0 | 4.0 | 2.0 | 2.0 | 4.5 | 4.0 | 2.0 | 2.0 |
| Austria | 95 | 95 | 95 | 57 | 47 | 37 | 3.0 | 3.0 | 3.0 | 3.0 | 4.5 | 4.0 | 4.0 | 4.0 |
| Belgium | 90 | 90 | 90 | 54 | 54 | 56 | 3.0 | 3.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.5 |
| Canada | 37 | 38 | 32 | 35 | 33 | 28 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| Denmark | 70 | 70 | 80 | 79 | 75 | 74 | 3.0 | 3.0 | 3.0 | 2.0 | 3.0 | 4.0 | 3.0 | 4.0 |
| Finland | 90 | 90 | 90 | 69 | 72 | 76 | 4.0 | 5.0 | 5.0 | 5.0 | 4.0 | 5.0 | 5.0 | 5.0 |
| France | 80 | 90 | 90 | 18 | 10 | 10 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 | 2.0 |
| Germany | 80 | 80 | 68 | 35 | 31 | 25 | 3.0 | 3.0 | 3.0 | 3.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Italy | 80 | 80 | 80 | 50 | 39 | 35 | 3.5 | 2.0 | 2.0 | 2.0 | 3.5 | 2.0 | 3.0 | 4.0 |
| Japan | 25 | 20 | 15 | 31 | 25 | 22 | 1.0 | 1.0 | 1.0 | 1.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Netherland | 70 | 70 | 80 | 35 | 25 | 23 | 3.0 | 3.0 | 3.0 | 3.0 | 4.5 | 4.0 | 4.0 | 4.0 |
| New Zealand | 60 | 60 | 25 | 69 | 51 | 23 | 3.0 | 3.0 | 1.0 | 1.0 | 4.0 | 4.0 | 1.0 | 1.0 |
| Norway | 70 | 70 | 70 | 58 | 59 | 54 | 3.5 | 4.5 | 4.5 | 4.5 | 3.5 | 4.5 | 4.5 | 4.5 |
| Portugal | 70 | 70 | 80 | 61 | 32 | 24 | 3.0 | 3.0 | 4.0 | 4.0 | 3.0 | 3.0 | 4.0 | 4.0 |
| Spain | 60 | 70 | 80 | 7 | 11 | 15 | 4.0 | 3.5 | 3.0 | 3.0 | 4.0 | 3.5 | 3.0 | 3.0 |
| Sweden | 80 | 80 | 90 | 80 | 80 | 79 | 4.5 | 3.0 | 3.0 | 3.0 | 3.5 | 3.0 | 3.0 | 3.0 |
| Switzerland | 50 | 50 | 40 | 31 | 24 | 18 | 3.0 | 3.0 | 2.0 | 2.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| UK | 70 | 40 | 30 | 51 | 39 | 31 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |
| United States | 26 | 18 | 14 | 22 | 15 | 13 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 | 1.0 |

*Source: OECD (1997 and 2004)*

The sample in what follows includes the regions of the following countries: Belgium, Germany, Spain, France, Italy, Netherlands, Austria, Portugal, Sweden and the UK. The choice of the countries in the sample is based on data availability in the Regional Statistics of Eurostat (various issues up to 2004), which is the source for all data but the index of coordination of the wage bargaining system, which comes from OECD (1997 and 2004).[6] The definition of the regions follows Eurostat (NUTS level 2 regions). The sample includes 110 regions.[7] The regression is estimated as a pooled panel of five-year averages, with or without fixed region and time effects, but also with random effects in some specifications to test the robustness of the results. The estimation period is from 1980 to 2000.[8]

[6] Future research could add Denmark, Norway and Finland in this sample, especially as these are countries with relatively centralized wage bargaining systems, but low regional unemployment variation.

[7] Eurostat includes 151 NUTS 2 level regions for the countries in the sample, but the sample falls to 110 regions because of missing observations.

[8] The data were obtained from Eurostat, various issues up to 2004. More recent observations have become available since then, showing that regional unemployment disparities have declined in most of Europe, including in Italy, together with an overall fall in unemployment. However, structural breaks seem to have been introduced in the more

The dependent variable is the difference between the wage in a region and the wage in the country of this region, measured as the absolute value of 1 minus the ratio of each region's wage with the national wage (absolute values are taken because the estimation attempts to find the determinants of regional wage differentials regardless if they are positive or negative). The wage rate is defined as total employment compensation, which includes nonwage compensation in cash, such as bonuses and other wage supplements in cash. The independent variables include: the lagged regional labor productivity differential compared with the labor productivity in the respective country, the lagged regional unemployment differential compared with the unemployment rate in the respective country (both calculated using the same formula as for the regional wage differential), and the OECD index of coordination of the wage bargaining system in each country (this is the same for each region within a country). The regional productivity and unemployment differentials are included with one lag to address causality concerns.

The results in Table 4 suggest that coordination in wage bargaining and regional wage dispersion seem to be linked. The panel is estimated first as a pool and then with fixed region effects, with random region effects and with fixed region and time effects. According to the Hausman test, the specification should include fixed effects as opposed to random effects. Also, both region and time effects are statistically significant. The estimate of the coordination index is negative and statistically significant at the 10 percent level in the pooled panel regression and at the 1 percent level in the regressions with fixed and random region effects. Although still with the right sign, the estimate is significant only at the 15 percent level in the regression with both fixed region and time effects. Despite the fact that the level of significance is not always high, one could say that according to these results a high level of coordination seems to be linked to low regional wage differentiation. This relationship seems to be linear, as the square of the coordination index does not have a statistically significant estimate.[9] The estimate of the unemployment differential is positive, as would be expected, but not always statistically significant. The estimate of the productivity differential is also positive and statistically significant but in the regression with the fixed region effects, in which, although significant, has the wrong sign. The specification with fixed effects explains up to 66 percent of the variation in regional wages.[10]

Institutions are often assumed to be exogenous, but labor market institutions do change over time. Although the change of labor market institutions is usually slow, some causality concerns are justified. Indeed, the coordination index includes 17 changes during the period considered, 10 of which are towards less coordination. Furthermore, it could be the case that countries without large regional wage differentials adopt a centralized wage bargaining system, rather than the other way around. Including lags and fixed effects in

recent wage series in some countries. Future research could address the empirical problems that could result from such breaks and extend the sample to more recent years.

[9] The results from the specification that includes the square of the coordination index are available from the author.

[10] We also tried to test whether the results were affected when some form of wage leadership was introduced into the empirical model (as in Demertzis, Hallett and Schermer, 2008). This test excluded Germany from the left-hand-side of the regression and added Germany's wages on the right-hand-side. The results remained robust.

*Table 4 Regional Wage Differentiation and Wage Bargaining in the EU, 1980–2000*

| | Pooled | Fixed region effects | Random effects | Fixed region and time effects |
|---|---|---|---|---|
| Constant | 0.107*** | | 0.126*** | |
| | (5.044) | | (6.344) | |
| Lagged unemployment differential | 0.002 | 0.109*** | 0.032 | 0.090** |
| | (0.092) | (2.952) | (1.574) | (2.391) |
| Lagged productivity differential | 0.472*** | -0.394*** | 0.306*** | -0.326*** |
| | (8.346) | (-3.425) | (5.440) | (2.894) |
| Index of coordination in wage bargaining | -0.012* | -0.026*** | -0.016*** | -0.014 |
| | (-1.834) | (-2.905) | (-2.601) | (-1.465) |
| Adj. R-squared | 0.25 | 0.63 | 0.11 | 0.66 |

*Note: The sample includes 110 regions from the following countries: Belgium, Germany, Spain, France, Italy, Netherlands, Austria, Portugal, Sweden and the UK. The definition of the regions follows the Eurostat NUTS 2 level. The data are five-year averages for the period 1980 to 2000. The dependent variable is the difference between the wage in a region and the wage in the country of this region, measured as the absolute value of 1 minus the ratio of the wage in a region with the national wage. *, **, and *** indicate statistical significance at the 10, 5 and 1 percent level, respectively.*

the specification addresses some of these concerns. In addition, estimation with instrumental variables could further test the robustness of the results.

Results from an estimation with instrumental variables suggest an even stronger link between coordination in wage bargaining and regional wage dispersion. The instruments include the lagged values of the coordination and centralization indices. The estimates of the coordination index in Table 5 are now statistically significant at the 1 percent level, even when both fixed region and time effects are included in the specification.[11]

Results from regressions with interaction terms suggest that the impact of coordination in wage bargaining on regional wage differentiation depends on productivity differentials, but not on unemployment differentials. The results in Table 6 show that the estimate of the coordination index remains positive and statistically significant at least at the 10 percent level when an interaction term with unemployment differentials is included. In contrast, the interaction term has the wrong sign and is statistically insignificant. However, when an interaction term with the productivity differentials is included, the estimate of the coordination index loses its significance. In contrast, the interaction term is negative and statistically insignificant at least at the 10 percent level. Therefore, countries with less coordinated wage bargaining systems seem to bring wage dispersion closer to productivity dispersion.

Using Italy as an example – the country with the highest regional unemployment disparities in the sample, the second lowest regional wage variation in the euro area, and a

[11] As the Hausman tests supports the estimation with fixed effects, what follows does not report results for the estimation with random effects.

*Table 5 Regional Wage Differentiation and Wage Bargaining in the EU, Estimation with Instrumental Variables, 1980-2000*

| | **Fixed region effects** | **Fixed region and time effects** |
|---|---|---|
| Lagged unemployment differential | 0.130*** | 0.108*** |
| | (3.435) | (2.795) |
| Lagged productivity differential | -0.380*** | -0.332*** |
| | (-3.245) | (-2.898) |
| Index of coordination in wage bargaining | -0.044*** | -0.032*** |
| | (-4.193) | (-2.967) |
| Adj. R-squared | 0.62 | 0.65 |

*Note: The sample includes 110 regions from the following countries: Belgium, Germany, Spain, France, Italy, Netherlands, Austria, Portugal, Sweden and the UK. The definition of the regions follows the Eurostat NUTS 2 level. The data are five-year averages for the period 1980 to 2000. The dependent variable is the difference between the wage in a region and the wage in the country of this region, measured as the absolute value of 1 minus the ratio of the wage in a region with the national wage. The instruments include the lagged values of the coordination and centralization indices. *, **, and *** indicate statistical significance at the 10, 5 and 1 percent level, respectively*

*Table 6 Regional Wage Differentiation and Wage Bargaining in the EU, Estimation with Interaction Terms, 1980-2000*

| | **Fixed region effects** | **Fixed region and time effects** | **Fixed region effects** | **Fixed region and time effects** |
|---|---|---|---|---|
| Lagged unemployment differential | 0.021 | -0.015 | 0.116*** | 0.097** |
| | (0.228) | (-0.171) | (3.179) | (2.580) |
| Lagged productivity differential | -0.387*** | -0.316*** | 0.419 | 0.327 |
| | (-3.358) | (-2.806) | (1.018) | (0.821) |
| Index of coordination in wage bargaining | -0.036*** | -0.026* | -0.003 | 0.004 |
| | (-2.758) | (-1.970) | (-0.180) | (0.298) |
| (Index of coordination in wage bargaining) x (Lagged unemployment differential) | 0.028 | 0.033 | | |
| | (1.057) | (1.312) | | |
| (Index of coordination in wage bargaining) x (Productivity differential) | -0.218** | -0.177* | | |
| | (-2.055) | (-1.708) | | |
| Adj. R-squared | 0.63 | 0.66 | 0.64 | 0.67 |

*Note: The sample includes 110 regions from the following countries: Belgium, Germany, Spain, France, Italy, Netherlands, Austria, Portugal, Sweden and the UK. The definition of the regions follows the Eurostat NUTS 2 level. The data are five-year averages for the period 1980 to 2000. The dependent variable is the difference between the wage in a region and the wage in the country of this region, measured as the absolute value of 1 minus the ratio of the wage in a region with the national wage. *, **, and *** indicate statistical significance at the 10, 5 and 1 percent level, respectively.*

centralized and coordinated wage bargaining system – the results imply that regional wage differentials are likely to increase if a more decentralized wage bargaining system was adopted. If Italy's coordination index was to decline from its current value of 4 to 3.3, or by 0.7, which is the one standard deviation of the change in the coordination index in the sample, regional wage differences would increase by a median of between 9 to 20 percent, depending on the specification and keeping everything else constant. The estimated impact is larger for regions with wages that are closer to the national wage and with productivity rates that are further from the national average.

### *B Evidence from wage curves: Germany versus Italy*

This section discusses whether estimates from wage curves depend on coordination in wage bargaining, using regional data for Germany and Italy. The results suggest an increasing responsiveness of wages to unemployment over time in Germany, despite no change in wage bargaining coordination from a high level, but show no trend in the responsiveness of wages to productivity. For Italy, there is some evidence that the recent increase in coordination in wage negotiations may have decreased the responsiveness of wages to productivity, but there seems to be no impact from earlier changes in coordination. Comparing the two countries, as Italy moved towards more coordination in wage negotiations, as was the case in Germany, the estimated elasticities of wages in Italy came closer to those in Germany.

Germany and Italy were selected from the sample of EU countries as two economies with relatively large regional disparities. Moreover, they allow comparisons between a country with no change in the wage bargaining process (Germany) and a country with a number of changes (Italy).[12] Germany's index for coordination in wage negotiations was equal to 4 during the whole sample period, suggesting a high level of coordination (Table 3). Italy's coordination index changed from 2 during the second half of the 1970s to 3.5 in the early 1980s, then back to 2 in the late 1980s, to 3 in the early 1990s, and to 4 in the late 1990s. Therefore, Italy moved from an intermediate level of coordination in wage bargaining to a more coordinated process, then back to an intermediate level of coordination, and then to a very coordinated process.

The estimates are from panel regressions, including regions for each country, following Iara and Traistaru (2004). The sample includes 16 regions for Germany and 19 regions for Italy. The data are annual observations, during 1980-2000. The dependent variable is the log of the real wage rate in each region (nominal wages are deflated by the CPI index). The independent variables comprise the log of the unemployment rate and the log labor productivity rate in each region. The regressions also include region fixed effects. The elasticities for unemployment and productivity are estimated separately for each 5-year period, to test whether they depend on the value of the coordination index in each period (as shown in Table 3). The results are presented in Table 7.

The results for Germany are mixed (first column in Table 7), suggesting that the responsiveness of wages to unemployment increased over time, but showing no clear trend

[12] In addition, Germany and Italy are the two countries with the most observations available for annual data in the sample.

*Table 7 Estimating Wage Curves for Germany and Italy, Panels of Regions, 1980-2000*

| | Germany | Italy | Italy |
|---|---|---|---|
| Unemployment rate | | | -0.120** |
| | | | (-2.010) |
| 1980-1984 | -0.067* | -0.139** | |
| | (-1.848) | (-2.015) | |
| 1985-1989 | -0.087*** | -0.099** | 0.001 |
| | (-2.664) | (-1.947) | (0.081) |
| 1990-1994 | -0.096** | -0.120** | |
| | (-2.585) | (-2.325) | |
| 1995-2000 | -0.107*** | -0.120** | 0.016 |
| | (3.356) | (-2.301) | (0.736) |
| Labor productivity | | | 0.078 |
| | | | (1.138) |
| 1980-1984 | 0.267** | 0.420*** | |
| | (1.968) | (4.874) | |
| 1985-1989 | 0.298** | 0.358*** | 0.001 |
| | (2.457) | (4.648) | (0.167) |
| 1990-1994 | 0.292** | 0.343*** | |
| | (2.521) | (4.653) | |
| 1995-2000 | 0.287*** | 0.299*** | -0.033*** |
| | (2.764) | (4.125) | (-4.793) |
| Adj. R-squared | 0.92 | 0.82 | 0.78 |

*Note: Panel regressions of annual data in logs, with fixed region effects, for the period 1980-2000. The sample includes 16 regions for Germany and 19 regions for Italy. The definition of the regions follows the Eurostat NUTS 2 level. The dependent variable is the log real wage rate of each region*

for the estimates of productivity. As expected, the estimates are negative for the unemployment rate and positive for the productivity rate. The estimates for unemployment become more negative over time. The Wald test rejects the null hypothesis that the coefficients of unemployment are equal in all subperiods at the 1 percent level. The change in the coefficient of unemployment may be driven by overall labor market reforms, as the coordination index remained constant during this period. In contrast, although the estimate for productivity increases after the early 1980s, it remains statistically the same during the rest of the period (the Wald tests cannot reject the hypothesis that the coefficients are equal after the mid-1980s).

The results for Italy suggest a fall in the responsiveness of wages to productivity during the last subperiod, when there was high coordination in wage negotiations, but no clear trend is found for earlier periods. Table 7 includes results from two specifications for Italy, one with estimates for all subperiods (third column) and one with separate estimates for the subperiod 1985-89, in which the coordination index had its lowest value (equal to 2) and for the subperiod 1995-00, in which the coordination index had its highest value

(equal to 4). The estimates show no clear trend in the responsiveness of wages to unemployment, although it starts relatively high and ends up lower.[13] However, the results suggest that the responsiveness of wages to productivity was significantly smaller in the last subperiod, when coordination in wage negotiations was high.

Comparing the two countries, the results suggest that the estimated elasticities were converging during the sample period. Italy's wage elasticities were much higher than Germany's in the beginning. By the end of the sample period, the estimated elasticities were closer, which was consistent with both countries having the same level of coordination in wage negotiations.

## IV Conclusions

The theoretical literature has argued that a centralized and coordinated wage bargaining system may cause low regional wage differentiation and high regional unemployment differentials. Empirical evidence in this paper for EU regions for the period 1980-2000 suggests that, indeed, highly coordinated wage bargaining systems and low regional wage differentiation are linked: countries with less coordinated wage bargaining systems have higher regional wage differentials, after controlling for regional productivity and unemployment differences. The results are robust to estimation with fixed effects and to estimation with instrumental variables, suggesting that it is the wage bargaining system that influences regional wage differentiation rather than the other way around. Furthermore, results from wage curves estimated for panels of regions in Germany and Italy suggest some links between the estimated elasticities and the level of coordination in wage bargaining.

The empirical evidence suggests that a more decentralized wage bargaining system could increase regional wage differentiation in countries with high regional productivity differentials, although not necessarily the country's labor market performance. Using the case of Italy as an example, the economic significance of the results is shown to be large. However, the discussion of the literature suggests that compression of regional wage distribution brought by more centralized and coordinated wage bargaining may be partly countered by internalization of possible effects on employment. Although the empirical results on the latter effect are not robust, labor market reforms should take both forces into account in order to achieve the best possible trade off between overall labor market performance and regional disparities.

The results should be treated as only suggestive, since the sample of countries is small and with a relatively small variation in their wage bargaining characteristics (most countries in Europe have relatively centralized and coordinated wage bargaining systems). Furthermore, the statistical significance of the results is relatively low in some specifications, although this is not the case in the estimation with instrumental variables. The work on wage bargaining indices is still in progress and existing indices may suffer from measurement errors. Reforms to the bargaining structure could coincide with other labor market

[13] The estimated unemployment elasticities for Italy are somewhat lower than the ones in Sans de Galena and Turenne (2005). The inclusion of labor productivity in the present specification may explain the difference.

reforms, suggesting that the results may capture such broad reforms, rather than reforms specific to wage negotiations. To further investigate the robustness of the results, it would be useful for future work to increase the country sample as more data become available, to improve the indices of wage bargaining, and to investigate the role of other determinants of regional wage differentials in addition to the ones controlled for in this paper.

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