Unemployment, inequality and the policy of Europe: 1984-2000

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1. Introduction

Unemployment happens to individuals. But the unemployment *rate* is a matter of *place*. And places are nested inside larger places. The local has properties the nation may not share. The nation has characteristics that may not apply to the continent. In an integrated economy, the forces that operate on unemployment rates may extend over many horizons, from the near neighborhood to the entire world.

Yet the literature on unemployment in Europe tends to concentrate on *national* characteristics and *national* unemployment rates. The predisposition is to blame unemployment on labor market 'rigidities' – and then to search for particular culprits, generally in the fields of national unemployment insurance, job protections and wage compression. Periodic movements to reform national labor markets sweep aside the careful qualifications found in empirical work such as Nickell (1997) and Blanchard and Wolfers (1999), and presuppose that greater wage flexibility is the established cure for European unemployment. Neither local conditions nor the influence of economic policy at the continental level play important roles in the policy debate.

In a recent paper, Baker *et al.* (2003) provide a comprehensive review of the national-institutions approach to explaining European

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unemployment. They find only one robust result, namely that coordinated collective bargaining and (perhaps) union density are associated with *less* unemployment in Europe. Of course, this interesting finding is inconsistent with the rigidities framework. So far as macroeconomic policy is concerned, while a handful of lonely voices argue that interest rates and growth rates dominate the determination of unemployment in Europe, these too tend to root the relevant decision-making at the national level (e.g. Palley 2004). Meanwhile the higher policy discussion accepts that European policy – especially monetary policy – mainly influences the price level, leaving unemployment to be governed by market forces and national institutions.

In this paper, we try a different approach. Instead of the nation, our smallest unit of analysis is the region. Data are generally available for up to 159 regional entities across Europe, embedded within 13 countries. We specify just four regional 'labor market' variables that, we find, account significantly for the variation in regional unemployment rates. Then the panel structure permits us to measure national fixed effects, and so to identify those countries with characteristics that affect unemployment rates after controlling for regional conditions. Next, the panel structure permits us to identify time effects, whose pattern gives a picture of the influence of transnational forces, such as the integration of Europe and the effect of European macro and monetary policies. In this way we allow the data to separate for us the influences of factors operating at the regional, national, and international or continental levels.

We identify two regional factors that influence the demand for labor. First is the strength of economic growth at any given time – an obvious determinant of construction and investment jobs, and a consequence of the local effects of macroeconomic policies and regional fiscal assistance. The second is a measure, which we constructed, of the average wage rate of the region relative to the average for Europe as a whole. Our thinking is that regions with higher average wages should tend to have stronger tax bases, more public employment and also more open (and therefore taxed) employment in services.

On the supply side, we also identify two factors. The first is the relative size of the population of very young workers – an obvious measure of the difficult-to-employ. The second is a measure of the inequality of the wage structure. To acquire this measure, we construct, for the first time, a panel of European inequalities at the regional level, comparable both across countries and through time.

Our hypothesis that regional pay inequalities should be placed on the supply side of the labor market is an innovation. It is more conventional to treat local wage rates as the *product* of supply and demand, while begging the question of whether these forces operate at the regional, national or higher levels. Instead, in this analysis we take the regional wage structure as a datum facing individual workers. We consider that this datum affects *how long* they choose to search for employment. The greater the differential between high and low-paid jobs in the local setting, the longer a rational person will hold out for one of the better jobs, accepting unemployment if necessary.

This theoretical position is well-known in neoclassical development economics, going back to a classic article by Harris and Todaro (1970), which treats the urban-rural pay differential as part of an incentive to migrate from the countryside to the cities, despite the presence of urban unemployment. The general concept, that inequality creates an incentive to search, has not been applied to Europe or to any developed-country setting so far as we know. But there is no compelling reason why it should not be. In practice, we find that pay inequality is a strong determinant especially of cross-sectional variation in European unemployment, and the positive coefficient is consistent with the Harris-Todaro conjecture.

Once regional conditions have been accounted for, our fixed-effects model finds few significant differences in unemployment among larger countries. The only substantial large-country fixed effects are for the UK (a negative shift) and Spain (a positive shift). However, large negative shifts are found for a number of smaller countries, which have much lower unemployment rates than our model would otherwise predict. The countries for which this is true are widely separated and appear to have little in common apart from the fact that they are small. We will present some hypotheses below that may help account for this phenomenon.

Finally, we replicate the estimates for sub-populations, including men, women and very young workers. We find significant differences in the unemployment experiences of different sub-populations: the very young as against older workers, and men as against women. As a broad rule, it appears that the less migratory a population, the higher its unemployment rate and the larger the effect of local labor market conditions on unemployment.

The time effects are striking for all population groups. They show a sharp rise in unemployment common to all regions beginning in 1993. This is an interesting break-point in view of the introduction of the Maastricht Treaty on European Union at the start of that year. The effect continues through the 1990s, and suggests that a substantial part of European excess unemployment – generally between two and three percentage points – reflects policy conducted *at the European level* since the Union. In this regard, the monetary policy of the European Central Bank and the convergence criteria for the euro come to mind as leading suspects.

2. Theoretical considerations

Our hypothesis is that unemployment at the local level is governed principally by four factors: two each on the demand and on the supply sides. On the demand side, the growth rate of effective demand and activity strongly conditions the availability of jobs; in periods of strong growth construction and investment jobs are notably abundant.

But so too does relative income. Richer places offer more employment of all kinds, whether in the public sector (because they have more tax revenue) or in the private services sectors (because they have more discretionary private income). In poor regions surplus labor is more likely to work, if at all, in the cash economy and to report itself as unemployed.

On the supply side, labor force demography clearly matters. Young people are hard to employ and to keep employed. So much is uncontroversial.

Our other argument is that regions with *more* equal pay structures will, other things equal, experience *less* unemployment. Since this is contrary to the standard view, it deserves a full explanation.[1]

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[1] One might suppose the causation to run the other way: that regional pay inequality would be simply a positive function of local unemployment rates. But while this is possible, two considerations suggest that it is not predominantly the case. First, unemployment rates vary much more than inequality measures over time. The effect of inequality on unemployment is therefore mainly cross-sectional (places with higher inequality experience higher unemployment on a chronic basis). Second, part of the greater inequality observed in a regional pay structure is due to the scarcity of de-

A half century ago Simon Kuznets (1955) argued that inequality would rise in the early stages of economic development and transition to industrial growth. New urban centers were places of concentrated income and wealth. It was the *differential* between incomes in these places and those in the countryside that would become significant as cities grew, and only decline later as the proportion of the population remaining in the countryside shrank. This was the most significant single factor behind Kuznets' inverted-U curve.

In 1970 John Harris and Michael Todaro offered a model capturing these characteristics, in a paper aimed mainly at development economists. In their model, workers migrate from a low-marginal-product rural sector to cities where minimum wages are imposed, and accept a high probability of sustained unemployment in exchange for a low probability of getting one of those jobs and enjoying the resulting rise in income. The equilibrium condition is that the expected value of the gain be just equal to cost incurred in leaving rural employment, and this condition entails substantial equilibrium unemployment. From this, a positive relationship between urban/rural pay inequality and equilibrium unemployment emerges.

While Harris and Todaro focused on East Africa, consider how their argument might apply in modern Europe. Modern advanced societies have an elite group of knowledge and finance workers, a core of manufacturing workers, and a large reservoir of workers in the services. Access to knowledge and finance jobs is restricted by cartels and credentialing. The same is not true for manufacturing workers, who nevertheless enjoy wage premiums due to industry-specific labor rents. Services workers with few skills enjoy few such advantages, and the pay in the services sector is largely set by social minimums, which are governed in substantial part by political decision-makers. Services workers are like the earlier generation of farm workers in many relevant economic respects, and they may be considered a reserve army of the *underemployed*.

So long as the differential between service wages and manufacturing wages is fairly small, *or* if it is possible to search for better jobs while working, services workers will not abandon current employ-

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cently-paid middle-range jobs, and not exclusively to larger pay differentials *per se*, though in practice both may contribute. There is no compelling reason in neoclassical theory why higher unemployment rates should produce a gap in employment in the middle of the pay scale, as opposed to the bottom of it.

ment to seek for better. But on the other hand, if there are large differentials and obstacles to on-the-job search, they will do so. In that event, measured unemployment will rise. As in Harris and Todaro, equilibrium local unemployment is a *positive* function of local pay inequalities.

Supply and demand at the regional level do not exhaust the possible sources of variation in unemployment. Labor market policies, and to some extent the rules for measuring who is unemployed and who is not, are set at the national level. These factors may be expected to introduce some variation in unemployment rates between countries.

Our analysis does not attempt to sort out the particular institutional factors behind differences in national unemployment rates, once local conditions have been controlled for. Rather we seek to establish *how much* of the observed differences in unemployment can be attributed to national differences, and *for which countries* these differences are important. The introduction of country fixed effects permits this measurement to be carried out easily.

Finally, the factors that work on the continental (or, indeed, global) level need to be considered. Where a rise or decline in unemployment is common across the full spectrum of regions of Europe, it is reasonable to attribute it to policies and institutional changes emanating at the European level (or some higher level, such as the effect of changing global economic conditions). Time fixed effects capture these movements. Since Europe for the past twenty years has been a laboratory for economic integration and rule-bound policy-making, it will be very interesting to see what pattern emerges, in relation to three specific events especially: the Single European Act (1987), the Maastricht Treaty on European Union (1993) and the introduction of the euro (1999).

In our model, several significant forms of unemployment are subject to policy control and so are involuntary in Keynes' (1936) meaning. These include, particularly, the growth rate, the degree of pay inequality at the regional level, and the contribution of European-level economic policy and institutional change to European unemployment. Other factors, including population structure and national institutional characteristics, would have to be considered as sources of frictional or even of voluntary unemployment. So the analysis should be of considerable interest in sorting out the empirical relevance of these old theoretical questions.

Our framework may be applied to different subsets of the population, which can be expected to have different degrees of responsiveness to the forces at work. Women move in and out of work more than men. Young people face an inevitable transition from school to work. The choice for these groups is what job to aim for? A worker who once accepts a low-wage job may be typed as low-productivity, and cannot make the transition to higher pay as easily as a worker who has never been employed at all. For this reason, young people especially have an incentive to resist taking bad employment. Youth unemployment in unequal regions should therefore be expected to be an especially serious problem.

Migration is a reinforcing consideration. Certain countries have larger emigrant populations than others. Within any given population, older male workers tend to be more mobile than either women or the very young. If acceptable jobs are not available in their immediate surroundings, they can be expected to search elsewhere, disappearing from the regional unemployment statistics. For this reason, the unemployment of less mobile subpopulations should show higher sensitivity to regional conditions, and less mobile subpopulations should generally experience higher unemployment rates, than more mobile subpopulations.

3. Data and model

Use of the region rather than the nation as the unit of geographic analysis has two distinct advantages. The first is that regions are more numerous: 159 in 'Old Europe' alone. The second is that regions are also more homogeneous: the standard deviation of population size for regions is merely a tenth of what it is for countries. Table 1 gives this information.

We propose a model in which regional unemployment rates depend on four regional factors: pay inequality (+), the youth proportion in the population (+), economic growth rate (–) and relative wages (–). The first two of these factors influence the supply of unemployed labor; the second two affect the demand for labor (or supply of jobs). In addition, we expect to find national differences in average unemployment rates and variations in unemployment common to all

regions in Europe. These may be measured by country fixed effects and time fixed effects, respectively.

POPULATION DIFFERENTIALS FOR NATIONS
AND REGIONS IN EUROPE, 1984-2000

Variable	No. observations	Mean	Standard deviation	Minimum	Maximum
Nations	169	28,128	25,164	355.9	80,759.6
Regions	1853	2,306	2,556	22.5	17,663.2

Population in thousands.

The main empirical innovation in the present paper lies in nearly comprehensive measures of pay inequality calculated across broad economic sectors at the level of European regions – the 159 entities over 17 years (1984-2000).

We employ the between-groups component of Theil's T statistic to measure pay inequality. The methodology has been proposed in Conceição and Galbraith (2000) and in Conceição, Galbraith and Bradford (2001), building on Theil (1972). Theil's T statistic can be expressed as follows:

$$T = \frac{1}{n} \sum_{i=1}^{n} \frac{y_i}{\mu} \cdot \log \left[\frac{y_i}{\mu} \right] \tag{1}$$

where y_i denotes the income of an individual region indexed by i, n is the number of individuals in the population and μ is the average income.

One of the most attractive features of this statistic is its decomposition property. As long as a distribution of income and a distribution of individuals are grouped into mutually exclusive and completely exhaustive groups, overall inequality can be decomposed into a between-groups component and a within-groups component. The between-groups measure is derived from group means for payroll and group population weights; the within-groups measure is a weighted average of the Theil inequality index for each group. Formal expressions for both components are included in Appendix 2; this study takes advantage of the fact that, under some very general conditions, the dynamics of overall inequality can be captured using only the between-groups component.

This between-sectors calculation provides a new source of information on the relative inequality of the pay structures in the regions of Europe, and because the sector categories are standardized, the measures are comparable across regional (and national) boundaries as well as through time. Our data are from Eurostat's REGIO data base (http://www.eu-datashop.de). We use compensation of employees (e2rem95) and employment (e2empl95) for 159 regional entities among 16 major economic sectors. Regions are classified by NUTS level 2 except for the regions of Germany and United Kingdom, where data are only available at NUTS level 1. A list of economic sectors and regions is included in Appendix 3.

The relative wage variable (RelWage) is the ratio of each region's average payroll per worker relative to the average payroll per worker of Europe as a whole. Average payroll is derived by dividing total compensation of employees by employment for each year. The remaining regional variables – growth of GDP and proportion of the population under 24 years of age – are constructed conventionally from REGIO.

We now turn to a regression analysis, with the following reduced form, two-way fixed-effects model:

$$UN = a + B_1 Theil + B_2 RelWage + B_3 GDPG + B_4 PopUn24 + D_i Country + D_j Time$$

where:

UN   = regional unemployment rate

Theil   = pay inequality across sectors for each region

RelWage = average regional wages relative to the European average

GDPG   = growth rate of GDP at the regional level

PopUn24   = proportion of the regional population under 24 years of age

Country = dummy to capture fixed country effects

Time   = dummy to capture fixed time effects.

The model can be fitted for all of Europe using annual data from 1984 to 2000, with full information for a total of 1465 region-year observations. The coefficients on the regional variables are reported in Table 2. Different models reflect estimates for the whole population

and its component parts: men, women, older and younger workers (ages greater or less than 25 years). We report a linear version of the model, a log-log version gave similar results and is not reported.

TABLE 2

COEFFICIENT ESTIMATES: LINEAR MODEL (1984-2000)

	Total		Male		Female		< 25 Yrs		> 25 Yrs	
	Beta	Pvalue	Beta	Pvalue	Beta	Pvalue	Beta	Pvalue	Beta	Pvalue
Theil	4.97	0.04	3.22	0.13	6.80	0.04	11.97	0.03	4.08	0.04
PopUn24	57.02	0.00	50.58	0.00	76.46	0.00	112.32	0.00	38.04	0.00
RelWage	−7.08	0.00	−4.95	0.00	−9.91	0.00	−6.37	0.00	−7.43	0.00
G-GDP	−4.48	0.02	−5.67	0.00	−2.35	0.39	−6.30	0.17	−4.69	0.00
$\bar{R}^2$	0.61		0.59		0.65		0.62		0.58	
No. observations	1465		1465		1465		1465		1465	

All the variables have the correct sign and all but three are significant at conventional significance levels. Coefficients are systematically higher for less-mobile populations, except that GDP growth rates matter less for women – no surprise. R^2 is in the range of 60% for all models.

Higher growth at the local level reduces unemployment. Larger numbers of young people are associated with higher unemployment. The data on unemployment and inequality at the level of European regions support our hypothesis of a positive relationship between these two variables, though at a moderate significance level. In areas with high levels of pay inequality *and* high numbers of young people, the two effects would appear to combine to yield significantly higher unemployment rates.

Inequality *across* Europe (measured by the RelWage variable) also appears to affect local unemployment rates. If the regression were taken literally, it would imply that reduction in the inequality of incomes across Europe would reduce unemployment in the poor countries. But at the same time it would increase it in the rich countries. Therefore this result is ambiguous in policy terms.

The regional variables taken together play a considerable role in the explanation of variance, but each level of analysis – regional, national and European – has a role to play. Table 3 provides measures

of the variance explained (for unemployment of all workers) when the model is specified without fixed effects, with one-way fixed effects, and with two-way fixed effects. Coefficient estimates on the regional variables are also shown; these are notably stable except that the effect of GDP growth is to some extent absorbed by the introduction of country and time effects.

TABLE 3

ANALYSIS OF VARIANCE EXPLAINED UNDER DIFFERENT SPECIFICATIONS*

	Region only		Region & country		Region & time		All variables	
	Beta	Pvalue	Beta	Pvalue	Beta	Pvalue	Beta	Pvalue
Theil	4.03	0.18	4.81	0.04	5.39	0.09	4.97	0.04
PopUn24	50.20	0.00	48.64	0.00	54.23	0.00	57.02	0.00
RelWage	−2.82	0.00	−6.81	0.00	−2.21	0.00	−7.08	0.00
G-GDP	−11.83	0.00	−8.56	0.00	−9.49	0.00	−4.48	0.02
Regional	X		X		X		X	
Country			X				X	
Time					X		X	
$\bar{R}^2$	0.16		0.57		0.21		0.61	

* Dependent variable is Total Unemployment.

It turns out that country fixed effects are relatively unimportant for large countries, with two exceptions. Taking France (with the closest to average unemployment for the period) as the base case and plus or minus 3% as the threshold, only Spain has much higher unemployment *ceteris paribus* than one would otherwise expect. In the UK, on the other hand, unemployment is lower than otherwise expected. Germany, with a positive fixed effect just over 3%, is a borderline case; most of the German fixed effect is surely due to the special circumstances following reunification.[2]

Apart from this, neither the large countries nor Scandinavia have large differences in unemployment rates apart from those captured by the regional variables. Whether the Spanish and UK cases can be traced to particular causes is a matter for later research; we would want to investigate closely the effect of the cash economy in Spain and that of credit institutions in the UK. But neither value can be attributed to Spanish wage rigidity or British flexibility, since the inequality

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[2] There is also an interesting negative effect for youth unemployment in Germany, which could be picking up the effects of the apprentice system.

of pay structures is already taken directly into account at the regional level.

There are, however, large *negative* fixed effects for small countries (Austria, Ireland, Portugal, Greece and, to a lesser extent, the Netherlands). Figure 1 provides a map of the country fixed effects; Table A1 (in the Appendix) presents the coefficient estimates. This effect may possibly be explained in some cases by the existence of large emigrant populations. The Portuguese in France are absent from the labor force measured in Portugal and therefore do not figure in Portuguese unemployment.

Austria is a more difficult case to explain. But the Austrian result may be due to strategic wage-setting, with Austrian workers close substitutes for Germans in competing sectors, but cheaper. In an exploration reported in Appendix 6 we find that Austrian wages are indeed systematically lower than German on average in manufacturing, but the sector averages are actually higher than German in non-traded sectors. Similarly, Irish wages are lower than British; this could help account for the explosion of jobs that brought Irish unemployment down so sharply in the late 1990s. Austrian and Irish wages are set substantially by central bargaining, and it appears that in these countries wage competitiveness may be concentrated where it is useful.[3]

FIGURE 1

EUROPEAN UNEMPLOYMENT: ALL WORKERS COUNTRY FIXED EFFECTS

Fixed effect

−11 - −5
−4
−3-3
4-5

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[3] We thank Richard Freeman and David Howell for jointly making the suggestion that we compare Austrian to German wages.

In Figure 2 we present the time effects associated with the two-way panel. These estimates show a striking increase in the pan-European component of the unemployment rate from 1993 to the end of the decade, rising to a peak value of 4.6 points above the 1985 baseline in 1994, and settling above 2 full percentage points for most of the rest of the decade. This provides, in our view and based solely on the coincidence of timing, a very succinct measure of the employment penalty associated with the events of 1992, notably the Maastricht Treaty and its implementation. (The European Exchange Rate Mechanism also collapsed in 1992. But Gordon (1999) pins the responsibility for rising European unemployment at this time on the fiscal tightening required by the Maastricht Treaty.) On a brighter note, excess youth unemployment in Europe has been reduced sharply since 1997 if these measures are correct.[4] Overall, it seems possible that the fixing of exchange rates and the introduction of the euro in 1999 had a good effect, as the pan-European component of unemployment declined toward the end of the decade. Table A2 in the Appendix reports the time effects and their significance levels.

FIGURE 2

EUROPEAN UNEMPLOYMENT – EUROPEAN TIME EFFECTS

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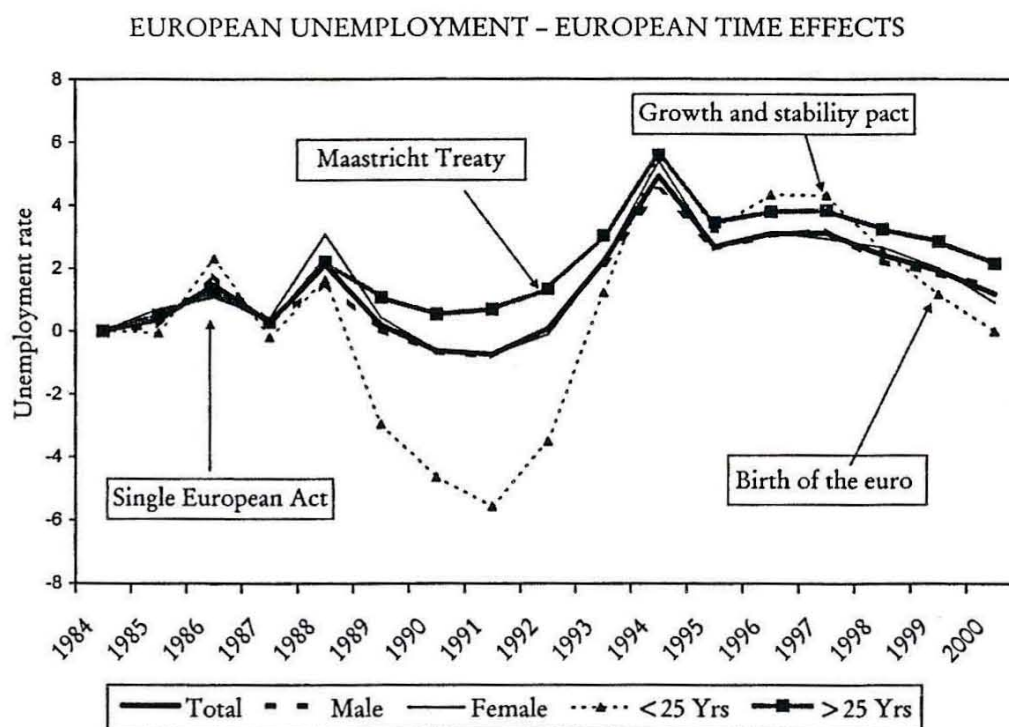
[4] Richard Freeman suggests a link to large increases in university enrollment, especially in Spain. We are looking for evidence on this conjecture.

4. Implications for unemployment policy in Europe

These results, so different from those implied by the standard view, should be treated with caution. Much work remains to be done to establish the general validity of the models advanced here, and to corroborate specific explanations here suggested. Nevertheless, we feel that the hierarchical and panel structure of our model represents a useful advance over work that is tied to the national level of analysis. Something like our approach may be the wave of the future as economists come to grips with regional, national and continental economic integration.

We draw a number of potential implications of this model for the design of unemployment policy in Europe. On the demand side, to state the least questionable inference, raising the growth rate of GDP reduces unemployment. That regional income *convergence* would do so is not readily determined from our information, since our variable measures *relative* wages. However, our model does suggest that income convergence would help the poorer regions, and that policies explicitly targeted to achieve regional income convergence would also reduce the *divergence* in unemployment rates, if not necessarily their average level. Policies that promoted income equalization for *individuals* – such as, for instance, measures that raised the payout of non-wage incomes such as pensions in the poorer regions – could in principle be expected to have this effect.

Targeted measures that provide *pre-labor* market opportunities for European youth would appear to help on the supply-side (and may already be doing so). Such opportunities would enable young people to time their entry into paid employment so as to escape being tarred as either relatively unproductive, or as having started working life with a long stretch of unemployment. It may perhaps be noted that the United States does this very effectively, with high levels of university enrollment, military enlistment – and unfortunately also incarceration – all targeted to keeping youth off the streets. As a result, youth unemployment in the United States is not (except for certain relatively small populations) nearly as serious a social problem as it is in Europe.

Perhaps our most interesting implication is that measures to *reduce* the inequality of European wages at the regional level – for ex-

ample, industrial development policies in poor regions – would help reduce chronic unemployment on average among Europeans. This is quite the opposite of the common view that Europe needs *more* pay inequality ('flexibility') rather than less. There is no support in our data for the idea that European unemployment is due to excessive solidarity in the European wage structure. It is possible, however, that some small countries have gamed the system at the expense of their larger neighbours; by exercising solidarity *and* discipline they have made themselves into attractive competitors for jobs in the traded-goods sectors.

Our analysis of country fixed effects lends little encouragement to the search for magic bullets in the form of national labor market institutional reforms. Perhaps the other large European countries should investigate the UK case very closely. Perhaps they should investigate Spain to learn what to avoid (except for the fact that, not being Spain, they have already avoided it). Perhaps there is something modest to be learned from Dutch active labor market policies; Holland (with low emigration) has somewhat lower-than-expected unemployment. (On the other hand, Holland also has high rates of disability and part-time work, social accommodations to a shortage of work that other countries may prefer to shun.) Apart from that, there is little evidence that institutional differences among France, Germany, Italy and the Nordic countries make big differences to their unemployment rates; most of the differences between these countries experiences seem fully accounted for by the regional variables.

Finally, our evidence points a reproving finger at the institutions and policy-makers of the European Union. It appears from our evidence that European policy strongly contributed to a continent-wide increase in unemployment in the 1990s. In a word, the Maastricht Treaty opened a half-decade that can be qualified as disastrous, and from which recovery is still incomplete. Overcoming the high unemployment visited on Europe as a whole by the misgovernment of macroeconomic policy at the continental level under recent leadership emerges from this analysis as a high priority. Though some progress appears to have been made in the late 1990s, a return even to the by-no-means-optimal conditions of the mid-1980s remains quite far from complete.

APPENDIX 1

Country and time fixed effects

NATIONAL DUMMIES – LINEAR MODEL (1984-2000)

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Total	Pvalue	Male	Pvalue	Female	Pvalue	< 25 Yrs	Pvalue	> 25 Yrs	Pvalue
BE	1.54	0.02	−0.35	0.53	5.16	0.00	−2.44	0.10	2.30	0.00
DE	3.32	0.00	4.12	0.00	2.97	0.00	−7.59	0.00	3.93	0.00
GR	−5.20	0.00	−5.12	0.00	−3.64	0.00	1.45	0.42	−6.82	0.00
ES	5.04	0.00	3.70	0.00	8.96	0.00	9.71	0.00	2.86	0.00
IE	−9.70	0.00	−6.48	0.00	−14.57	0.00	−24.12	0.00	−7.47	0.00
IT	0.53	0.17	−0.24	0.48	3.46	0.00	9.28	0.00	−1.69	0.00
NL	−3.69	0.00	−3.16	0.00	−4.03	0.00	−13.00	0.00	−2.79	0.00
AT	−6.03	0.00	−4.90	0.00	−7.05	0.00	−17.09	0.00	−5.12	0.00
PT	−10.79	0.00	−8.25	0.00	−13.86	0.00	−16.81	0.00	−10.43	0.00
FI	0.90	0.24	3.26	0.00	−1.97	0.06	3.30	0.06	0.42	0.51
SE	−1.06	0.11	1.88	0.00	−4.41	0.00	−3.70	0.02	−0.95	0.08
UK	−4.10	0.00	−0.28	0.60	−9.09	0.00	−12.64	0.00	−3.50	0.00

TIME DUMMIES – LINEAR MODEL (1984-2000)

	Model 1		Model 2		Model 3		Model 4		Model 5	
	Total	Pvalue	Male	Pvalue	Female	Pvalue	< 25 Yrs	Pvalue	> 25 Yrs	Pvalue
1984	−0.36	0.70	−0.17	0.83	−0.70	0.58	0.06	0.98	−0.50	0.51
86	1.11	0.18	1.60	0.03	0.36	0.75	2.35	0.22	0.75	0.28
87	−0.10	0.91	0.08	0.91	−0.30	0.79	−0.14	0.94	−0.22	0.74
88	1.76	0.03	1.38	0.06	2.38	0.04	1.70	0.37	1.72	0.01
89	−0.17	0.83	−0.14	0.84	−0.27	0.80	−2.90	0.12	0.56	0.40
90	−0.99	0.21	−0.83	0.23	−1.31	0.23	−4.59	0.01	0.04	0.96
91	−1.11	0.17	−0.98	0.17	−1.45	0.19	−5.51	0.00	0.19	0.78
92	−0.28	0.73	−0.09	0.90	−0.81	0.47	−3.44	0.07	0.84	0.22
93	1.86	0.04	1.96	0.01	1.53	0.21	1.28	0.54	2.53	0.00
94	4.57	0.00	4.31	0.00	4.70	0.00	5.72	0.01	5.09	0.00
95	2.32	0.00	2.46	0.00	1.95	0.07	3.33	0.06	2.95	0.00
96	2.74	0.00	2.88	0.00	2.45	0.02	4.39	0.01	3.30	0.00
97	2.76	0.00	3.04	0.00	2.23	0.04	4.37	0.02	3.34	0.00
98	2.06	0.01	2.03	0.00	1.97	0.07	2.63	0.14	2.74	0.00
99	1.55	0.05	1.65	0.02	1.31	0.23	1.22	0.51	2.36	0.00
2000	0.83	0.33	1.25	0.10	0.21	0.86	0.05	0.98	1.64	0.02

APPENDIX 2

Constructing the Theil statistic

The Theil statistic is composed of two elements: a between-group inequality component and a within-group inequality component:

$$T \equiv T_B + \overline{T}_w \tag{1}$$

where:

T = total Theil

T_B = between-groups Theil component

$\overline{T}_w$ = within-group Theil component.

The between-groups component can be represented by the following two equations:

$$T_B = \sum_{i=1}^{n} \left(\frac{w_i}{\sum_{i=1}^{n} w_i} \right) \ln \left[\frac{w_i / \sum_{i=1}^{n} w_i}{e_i / \sum_{i=1}^{n} e_i} \right] \tag{2}$$

$$T_B = \sum \frac{e_i}{\sum_{j=1}^{n} e_j} \frac{\overline{w}_i}{\overline{w}_Y} \ln \left(\frac{\overline{w}_i}{\overline{w}_Y} \right) \tag{2'}$$

The within group component equals:

$$\overline{T}_w = \sum_{i=1}^{n} \left(\frac{w_i}{w} \right) \cdot T_w \tag{3}$$

$$T_w = \left(\frac{w_{ij}}{w_i} \right) \cdot \ln \left[\frac{w_{ij} / w_i}{e_{ij} / e_i} \right] \tag{4}$$

If we index regions with the subscript i and sectors with the subscript j, then

w_{ij} = the total compensation received in region i and sector j

e_{ij} = total people employed in region i and sector j

$\overline{w}_i$ = average income of region i

$\overline{w}_Y$ = average income of all regions.

APPENDIX 3

List of regions and sectors in the REGIO data set

LIST OF REGIONS – NUTS LEVEL 1 FOR DE AND UK, NUTS LEVEL 2 FOR REMAINING COUNTRIES

1	be1	Région Bruxelles-hoofdstad gewest	53	es43	Extremadura
2	be21	Antwerpen	54	es51	Cataluña
3	be22	Limburg (B)	55	es52	Comunidad Valenciana
4	be23	Oost-Vlaanderen	56	es53	Illes Balears
5	be24	Vlaams Brabant	57	es61	Andalucia
6	be25	West-Vlaanderen	58	es62	Murcia
7	be31	Brabant Wallon	59	es63	Ceuta y Melilla (ES)
8	be32	Hainaut	60	es7	Canarias (ES)
9	be33	Liège	61	fr1	Île de France
10	be34	Luxembourg (B)	62	fr21	Champagne-Ardenne
11	be35	Namur	63	fr22	Picardie
12	de1	Baden-Württemberg	64	fr23	Haute-Normandie
13	de2	Bayern	65	fr24	Centre
14	de3	Berlin	66	fr25	Basse-Normandie
15	de4	Brandenburg	67	fr26	Bourgogne
16	de5	Bremen	68	fr3	Nord-Pas-de-Calais
17	de6	Hamburg	69	fr41	Lorraine
18	de7	Hessen	70	fr42	Alsace
19	de8	Mecklenburg-Vorpommern	71	fr43	Franche-Comté
20	de9	Niedersachsen	72	fr51	Pays de la Loire
21	dea	Nordrhein-Westfalen	73	fr52	Bretagne
22	deb	Rheinland-Pfalz	74	fr53	Poitou-Charentes
23	dec	Saarland	75	fr61	Aquitaine
24	ded	Sachsen	76	fr62	Midi-Pyrénées
25	dee	Sachsen-Anhalt	77	fr63	Limousin
26	def	Schleswig-Holstein	78	fr71	Rhône-Alpes
27	deg	Thüringen	79	fr72	Auvergne
28	def	Schleswig-Holstein	80	fr81	Languedoc-Roussillon
29	deg	Thüringen	81	fr82	Provence-Alpes-Côte d'Azur
30	gr11	Anatoliki Makedonia, Thraki	82	fr83	Corse
31	gr12	Kentriki Makedonia	83	ie01	Border, Midlands and Western
32	gr13	Dytiki Makedonia	84	ie02	Southern and Eastern
33	gr14	Thessalia	85	it11	Piemonte
34	gr21	Ipeiros	86	it12	Valle d'Aosta
35	gr22	Ionia Nisia	87	it13	Liguria
36	gr23	Dytiki Ellada	88	it2	Lombardia
37	gr24	Sterea Ellada	89	it31	Trentino-Alto Adige
38	gr25	Peloponnisos	90	it32	Veneto
39	gr3	Attiki	91	it33	Friuli-Venezia Giulia
40	gr41	Voreio Aigaio	92	it4	Emilia Romagna
41	gr42	Notio Aigaio	93	it51	Toscana
42	gr43	Kriti	94	it52	Umbria
43	es11	Galicia	95	it53	Marche
44	es12	Principado de Asturias	96	it6	Lazio
45	es13	Cantabria	97	it71	Abruzzo
46	es21	Pais Vasco	98	it72	Molise
47	es22	Comunidad Foral de Navarra	99	it8	Campania
48	es23	La Rioja	100	it91	Puglia
49	es24	Aragón	101	it92	Basilicata
50	es3	Comunidad de Madrid	102	it93	Calabria
51	es41	Castilla y León	103	ita	Sicilia
52	es42	Castilla-la Mancha	104	itb	Sardegna

105	lu	Luxembourg
106	nl11	Groningen
107	nl12	Friesland
108	nl13	Drenthe
109	nl21	Overijssel
110	nl22	Gelderland
111	nl23	Flevoland
112	nl31	Utrecht
113	nl32	Noord-Holland
114	nl33	Zuid-Holland
115	nl34	Zeeland
116	nl41	Noord-Brabant
117	nl42	Limburg (NL)
118	at11	Burgenland
119	at12	Niederösterreich
120	at13	Vienna
121	at21	Kärnten
122	at22	Steiermark
123	at31	Oberösterreich
124	at32	Salzburg
125	at33	Tirol
126	at34	Vorarlberg
127	pt11	Norte
128	pt12	Centro (PT)
129	pt13	Lisboa e Vale do Tejo
130	pt14	Alentejo
131	pt15	Algarve
132	pt2	Açores (PT)

133	pt3	Madeira (PT)
134	fi13	Itä-Suomi
135	fi14	Väli-Suomi
136	fi15	Pohjois-Suomi
137	fi16	Uusimaa (suuralue)
138	fi17	Etelä-Suomi
139	fi2	Åland
140	se01	Stockholm
141	se02	Östra Mellansverige
142	se04	Sydsverige
143	se06	Norra Mellansverige
144	se07	Mellersta Norrland
145	se08	Övre Norrland
146	se09	Småland med öarna
147	se0a	Västsverige
148	ukc	North East
149	ukd	North West (including Merseyside)
150	uke	Yorkshire and The Humber
151	ukf	East Midlands
152	ukg	West Midlands
153	ukh	Eastern
154	uki	London
155	ukj	South East
156	ukk	South West
157	ukl	Wales
158	ukm	Scotland
159	ukn	Northern Ireland

TABLE A4

SECTORIZATION USED TO CALCULATE REGIONAL INEQUALITY

Sectors by NACE-CLIO (1984-1994)	Sectors by NACE (1995-2000)
Fuel and power products	Agriculture, hunting and forestry
Ferrous and non-ferrous ores and metals, other than radioactive	Fishing
Non-metallic minerals and mineral products	Mining and quarrying
Chemical products	Manufacturing
Metal products, machinery, equipment and electrical goods	Electricity, gas and water supply
Transport equipment	Construction
Food, beverages, tobacco	Wholesale and retail trade; repair of motor vehicles*
Textiles and clothing, leather and footwear	Hotels and restaurants
Paper and printing products	Transport, storage and communication
Products of various industries	Financial intermediation
Building and construction	Real estate, renting and business activities
Recovery, repair, trade, lodging and catering services	Public administration and defence; compulsory social security
Transport and communication services	Education
Services of credit and insurance institutions	Health and social work
Other market services	Other community, social, personal service activities
Non-market services	Private households with employed persons

* Motorcycles and personal and household goods.

APPENDIX 4

Sensitivity analyses

The REGIO data set permits us to extract annual data set from 1984 to 2000 for the major countries of Europe. However, for a number of the small countries, including Greece, Austria, Ireland and Portugal, full data are available only for the second half of the 1990s. This raises two questions: whether those years are representative of the whole period for these countries, and whether the panel analysis as a whole would be different if they were excluded.

Examination of the unemployment rates for the four countries suggests that the relatively low unemployment rates seen in Austria, Greece and Portugal in the late 1990s are not wildly unrepresentative of their experience over the whole period, even though the absolute levels of unemployment do vary through time. The Irish case is very different, as Ireland passed from a high- to a low-unemployment country in the mid-1990s. It would thus be inappropriate to regard the low country fixed effect found for Ireland as representative of institutions producing low unemployment throughout the period. It represents, rather, the exceptional experience of the late 1990s, when Ireland experienced a powerful economic boom.

To test the second question, we ran the full panel regression, with two-way fixed effects, on a panel excluding Greece, Austria, Ireland and Portugal. The results for the whole population are given in Table A5. Results for the male, female, young and older subpopulations tell a similar story and are available from the authors.

SENSITIVITY ANALYSIS – MODEL 1
(TOTAL UNEMPLOYMENT) – EXCLUDING AU, IE, GR, PT

	Model 1	
	Total	Pvalue
Theil	31.75	0.00
PopUn24	71.48	0.00
RelWage	–6.15	0.00
G-GDP	–6.92	0.00
BE	1.29	0.05
DE	4.54	0.00
ES	4.21	0.00
IT	0.32	0.43
NL	–3.47	0.00
FI	1.38	0.07
SE	–0.52	0.43
UK	–4.69	0.00
84	–0.36	0.70
86	1.11	0.18
87	–0.10	0.91
88	1.76	0.03
89	–0.17	0.83
90	–0.99	0.21
91	–1.11	0.17
92	–0.28	0.73
93	1.86	0.04
94	4.57	0.00
95	2.32	0.00
96	2.74	0.00
97	2.76	0.00
98	2.06	0.01
99	1.55	0.05
00	0.83	0.33
$\bar{R}^2$	0.63	
No. observations	1240	

The model is substantially unaffected by the exclusion of the four small countries. All coefficients have the same sign and all remain significant. One difference is that the relationship between inequality and unemployment is stronger, and the significance of the coefficient estimate on the inequality variable rises eight-fold, when the four small countries are not included. We take this as confirmation that the inequality-unemployment relation is not an artifact of the inclusion of the small countries in the late 1990s.

APPENDIX 5

Wage and employment effects on inequality

The between-groups component of Theil's T statistic is a compound measure influenced by both the relative wage rates between groups and the relative size of each group. A region with high inequality may have a large differential between the best and worst paid, or a marked bimodalism in the structure of employment, or some combination of both factors. It is worth noting that the line of causality traditionally argued to hold in economics, which runs from unemployment rates to the pay structure, does not imply anything in particular about the structure of employment. If there exists a large excess of unskilled workers, that should reduce the relative pay of unskilled workers, increasing inequality, but it would not necessarily change the technology employed in particular processes of production.

To provide an illustration of the roles of these two factors we examine the structure of pay and employment in four European regions, two with high and two with low unemployment in the year 2000. The following regions are included in the analysis: Andalucia and Extremadura with high unemployment rates, and Navarra and Stockholm with low unemployment rates:

- Extremadura (24.4%)
- Andalucia (25%)
- Navarra (4.8%)
- Stockholm (3.7%).

TABLE A6

SUMMARY STATISTICS FOR AVERAGE WAGES
ACROSS 16 SECTORS FROM 1995-2000

	Mean	Min.	Max.	No. observations
Extremadura	21.49	5.4	65.5	72
Andalucia	22.65	5.1	79.7	82
Navarra	25.93	7.5	52.1	72
Stockholm	35.59	16.7	64	88

Ranges for low-unemployment regions are much lower than for high-unemployment regions. We also find that low unemployment regions have substantially larger shares of their employment near the mean, and less associated with the extremes of the distribution.

APPENDIX 6

Evaluating the strategic-wage conjecture

The conjecture that certain small countries with strong collective wage bargaining might generate domestic full employment at the expense of a larger neighbour can be evaluated directly for the case of Austria and Germany. The evidence is suggestive. As Table A7 shows, average wages in Austria are systematically higher than in Germany except in two sectors: manufacturing and real estate. Manufacturing is, of course, by far the largest of these sectors. Is this the secret of Austrian unemployment rates consistently half those of Germany?

TABLE A7

RATIO OF AUSTRIAN TO GERMAN AVERAGE WAGES, BY MAJOR SECTORS

	1995	1996	1997	1998	1999	2000
Mining and quarrying	1.04	1.01	1.01	1.06	1.09	0.98
Manufacturing	0.88	0.88	0.88	0.89	0.92	0.86
Electricity, gas and water supply	1.22	1.19	1.21	1.26	1.22	1.14
Construction	1.04	1.03	1.06	1.11	1.27	1.20
Transport, storage and communication	1.03	1.00	1.03	1.07	1.18	1.14
Financial intermediation	1.06	1.07	1.08	1.09	1.23	1.18
Real estate, renting and business activities	0.99	0.96	0.94	0.90	1.09	0.95
Public administration and defence; compulsory social security	1.16	1.15	1.13	1.10	1.12	1.12

Table A8 gives a similar analysis of relative wages in Ireland and the UK in the late 1990s; if the data are accurate a similar story may apply. Indeed it is striking how much higher average pay in such sectors as finance, health and education appears to be in Ireland than in England. But manufacturing pay is lower, and this could well have given Ireland the edge in the location of new industry during the technology boom.

RATIO OF IRISH TO BRITISH AVERAGE WAGES, BY MAJOR SECTORS

	1995	1996	1997	1998
Mining and quarrying	0.71	1.05	0.86	0.87
Manufacturing	0.81	0.84	0.75	0.71
Electricity, gas and water supply	0.74	0.65	0.70	0.63
Construction	1.32	1.27	1.17	1.11
Wholesale and retail trade*	1.35	1.39	1.32	1.29
Hotels and restaurants	1.15	1.05	0.97	0.90
Transport, storage and communication	0.79	0.87	0.76	0.70
Financial intermediation	1.51	1.49	1.20	1.11
Real estate, renting and business activities	1.19	1.13	1.07	1.02
Public administration and defence**	1.08	1.17	1.11	1.18
Education	1.27	1.30	1.17	1.10
Health and social work	1.52	1.48	1.39	1.22
Other community, social, personal service activities	0.97	0.90	0.66	0.57

* Including repair of motor vehicles, motorcycles and personal and household goods.
** Including compulsory social security.

APPENDIX 7

Coverage by country and year

DATA COVERAGE BY COUNTRY AND YEAR
(number of regions in parentheses)

Year	No. observations												
1984	35	be (8)	it (20)	uk (7)									
1985	35	be (8)	it(20)	uk (7)									
1986	56	be (8)	es (17)	it (20)	pt (4)	uk (7)							
1987	69	be (8)	es (17)	fr (20)	it (20)	pt (4)							
1988	63	be (8)	es (18)	it (20)	nl (12)	pt (5)							
1989	84	be (8)	es (18)	fr (21)	it (20)	nl (12)							
1990	86	be (8)	es (18)	fr (21)	it (20)	nl (12)							
1991	78	es (18)	fr (21)	it (20)	nl (12)	pt (7)							
1992	78	es (18)	fr (21)	it (20)	nl (12)	pt (7)							
1993	57	es (18)	it (20)	nl (12)	pt (7)								
1994	45	es (18)	it (20)	pt (7)									
1995	133	de (16)	gr (13)	es (18)	fr (21)	it (20)	nl(12)	at (9)	pt (7)	fi (4)	se (6)	uk (7)	
1996	139	de (16)	gr (13)	es (18)	fr (21)	it (20)	nl(12)	at (9)	pt(7)	fi (6)	se (6)	uk (11)	
1997	136	de (16)	gr (12)	es (18)	fr (21)	it (20)	nl(12)	at (9)	pt (7)	fi (4)	se (6)	uk (11)	
1998	144	de (16)	gr (12)	es (18)	fr (21)	ie (2)	it(20)	nl (12)	at (9)	pt (7)	fi (6)	se (8)	uk (12)
1999	131	de (16)	gr (12)	es (18)	fr (21)	ie (2)	it(20)	nl (12)	at (9)	pt (7)	fi (5)	se (8)	
2000	96	de (16)	gr (13)	fr (21)	ie (2)	it (20)	at(9)	fi (6)	se (8)				
	1465												

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