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Wage Inequality in Europe: the Role of Labour Market and
Redistributive Institutions

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Abstract - This paper aims at a deeper understanding of the determinants of wage inequality, the most important component of income inequality, in the European countries. We investigate on how wage inequality is affected by government regulation in the labour market and by the redistribution operated by the social protection system, also controlling for the impact of the effect of skill-premium related to technical change. To explain the continuously rising wage inequality in Europe, two regression models of wage inequality are employed each one using a different databases. In the last period, the overall degree of governance of the labour markets does not substantially change, but a different balance between decreasing labour market regulation and increasing redistribution manifest across Europe. While job and wage protection has been eased, income redistribution was strengthened, though its size differs across four clusters of European countries, depending on the majority voting preference for “risk insurance”. Overall, institutional substitution between labour market regulation and income redistribution seems to back the upward trend in wage inequality.

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1. Introduction

The debate over income inequality in the era of globalization has been revived by evidence showing that economic growth does not necessarily convey a reduction in income disparities. As for the *between-country* income inequality, in the last decade the rocketing growth rates of the emerging countries seem to have given rise to a slight decrease of the Gini indicator of income inequality with respect to its long-run stable value (Bourguignon and Morisson, 2002). Yet, the population-weighted measurement of world income inequality, which also takes into account the size of countries (e.g., the growth-induced changes in interpersonal income disparities after the polarization between urban and rural incomes in India and China), suggests that the worldwide interpersonal income inequality is widening (Milanovic, 2002). As for the *within-country* income disparities in advanced countries, although a trend general and stable over a long time for the majority of economies is difficult to detect, a clear increase of disparities has occurred in the Anglo-Saxon countries (Atkinson and Brandolini, 2005).

This paper aims at a deeper understanding of the determinants of wage inequality, the most important component of income inequality, in the European countries. Wage inequality in European countries stems from the interaction between labour demand-and-supply and institutional factors. Broadly speaking, after the increase in income inequality determined by market forces within many European economies in the 1980s, income redistribution was intensified and labour market deregulation expanded. The research effort will be concentrated in disentangling the impact on wage inequality of government regulation in the labour market and redistribution operated by the social protection system, also controlling for the impact of the effect of skill-premium related to technical change.

We investigate on how labour market and welfare institutions affect the earnings distribution and argue that on the average the overall degree of governance of the European labour markets was not modified, but a changing balance between decreasing labour market regulation and increasing redistribution seems to characterise the 1990s. While job and wage protection has been recently eased across Europe, income redistribution was strengthened, though its size differs across four clusters of European countries – depending on the majority voting preference for “risk insurance”, as shown by econometric estimates. To explain the continuously rising wage inequality in Europe, two regression models of wage inequality are employed each one using a different databases. The Luxembourg Income Study (LIS) database, which collects and homogenises national statistics, allows to differentiate income distribution between factor income (FI) and disposable income (DPI) and so makes an assessment of the overall income redistribution possible. The European Community Household Panel (ECHP) database, which is based on a specific socio-economic survey, allows the break-down of wage distribution across sectors and workers’ occupations, so that the assessment of the impact of labour-demand-and-supply for each skill level, as determined by the

technological choices of the firms, can be singled out, and so permits to understand the forces behind the increase in earning disparities.¹

2. Employment rates and wage inequality in Europe

During the period of high macroeconomic instability, which started in the 1970s and lasted till the 1990s, the European economies suffered from high (albeit slowly declining) inflation, as well as inadequate employment and sluggish growth rates. The theoretical framework to interpret these decades has centred on the interaction between shocks and labour market institutions.

One interpretation (Blanchard and Wolfers, 2001) argues that the more wage and job adjustments are regulated by labour market institutions, the more a rise in the unemployment rate translates into unemployment hysteresis. After total factor productivity (TFP) fell below the real wage in the 1970s, rigid labour markets produced longer lasting unemployment, and skill obsolescence held back workers in finding a new job. Moreover, much higher real interest rates since the 1980s magnified the negative effect of TFP on labour demand, thus determining an upward shift in the equilibrium unemployment rate. An additional explanation for unemployment persistence points to macroeconomic turbulence (Ljungqvist and Sargent, 1998). The higher the frequency of negative shocks, the higher the probability that labour market rigidities would hamper the market adjustment via wages and prices, the larger the ensuing gap between the reservation wage (linked to the unemployment benefits, in turn based on the wage level when employed) and the new lower mean wage, the longer the unemployment spells.

A second interpretation (Nickell et al., 2001) claims that high unemployment rates in Europe are mainly the consequence of an inefficient interaction between labour market institutions and fluctuations in aggregate demand. Empirical evidence about the influence of regulation on the functioning of the labour market is mixed. High union density and long-lasting unemployment benefits exert a negative effect on the employment rates, while coordinated wage bargaining and active labour policies appear to favour a better matching between labour demand and supply. As the relevant shifts of the Beveridge curves of European countries in the last decades reveal, a high unemployment rate results from the changing capacity of the labour market in making the unemployed match the vacancies, rather than from the distortion caused by institutions to macroeconomic adjustment after shocks.

A third interpretation (Fitoussi et al., 1999) points to the long period of real interest rates higher than growth rates as the origin of higher structural unemployment. Till the first half of 1980s, macroeconomic policies alleviated the consequences on employment of oil price shocks and fast wage dynamics. Since the second half of the 1980s, the monetary and fiscal policy-mix was geared to restriction. The Maastricht criteria and the subsequent introduction of the Stability Pact have imposed on European governments an

¹ A plurality of other economic and institutional factors affect wage inequality across and within countries, first of all international trade. Trade openness depresses the wage and employment levels of low-skilled workers in the advanced countries, due to the rise in the imports of the low-skilled intensive products and the decrease in the relative labour demand for low-skilled workers. Yet, in the European Union in the 1980s and 1990s the shrinking of the traditional sectors was just beginning, and competition from the LDC did not exert yet a differential impact across the economies of the European Union in terms of declining wages of low-skill workers.

accelerated reduction of public deficits and debts, despite the priority attributed to monetary stability was procrastinating slow growth. Poor macroeconomic governance of the integration process, and consequently the virtual dismissal of stabilization policies by national governments, is regarded as the main cause of the slow employment and growth rates of European economies.

None of these interpretations establishes a specific link between the depressed labour demand experienced by many European countries after macroeconomic shocks, and the evolution of their indicators of wage inequality. Therefore, the analysis of possible connections between employment and wage disparities in Europe has been sunk in the broad interpretation of globalization as a major cause of increasing inequality either in wages or in unemployment, depending on labour market institutions (Krugman, 1994). While in the literature a comprehensive investigation over the determinants of rising wage inequality in Europe has still to come, some empirical studies have started to cast light on the question. Yet, the opinion is sharply divided.

The OECD, mainly focusing on data referred to the workforce looking for low-pay jobs, finds a positive correlation between employment rates and wage inequality: countries where earnings inequality has risen less than average appear to have experienced a relative increase in unemployment and a relative decrease in employment.² This view corroborates the Krugman hypothesis, which points to a negative causal relationship between wage compression and low-skill employment in Europe, on the assumption that regulation has been preventing the wage reduction required by the sectors more exposed to harsher international competition, thus provoking the shift in structural unemployment. A much lower Gini wage inequality with a much lower employment rate in Europe, as compared to the US, stems from labour market institutions, protecting jobs and wages of the “insiders” at the cost of a reduction in employment and participation rates of the low-skill and low-wage labour force.

Other studies, mainly focusing on data for jobs in traditional sectors³ and wage dispersion for the household indicator⁴, have put forward the opposite view of a negative correlation between employment rates and earnings inequality. It is worth noticing that these findings are hardly compatible with the Krugman hypothesis, where a rise in earnings inequality is traced back to market pressures fostering a fall in the employment rate, mainly due to a declining relative demand for low-skill workers.

The scattered diagram in Figure 1 collects the data on employment rates, supplied by Eurostat, and the Gini indices, calculated on wages for 13 European countries, under the five waves running from 1979 to

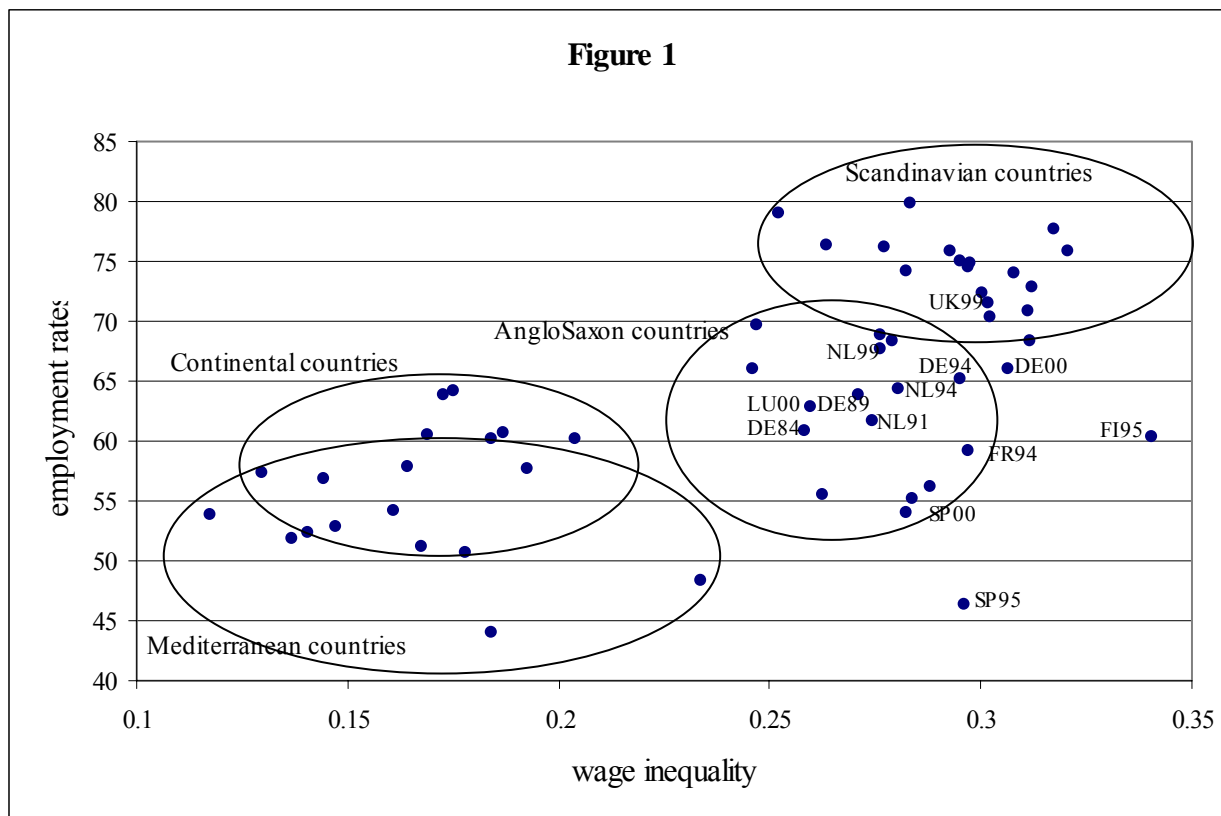
² “Employment and unemployment developments – in particular, the relative employment of youths and older persons of working age – tended to be less favourable in countries in which earnings inequality increased more slowly since 1970 (or fell), than in countries where the earnings inequality rose more rapidly” (OECD, 2004, p.129). “(C)ountries in which a more equal distribution of earnings appears to have worsened consistent with relative labour demand having shifted towards high-skilled workers” (Ibidem, p.140).

³ “In sum, our examination of the wage compression hypothesis (like that of the other empirical researchers) finds little support for the belief that lack of jobs in the EU is due to the effect of the compression of wages on employment in low skill industries” (Freeman and Schettkat, 2001, pp.25).

⁴ “Unlike for earnings inequality among full-time employed individuals, for pretax–pretransfer income among households we observe sizeable increases over time in most countries. This development appears to have been driven to an important extent by changes in employment. In countries with better employment performance, low-earning households benefited relative to high-earning ones; in nations with poor employment performance, low-earning households fared worse.” (Kenworthy and Pontusson, 2005, pp.21-2).

2000, now available from the LIS database. Four clusters of countries are identified (Scandinavian, Continental, Mediterranean and Anglo-Saxon countries), corresponding to the usual aggregation based on the features of their social protection models.

Figure 1. Employment rates and wage inequality in European countries (1979-2000)



This evidence indicates that the portrayal of Europe as a whole as the land of wage compression – as opposed to high wage flexibility in the US – is misleading. The four Scandinavian countries (Denmark, Finland, Norway and Sweden) present both wage inequality and employment rates much higher than the EU average; the Anglo-Saxon countries (United Kingdom and Ireland) share about the same wage inequality but show lower employment rates, the Mediterranean countries (France, Italy and Spain) display both wage inequality and employment rates lower than EU average and gather in the circle just opposite to Scandinavian countries. Due to higher employment rates, the Continental countries (Belgium, Germany, Luxembourg and the Netherlands) are placed over the Mediterranean countries. Despite their large overlapping as for low wage inequality, the identities of the former and the latter cluster, will be vindicated in Figures 2 and 3 where the much higher redistribution in the Continental countries is shown. The picture in Figure 1 evolves from the mid-1980s to the year 2000. Named spots identify those countries moving outside their original clusters in particular years. For many countries belonging to the Continental and Mediterranean clusters, the Gini coefficient computed on wages moved rightwards while employment rates did not change much.

Overall, the evidence of Figure 1 shows that the poor performance of employment rates in Europe – going downward in the 1980s but upward in the 1990s - is associated to an increase in wage inequality. While the Scandinavian countries keep their corner for the whole period, many Continental and some Mediterranean countries, after their earlier waves, moved rightwards and, to a somewhat lesser extent, upwards. In more recent times, the Anglo-Saxon countries have been joined by non-belonging members and the association between employment rates and wage inequality is less clearly identified by their original clusters, than it used to be. Therefore, our diagram is at odds with what one would expect according to the Krugman hypothesis. The divide within Europe - four clusters each characterized by a different combination of high or low values for employment and wage inequality - seems to be withering during the 1990s.

Were the Krugman hypothesis proven true, one would have found that a disproportionate rise in low-skill and low-pay unemployment ended up in a compression of the wage distribution, due to the lack of jobs for the new entrants and the dismissal of low-wage workers from the bottom half of the wage distribution. Quite on the contrary, during the whole period from 1979 to 2000 Gini wage coefficients have steadily increased in European countries, with no comparable changes in unemployment rates for all sections of the labour force. During the 1980s, the labour market regulation might not have allowed a prompt adjustment via the price of labour. Yet, the alternative adjustment via a lower quantity of the low-skill and low-wage employed, far from causing a compression in wage distribution, has been unable to discontinue the rise in wage inequality. During the 1990s, the high wage inequality at high employment rates in the Scandinavian and the Anglo-Saxon countries, and, more importantly, the trend towards a higher wage inequality at slightly increasing employment rates in the other two clusters, indicate that is a clue to revealing that more complex dynamics have been at work.

3. A view on labour market regulation and redistributive institutions in Europe

The econometric estimates that will be performed in the sections 4, 5 and 6, aim at maintaining the hypothesis that the main causality link goes from a depressed labour demand to wage and employment performances, depending on the evolution of strictly interwoven labour market and redistributive institutions. Here is the conceptual framework for the empirical investigation.

In Europe, regulation and redistribution have heavily impinged on labour demand-and-supply, and conversely in each country institutions are moulded by the specific labour market conditions (Katz and Autor, 1999). After the upward shift of the equilibrium unemployment rate at the end of the 1970s, in many European countries employment protection and minimum wage became more effective. High levels of union density and collective bargaining coverage strengthened the unions bargaining power in negotiations and the rigidity of the minimum wage paid to the low-skill workers in excess of their productivity levels. Employment protection legislation (EPL) restrained the capacity of firms to fire workers at low legal costs and raised the reservation wage of the unemployed (Bertola, Blau, and Kahn, 2002). The sluggish creation of new jobs prevented the low-skill young workers from entering the labour market. While the unemployment rate experienced a shift upwards in many European countries, labour market regulation avoided a downward effect of depressed labour demand on the employment rates of prime-age males, and the negative impact on

the households' income and consumption levels of the worsening in earnings inequality was smoothed by the income redistribution provided by the tax-and-transfers system.

However, job protection has been eased in many European countries in the 1990s. The distortions inflicted to wage determination in the market by EPL (Bertola and Boeri, 2002), by a rigid minimum wage (Card and DiNardo, 2002), by the centralised wage-setting system (Blau and Kahn, 1996), and by union density and labour contracts coverage (Brugiavini et al., 2001) have been reduced. In the Scandinavian countries, and mainly in the Netherlands among the Continental countries, wage moderation has been traded for the strengthening of unemployment protection, that is a longer duration of unemployment transfers and a higher level of the replacement rates though under tighter eligibility criteria. While reforms of wage-setting mechanisms, such as lower coordination across wage negotiation and bargaining at the firm level, allowed local market conditions to be taken into account, the diffusion of temporary and part-time contracts helped the increase in employment rates, mostly concentrated in temporary jobs as well as higher women participation and older workers staying in the labour market. Moreover, a more encompassing composition of active labour market policies (ALMP), with more funds devoted to in-work benefits, job matching and re-employment services, have partially substituted for EPL and the fall of net union density has been accompanied by the government replacing the unions as the provider of risk insurance (OECD, 2004).⁵

Let us then explore more closely how redistributive institutions behaved in Europe during the easing in regulation put forward by labour market institutions.

4. Heterogeneity across redistributive systems

In this section, we perform time-series cross-country econometric estimates on the amount of redistribution of the welfare institutions of European countries in mid-1980s and mid-1990s.

Under the assumption that income redistribution is the outcome of the political pressure by the median voter's relative factor income position, the redistribution indicator is constructed as the difference between the Gini inequality index for factor income and the Gini inequality index for disposable income⁶. The regression model below links the dimension of redistribution to the society's preference for "risk insurance" expressed by the majority voting political mechanism where the "median voter" is decisive. The econometric tests conducted show that different countries may have different attitudes towards risk insurance, with idiosyncratic propensities towards redistribution.

Provided that the median voter hypothesis in principle could be ascertained irrespective of time and space (Model 1), at first all available information, which amounts to 44 observations, have been gathered

⁵ The exception is the so called "Ghent system" operating in some Continental countries, mainly in Netherlands, whereby the unions keep being involved in the administration of unemployment benefits (Checchi and Lucifora, 2002).

⁶ We endorse the view that the median voter "should (...) be taken more as a metaphor representing the aggregation of voter's preferences than as a direct explanation of political decisions" (Atkinson, 1999, p.117). The median voter is to be conceived as a metaphorical agent expressing the sense of precariousness that the majority of the electorate derives from their market earnings, and the consequent demand for "risk insurance" by redistribution through tax-and-transfers. In fact, the majority voting in favour of redistribution should be regarded as the joint effect of a series of factors - pressure groups, political regimes, government fragmentation, etc. - rather than the decisive preference of the isolated individual occupying the median position in the electorate.

into a single pooling regression model. An OLS regression (Equation 1) connects the extent of a country's income redistribution to the distance of the median voter income from mean income in that country, one period lagged.

$$(1) (GiniFI_i - GiniDPI_i)_t = \alpha + \beta \left(\frac{YmdFI_i}{YmnFI_i} \right)_{t-1} + u_{i,t}$$

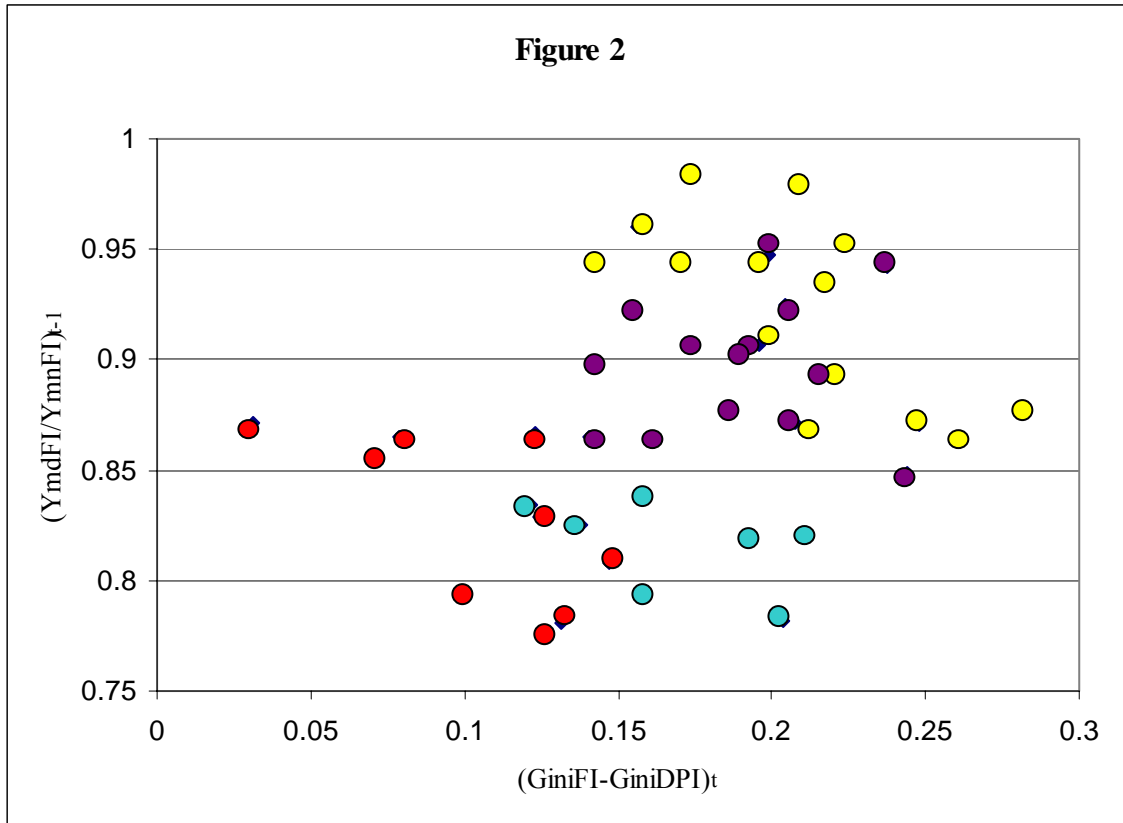
The dependent variable – the reduction in income inequality assessed by the difference between a country's Gini indices on factor income (*GiniFI*) and disposable income (*GiniDPI*) - accounts for the extent of redistribution. The independent variable describing the political pressure - i.e. how much poorer-than-average the median voter is - is the median-to-mean factor income ratio (*YmdFI/YmnFI*), ranging between zero and one and signalling less inequality as its value goes up.⁷

The regression is meant to test the reliability of the postulated theoretical relationship between the income level of the median voter (relative to the mean income) and the extent of redistribution. The significant increase appearing in the average FI Gini coefficient mid-1990s *vis-à-vis* that for the mid-1980s, by reinforcing the findings which emerged by looking at the *Ymd/Ymn* ratios, extends to the whole income distribution the assessment of an increase in income inequality effected by the operation of market forces from the mid-1980s to the mid-1990s. To prove that the preference of a median voter hit by a decrease in their factor income level determines a wider redistribution through tax-and-transfers, one would expect a negative relationship linking the dependent to the independent variable: a decrease in the median-to-mean factor income ratio is associated to an increase in redistribution. The more distant is the income level of the median voter from the mean income, the wider the expected difference between *ex ante* (FI) and *ex post* (DPI) Gini coefficients, as redistribution should provoke a fall in the DPI Gini coefficient.

Figure 2 shows the scattered diagram where the abatement of the Gini coefficient, from factor income (FI) to disposable income (DPI), is on the horizontal axis and the median-to-mean factor income ratio is on the vertical axis. Although no neat relationship emerges from the whole set of observations, and a first glance observation may suggest a very mild positive relationship between the two variables, one can also appreciate four rather blurred groupings, with a somewhat similar and negatively sloping shape, which are placed in parallel to each other along the main diagonal. This finding could be traced back to the influence of different cultural values and psychological attitudes of society at large in different clusters of countries. Since preferences for public goods and social insurance may sharply diverge from preferences on private goods, the range of social protection institutions and the degree of redistribution involved may be large. Market economies at the same technological level and with the same consumption model differ as for the degree of desired risk insurance. To capture this cross-country heterogeneity in the society's choice for redistribution, three dummy variables were included in the model.

Figure 2. Scatter diagram of the Median Voter equation

⁷ The indicator for the median voter's preference for redistribution - the median-to-mean income ratio - is an indicator of income inequality just as the Gini coefficient. A lagged variation in the *Ymd/Ymn* ratio is regressed onto the difference between the Gini FI and DPI indicators of income inequality, so preventing spurious correlations



The new specification of the regression model is therefore modified as shown in equation (2):

$$(2) \quad (GiniFI_i - GiniDPI_i)_t = \alpha + \beta \left(\frac{Y_{mdFI}_i}{Y_{mnFI}_i} \right)_{t-1} + d1 + d2 + d3 + u_{i,t}$$

where $d1$, $d2$ and $d3$ indicate the dummies added to allow for structural differences in preferences for clusters of countries characterised by different models of Welfare State. The first dummy ($d1$) is meant to single out the peculiarities of the social-democrat model in Scandinavian countries (Denmark, Finland, Norway and Sweden) and is expected to show a positive sign, so to reflect that this is the welfare state which is reputed the most generous in Europe. The other dummies cover respectively ($d2$) catholic Mediterranean countries (France, Italy and Spain) and ($d3$) liberal Anglo-Saxon countries (Ireland and the UK). As they are all characterised by a narrower Welfare State⁸, both dummies $d2$ and $d3$ are expected to show a negative sign. The limited extent of redistribution in Mediterranean and Anglo-Saxon countries might be traced back, along with other factors, to the segmentation by which in both clusters of countries the labour market is characterised. In other words, the political pressure exerted by the median voter may be weaker due to his

⁸ The general reference for different Welfare State models existing in different socio-economic environments and reflecting different institutional characters as well as different preferences about the mix of private and public goods is Esping-Andersen (1999). Many studies considering different clusters of Welfare State systems in Europe, place France in the Continental group of countries. Empirical evidence casts doubts on this affiliation, by showing a surprising homogeneity among the labour market institutions of France, Italy, Spain, Portugal, Greece. These countries, usually gathered under the “Mediterranean” heading, are characterised by a high employment protection legislation and a low percentage of individuals under social benefits (See Boeri, Boersch-Supan, and Tabellini, 2001). This striking inverse correlation between the two main forms of labour market regulation, compared to the more mixed evidence of other European countries, suggests that the inclusion of France in the Mediterranean group is the most sensible choice. Moreover, the Eurostat Social Protection Database presents very close low values of social benefits and employment rates for Italy, Spain, Greece and France.

relatively higher probability of remaining an insider *vis-à-vis* the other two clusters of countries. The remaining countries (Belgium, Germany, Luxembourg and the Netherlands), taken as reference countries, belong to the group of the so-called corporatist Continental Europe countries, characterised by a welfare state with a medium redistributive impact.

Table 1. Heterogeneity across clusters of countries

	model 1	model 2
α	-0.074	0.599
t	(-0.613)	(4.516)
β	0.283	-0.456
t	(2.057)	(-3.097)
d1 (Nw Sw Fi Dk)	-	0.0299
t	-	(2.324)
d2 (Fr It Es)	-	-0.118
t	-	(-6.802)
d3 (Ie Uk)	-	-0.057
t	-	(-2.980)
Adj.R2	0.07	0.606
n. obs.	44	44
Jarque-Bera/Salmon-Kiefer	1.222	0.742
Breusch-Pagan	0.761	1.537

Table 1 presents the results of the two regression models. While the first model connecting income inequality to redistribution finds a positive relation, but gives unsatisfactory results as to the quality of the estimates, the second model identifies a rather strong negative relation, supported by considerably higher significance levels and explanatory power. The regression results therefore show that the median voter hypothesis is consistent with the empirical evidence: after having controlled for different institutional features characterising the four clusters of countries, all the parameters show the expected sign and are highly significant. The relevant Chi-square critical values state that for both tests - the Jarque-Bera/Salmon-Kiefer test for errors being normally distributed and the Breusch-Pagan test for homoskedasticity – the null hypotheses can be accepted at a very satisfactory significance level.

One may observe that regressions linking such variables like income inequality and redistribution are exposed to the problem of reverse causation. The direction of causality may be ambiguous: is it a lower median-to-mean ratio to determine an increase in redistribution (the causality link implied by our estimates), or is it the variation in redistribution to determine the change in the median voter's income position? The negative sign obtained by the correlation between redistribution and the lagged independent variable mitigates the relevance of this issue. In fact, were the direction of causality from redistribution to the median voter's relative income position one would expect a *positive* relationship – i.e. more redistribution implying a higher median-to-mean factor income ratio – which is not supported by the regression results (See Table 1, Model 1). Moreover, in our model specification, the inequality index referred to the political mechanism is measured by the FI data, while redistribution regards the recovery in the DPI inequality with respect to FI. Hence, the possibility of a positive relationship according to a reverse causation is ruled out on theoretical grounds. In fact, it would amount to imagine that the independent variable – indicating income inequality

after the tax-and-transfers reshuffling – positively feeds-back on a dependent variable represented by the income inequality *before* the tax-and-transfers reshuffling, which is clearly preposterous.

Therefore, the view is confirmed that the larger the income inequality conditions experienced by the metaphorical agent expressed by the median-to-mean ratio, the larger the need for risk insurance, the larger the extent of redistribution obtained by majority voting, once the link is tested at the cluster level. The regression results for the four clusters of countries support the hypothesis - conveyed by the own specific intercept of each cluster - that the negative relationship between the median voter's relative income position and redistribution is sensitive to the particular inequality aversion, which is peculiar for each group. In all clusters, a change of the median-to-mean FI ratio brings about a redistributive reaction, estimated by the common β coefficient (-0.456) indicating an inverse relationship, which is located at a different height in the plan for each group of countries.

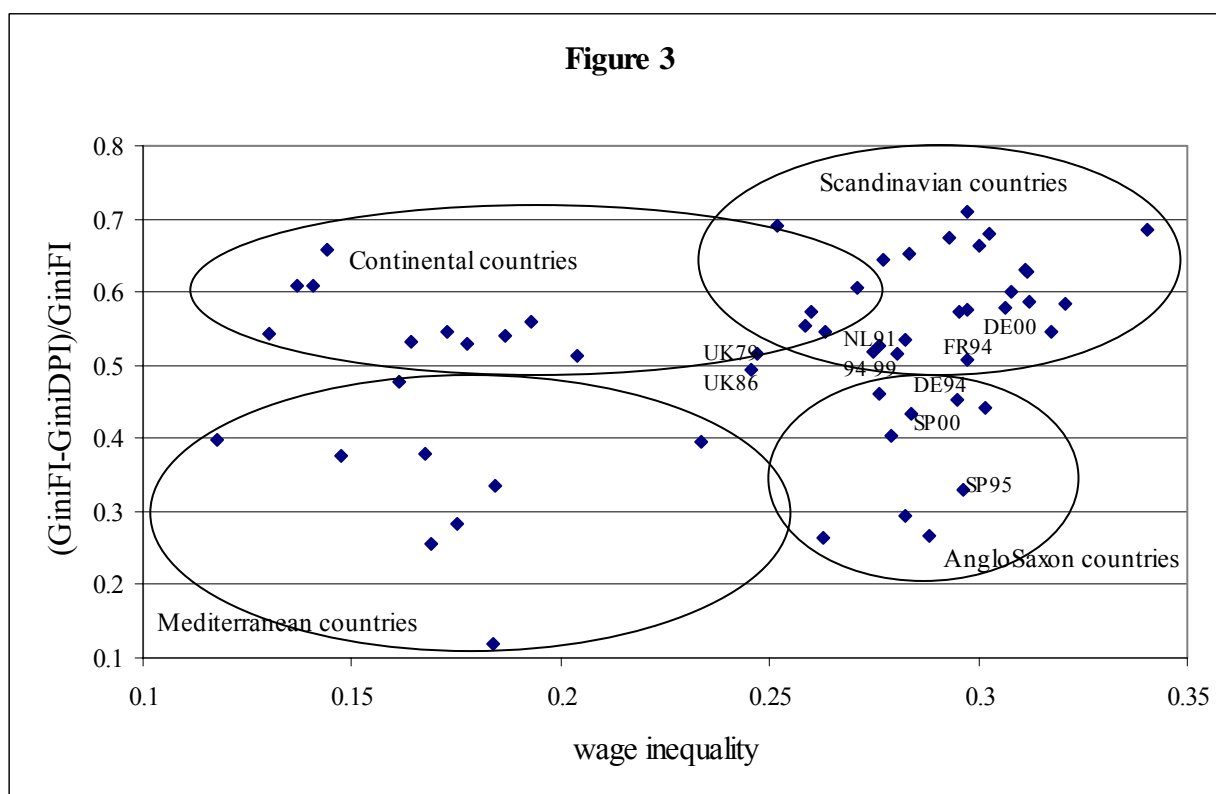
5. Redistribution and wage inequality

In Figure 3 the Gini wage values are plotted against the difference between the factor income (FI) and the disposable income (DPI) Gini coefficients, weighted by the FI the indicator for redistribution, used in our time-series cross-country econometric investigation. The four clusters identified by the correlation of wage inequality with employment show up again for the correlation between wage inequality and redistribution.

The upward moving spots inside the circle for Scandinavian countries support the view that the larger income redistribution, the more unions have allowed for labour market deregulation. In the Anglo-Saxon cluster, wage disparities not only increase in the period 1979-2000 (the two spots for the 1880s are at the left of the circle), but keep being associated to a much lower degree of redistribution. The Continental cluster shows lower values for wage dispersion than the Scandinavian one, suggesting that a large social transfers system there combines with a limited labour market deregulation. Instead, in the Mediterranean cluster both variables present low values, which is a signal that the lasting paucity of redistributive institutions is compensated by labour market regulation which restrains wage dispersion by putting a hold on market forces.

Therefore, a substitutability process among institutions seems to have occurred in many European countries, in the form of a shifting combination between labour market and welfare institutions. As Figure 1 and 3 show, during the 1990s wage inequality has not reversed its course, but many countries of the Continental or Mediterranean Europe appear to join the high wage inequality league (Scandinavian and Anglo-Saxon clusters). While a lower union density and milder job protection allowed jobs to expand, in particular for women and the new entrants into the labour market, the pay for low-skill workers could have been reduced even more than how employment had augmented.

Figure 3. Redistribution and wage inequality in European countries (1979-2000)



A different mix of lower regulation coupled with higher redistribution across European countries has increased heterogeneity in wage and employment performances within European countries. In some countries, a weakening of job protection has been accompanied by more generous unemployment benefits and effective ALMP, so that a rising wage inequality has come with the increase of temporary labour contracts. In other countries, the polarisation between the stable working position of the high-skill “insiders” and the long unemployment spells of the low-skill workers has been reinforced. The extensive recourse to flexible labour contracts has created the segregated market for part-time jobs. On the one hand, the bargaining power of the prime-age male workers has further strengthened. On the other hand, the demise of job protection has increased the length of time preceding the passage to permanent labour contracts for low-skill workers, as in many European countries appropriate measures meant to facilitate re-employment of the workers at the end of temporary labour contracts are still lacking⁹. Hence, labour market deregulation has prompted a significant downward wage flexibility, but a strong recovery in employment rates is still to come. A tentative explanation is that the boost to labour supply elasticity could not have been sufficient to raise the employment and the participation rates of the low-productivity sections of the labour force¹⁰. The main

⁹ The varying extent of labour market deregulation across the European economies has been also connected to different degrees of goods market deregulation, whereby a weaker price power of firms following harsher competition, by shrinking rents to be shared between producers and workers, hinders the unions’ bargaining power (Blanchard and Giavazzi, 2003). Many other factors prompted the recovery of employment rates in many EU countries in the second half of the 1990s, the most important of which is tax cuts, in particular the reduction in social contributions which has shrunk the wedges between the labour costs to employers and employees’ effective pay.

¹⁰ Also a too high effective marginal tax rate in the lower end of the income distribution may discourage the very unskilled to enter the labour market for low-pay jobs. We will not deal with the relationship between the tax system, as recent studies report on a negligible influence of the tax wedge (the non-wage labour costs due to social contributions

impact of deregulation has been on earnings disparities, the effects of which on disposable income inequality has been mitigated by redistribution operated by welfare institutions.

Given the upward trend for wage inequality at slowly rising employment rates across clusters (Figure 1), and a similar pattern for the correlation between wage dispersion and redistribution (Figure 3), labour market deregulation sustains wage inequality, while income redistribution compensates for the fall in wage levels at the bottom of the earnings distribution. The labour market deregulation which took place in many European countries, impinging both on the low-skill workers' pay in the labour market and on the number of unemployed workers eligible for social transfers, has probably benefited from the support to the households' disposable income represented by larger redistribution countervailing a rising downward wage flexibility and a variable job involvement inside the household. This is the interpretation to be tested in the next two sections.

6. Wage inequality in Europe: a regression model with the LIS database

Econometric estimates are conducted in this section through a regression model which looks at wage inequality as a function of four variables. First, as we consider that a prolonged period of low labour demand was at the origin of the upward trend in wage inequality in Europe the youth employment rate has been introduced as a proxy for the more or less difficult matching of the labour force with job vacancies. The variable actually used is male employment rates for the age groups 20-24, 25-29, 30-34, as supplied by Eurostat, to reduce the interference both by the upward trend of women participation and by fertility. Second, net union density, that is unions membership excluding pensioners and the self-employed, has been considered to indicate the degree of labour market regulation. Third, redistribution enters as a determinant of wage inequality as unions may trade wage moderation in labour contracts negotiations with a strengthening of unemployment benefits and other social transfers by welfare institutions. The extent of redistribution is quantified by the difference between the factor income (FI) and the disposable income (DPI) Gini coefficients, weighted by the Gini FI. Fourth, we aim at separating out the role of labour market and welfare institutions in the evolution of wage inequality from the impact exerted on the employment and wage rates by technical change, as reflected in the shift of the sectoral composition towards the ICT industries and services, and by the skill upgrading of human capital, as reflected in the functions performed by the workers. Hence, in this regression model we regard higher education, whether or not obtained by a university institute, as an indicator of the upgrading of the technological level of the productive system, which is supposed to determine the widening of the skill premium and to discriminate against low-skill workers.

The panel of 13 countries over 5 waves yields 56 actual observations (over a theoretical maximum of 65 observations, were the panel complete) for the dependent variable, which has been extracted from the LIS database, just like all other information on the FI and the DPI distribution. Data on the remaining variables

paid by the employees as well as by the employers) in the labour market. An econometric analysis of the wage formation mechanism in a dynamic contest has verified that in the EU countries an increase in the tax wedge (or a shift of the tax burden from the employers to the employees) has only a temporary and very small effect on the real wage (Arpaia and Carone, 2004).

have been collected from published sources: net union density, which gathers percentages of union membership on the labour force net of self-employed and retired workers, is taken from Ebbinghaus and Visser (2000) and integrated with adjusted administrative data surveys as reported by OECD (2004); educational attainment, which refers to the tertiary level (L3), is taken from de la Fuente and Domenech (2002) and has been included with a three periods lag, as this variable is meant to be an indicator of the average human capital level of the existing labour force, relying on the assumption that those who graduated ten-fifteen years earlier are presently employed and represent a substantial part of the skilled workers. A time period corresponds to 5 years, which is the approximate length of time separating the five waves of the LIS database from each other. Table 2 summarizes the dependent and independent variables summary statistics.

Table 2. Summary statistics for the regression model 1

	Giniwages	netunden	(GiniFI-GiniDPI)/GiniFI	emplrt20-24 _{t-1}	emplrt25-29 _{t-1}	emplrt30-34 _{t-1}	EduL3 _{t-3}
min	0.1176	8.9	0.25507	43.9	68.2	76.7	3.51
max	0.3406	97.35	0.70848	79.2	94.5	95.8	18.3
mean	0.2560	45.498	0.51534	63.71	82.666	88.263	10.212
st.dev.	0.0596	23.785	0.12221	9.399	5.7094	4.6080	4.2038

In addition to the independent variables discussed above, the regression equation includes a drift on union density so to estimate a separate coefficient for the more deregulated labour markets of the Anglo Saxon and Scandinavian countries (as revealed by Figure 1). The regression equation, therefore, reads as follows:

$$Giniwages = \alpha + \beta netunden + \gamma(GiniFI - GiniDPI)/GiniFI + \delta emplrt_{t-1} + \varphi EduL3_{t-3} + \lambda(netundenAS) + u$$

Given the cross-country time-series nature of the data, one would have hoped for a fixed effect panel regression analysis. A single equation model, pooling all available observations, was instead preferred to a multiple equation model, as the non negligible number of erratically missing observations results in a rather unbalanced panel, with a substantial overall loss of information.

However, rising wage disparities determined in European countries by market forces may have compelled the unions to engage in a stronger quest for “risk insurance”. Thus, the Gini wage coefficient could endogenously feed-back on the redistribution operated by welfare institutions, so that reverse causation may occur. Moreover, complementarity or substitutability between the regulatory function of legislation and labour market institutions, and the redistributive function of welfare institutions, may also apply. Therefore, the pooling panel regression does not escape the suspect of endogeneity: income (re)distribution, union density and educational attainment may be seen as a rather interwoven set of variables. Despite this conceptual interrelation, when it comes to their measurement, which is done through the proxy variables employed in the regression, the correlation coefficients between each couple of variables, shown in Table 2, are rather low.¹¹

¹¹ The size of the feed-back effect seems to be less than expected in Europe. Despite redistribution from mid-1980s to mid-1990s substantially reduced income inequality for disposable income with respect to factor income, in many

To tackle this possible source of endogeneity a regression equation was estimated making recourse to 2SLS estimators. As the same variables, one-period lagged, have been employed as instrumental variables, more observations were lost to the sample, which is constrained by the availability of the LIS information.

Table 3. Correlation coefficients model 1

	Giniwages	netunden	(GiniFI-GiniDPI)/GiniFI	emplrt30-34 _{t-1}
netunden	0.289773			
(GiniFI-GiniDPI)/GiniFI	0.276183	0.65079		
emplrt30-34 _{t-1}	-0.449696	-0.12753	-0.12524	
EduL3 _{t-3}	0.188982	0.11257	0.37375	0.171988

Table 4 shows the estimates resulting from the regression equation. The first three columns present the same model where, for the sake of comparisons, the youth employment rate variable is estimated by making recourse to three different age groups. The negative sign for youth employment rate reflects the expansionary effect on wage inequality due to the low labour demand and a worsening match between the unemployed and vacancies. None of the three age ranges conveys fully satisfactory estimates, though their significance improves with age. The better performance of the 30-34 range may be interpreted on the one hand as the better position of this age group in overcoming the difficult access to the job market, and on the other hand as a decreasing interference of the education system. Net union density is always highly significant. The negative sign of this variable is a signal that Continental and Mediterranean countries have joined the other two clusters in rising wage inequality following the withering of the unions' bargaining power. The positive sign of the drift on net union density for Scandinavian and Anglo-Saxon countries expresses the lower slope for the more deregulated labour markets of these two clusters. The positive sign of redistribution confirms that higher wage inequality may depend on more generous redistribution, as higher unemployment spells due to lower job protection and lower low-skill workers' wages are compensated by higher duration and coverage of unemployment benefits. Instead, a negative relationship would have been traced back to the persistence of labour market regulation: a lower number of low-pay workers reduces wage dispersion while redistribution in terms of unemployment benefits widens it.

The last column, which adds education, presents the results for the complete model. The inadequate performance of the education variable, with unexpected sign and non-significant estimate, suggests that the indicator of technological level fails to live up to our expectations. The slope of the skill-educational profile, that is the form of the relation between skill level and educational attainment, greatly differs across countries, as university educational programmes for the same graduate or post-graduate degree are idiosyncratic across countries. Pairwisely, the link between skill and productivity levels differs too, depending on the varying production techniques adopted by firms belonging to the same sector but participating in different economic environments.

European countries the Gini coefficient calculated on disposable income remained higher than that determined by market forces in the previous decade (Croci Angelini and Farina, 2005).

Table 4. Regression results model 1 (LIS database)

Variables	2SLS estimate	2SLS estimate	2SLS estimate	2SLS estimate
netunden	-0.00317 ***	-0.00327 ***	-0.003101 ***	-0.00353 ***
t-value	(-2.961)	(-2.924)	(-3.008)	(-2.581)
(GiniFI-GiniDPI)/GiniFI	0.4444 **	0.45899 **	0.36590 *	0.527153 *
t-value	(2.030)	(2.004)	(1.785)	(1.798)
emplrt30-34 _{t-1}	-0.0043 *			-0.00415
t-value	(-1.716)			(-1.420)
emplrt25-29 _{t-1}		-0.00197		
t-value		(-1.005)		
emplrt20-24 _{t-1}			0.001145	
t-value			(1.096)	
EduL3 _{t-3}				-0.00096
t-value				(-0.238)
Drift netundenAS	0.00193 ***	0.00215 ***	0.00215 ***	0.00207 ***
t-value	(3.193)	(3.533)	(3.815)	(2.611)
constant	0.49548 **	0.26800	0.07239	0.45966 *
t-value	(2.208)	(1.571)	(0.677)	(1.703)
R-square	0.27471	0.20254	0.31608	0.15825
Effective sample size	32	32	32	32

Estimates significantly different from zero at the 10 percent (*) 5 percent (**) and 1 (***) percent levels

The two last decades are a sufficiently long period of time for the interaction between the short-term macroeconomic shocks and the long-term technological trajectories to develop. In the recent transition of European economies to a knowledge-based economy, which started in the second half of 1990s, those sectors characterised by high knowledge intensity reflected in the high educational levels of the workforce, such as the ICT sectors, experienced the strongest employment growth. Indeed, technological shifts in the productive processes have set off, either in the form of the sectoral composition moving towards an increasing share of high-tech manufacturing and services, or in the form of a higher proportion of highly-educated and high-skilled workers compared to the medium and low-skilled workers. Both these structural changes could have distorted the composition of labour demand towards high-skill workers, thus depressing the low-skill workers' employment and wage rates.

A possible explanation for the scant relevance of the educational variable is that the educational attainment has no direct effect on the probability that the worker occupies the function or mansion which is appropriate to his professional background and thus that his wage level matches with his productivity. Overall, the general educational performance of the whole population is too loose an indicator of the skill structure of the labour force, and cannot be taken as an appropriate measure for the productivity of the employed labour force, not to mention poor data reliability and comparability across countries. The failure of this regression model to get a better understanding of technological choices leaves unanswered the question whether wage inequality, in addition to the impact of labour market regulation on the bottom of the wage distribution, is also influenced at the top by technical factors at the sectoral and firm levels prompting skill premium differentials.

The most severe obstacle in the investigation of links between wage inequality, institutions and technology is by all means the difficulty to find appropriate indicators. Indeed, the youth employment rate is just a proxy for the growth trend of labour demand; and the redistribution indicator computed by the LIS

database, is regressed on wage inequality across employed workers but does include – in addition to the social transfers to in-work individuals - also unemployment benefits and pensions.

However, the problem to be tackled is that all four independent variables refer to the population at large. Hence, in the next section we will use the ECHP database, and accordingly modify our econometric model, in order to get more appropriate indicators for the three determinants of wage inequality here considered.

7. Wage inequality in Europe: a regression model with the ECHP database

The next regression model relates to the same conceptual framework, but employs data entirely coming from another source, the ECHP. The econometric investigation has been performed on four countries only, one for each cluster: Denmark, Italy, the Netherlands and the UK; and two waves: the first (1994) and the fourth (1997), so that a four-years time lag may be compared to the five-years one introduced in the previous model. For each country and wave the Gini coefficients have been calculated for wages disaggregated according to 18 economic sectors¹² and three occupational levels: managers, white and blue collars¹³. Each wave therefore amounts to a theoretical maximum of 216 observations, which is reduced to 180 observations as not all countries have all sectors, and not all sectors have workers in all occupations in sufficient numbers. The same breakdown has been employed to inquire whether the job contract was intended as permanent, the workers had obtained social transfers under any headings in the preceding year, and what had been their educational attainment, i.e. their maximum grade of schooling. In particular, since the Gini coefficient of wage inequality per sector and per skill is expected to capture the *between-sectors* dispersion, the educational attainment regressed on the Gini measures of wage inequality should convey the effect of the educational gap magnifying divergences at the *within-sector* and *within-skill* levels. Information about wages, job tenure, social transfers and educational attainment have been employed to write the second regression model which also includes a few dummy variables and reads as follows:

$$Giniwages_i = \alpha + \beta jobtenure_i + \gamma socialtransfers_i + \delta edu1/3_i + dwhi + dblue + dservices + dDK + u_i$$

The first independent variable, which enters as the percentage of tenured jobs per sector and occupation, is regarded as a more appropriate proxy, at disaggregate level, for the impact of labour market deregulation, which to a large extent has consisted in an increasing percentage of temporary contracts. The second independent variable, which enters as the ratio between the amount of social transfers accruing to the workers per sector and occupation and the amount of their earned income (wages and salaries), is an indicator for redistribution which does not refer to the whole tax-and-transfers reshuffling but just to the social transfers declared by the workers. This redistribution accruing to the employed labour force also

¹² Information about the economic activity sectors was obtained by the variable PE007 which identifies the sectors according to the NACE (classification of economic activities in the European Community) code system and covers nine varieties of services (private and public) along with manufactures and other activities.

¹³ The three occupational levels were obtained by ri-classifying the occupational variable PE006 into three groups.

comprehends unemployment benefits received in the unemployment spells which have been allowed by the relaxation of labour market regulation. Therefore, the redistribution indicator considered in this regression model is a measure of the actual “mutual risk insurance” taking place among the employed labour force, which is permitted by the “pooling” of contributions to the national social protection institutions by workers and firms. The variable “social transfers to workers” is expected to account for institutional complementarity or substitutability between labour market regulation and welfare institutions influencing the wage and employment differentials in the European countries.

A higher level of monetary benefits provided by welfare institutions to the employed labour force is expected to allow for a widening wage inequality. A positive sign of the coefficient linking wage inequality to social transfers accruing to employed workers, can be interpreted as a clue of a “corporatist” agreement between unions and governmental institutions, that is a larger social insurance traded for a lower pay for the low-skilled workers at the bottom of the wage distribution.

Finally, the education variable now refers to the actual educational attainment of the labour force as declared by workers, and is regarded as a more insightful indicator than that employed in the former model. The impact of technical change on both wage inequality and the unemployment rate depends on the growth potential of a country, which in turn is a function of its technological trajectories as reflected by the weight of industries intensively using new technologies and human capital. In some countries the impact on the employment rate mainly comes from the aggregate demand fluctuations, while in others supply-side forces are more important, so that different earnings dispersion might result even if similar technological paths followed by the EU countries. These considerations suggest to look for an indicator conveying information on skill levels, so to check for the direct impact of technical progress on wage differentials across the employed labour force. The education variable enters as the ratio of the number of workers with higher education (ISCED5-7) to the number of workers who have failed to complete secondary education (ISCED0-2) again per sector and occupation.

The summary statistics for the variables employed in the second regression model are reported in Table 5.

Table 5. Summary statistics for the regression model 2

	giniwages	jobtenure	socialtransfers	edu1/3
min	0.0032943	0.4026846	0	0.001
max	0.5672744	1	0.4083306	49
mean	0.2275286	0.8841157	0.0792788	1.9404229
st.dev.	0.1057347	0.0963618	0.0872835	5.1565745

The regression model again incurs the problem of possible reverse causation for the redistribution indicator. As with the first regression model, we have made recourse to 2SLS estimators by including a one period lagged variable and employing the vector of wave 1 as instrumental variables to estimate the parameters of wave 4. Therefore, in contrast with the previous model, which spanned over two decades, this model only covers a very limited length of time. This circumstance, together with a more limited sample of

countries and a much more detailed information per country, makes a proper comparison between the two sets of results hard to express, yet one may notice that they embrace different angles of a same picture.

The correlation coefficients computed for all variables are reported in Table 6.

Table 6. Correlation coefficients model 2

	Giniwages	jobtenure	socialtransfers
jobtenure	-0.32433		
socialtransfers	0.50804	-0.37962	
edu1/3	-0.15857	0.15805	-0.04167

Table 7. Regression results model 2 (ECHP database)

Variables	2SLS estimate	2SLS estimate	2SLS estimate
jobtenure	-0.19225 **	-0.172653 **	-0.164168 **
t-value	(-2.358)	(-2.123)	(-2.037)
socialtransfers	0.912572 ***	0.929963 ***	0.889359 ***
t-value	(6.736)	(6.907)	(6.390)
edu1/3		-0.003329 **	-0.003558 **
t-value		(-2.374)	(-2.544)
dwhite	-0.047726 ***	-0.061375 ***	-0.060411 ***
t-value	(-2.808)	(-3.436)	(-3.407)
dblue	-0.043489 ***	-0.05825 ***	-0.054672 ***
t-value	(-2.595)	(-3.279)	(-3.063)
dDK	-0.104169 ***	-0.096535 ***	-0.096619 ***
t-value	(-5.397)	(-4.999)	(-5.050)
dservices			0.018633
t-value			(1.334)
constant	0.370179 ***	0.365905 ***	0.350509 ***
t-value	(4.702)	(4.694)	(4.515)
R-square	0.3628	0.3799	0.3948
Adj R-square	0.3440	0.3579	0.3696
Nobs	176	176	176

Estimates significantly different from zero at the 10 percent (*) 5 percent (**) and 1 (***) percent levels

Table 7 reports the regression results for three specifications of the regression model: the first excludes the education variable, while the third also includes the services dummy. All variables, except education, show the expected sign and vary little across columns. The significance level is overall satisfactory. Labour market (de)regulation, proxied by the relative frequency of permanent jobs, is found to be a reliable enough explanation of wage inequality. Redistribution to workers is able to explain the most of variability in the Gini coefficient computed on wages when sector and occupation are accounted for. While education does not appear to be a very relevant factor, its unexpected sign may stand to signal that, other things equal, more education is accompanied by less wage inequality, a result that may sound less surprising, than upon a first glance analysis. In fact, other things being equal in addition to the above discussed variables include dummies (dwhite, dblue) to take care of the worker's occupation.

The disaggregation of the four countries by economic sector and occupation, while permitting to focus on the worker's occupation as a relevant condition to explain wage inequality, ends up in hiding those national characters which used to be so important in identifying the relevant cluster in the former analysis. The exception is the dummy dDK which insulates the Scandinavian Denmark where e.g. female employment

in the public sector is exceptionally high. A tentative indicator for high technological level is provided by the dummy variable which singles out the service sector (*dservices*). Had its significance be more adequate, one could have ventured in the suggestion that this is a more telling proxy for technical change than education.

The positive sign of the correlation between variations in social transfers accruing to workers and variations in wage inequality sustains the hypothesis that wage decompression has been accompanied by a tighter orientation of social protection to the employed labour force.

8. Conclusions

A depressed labour demand in the 1980s started a trend of increasing wage inequality accompanied by sluggish employment growth, which eventually prompted a fall in unions' bargaining power and an easing in labour market regulation. During the 1990s, wage inequality kept rising, despite a recovery in the employment rates at the end of the decade. We have investigated whether the interaction between labour market and redistributive institutions has to be taken into account in explaining wage inequality in Europe, also with education as a proxy controlling for technical change. To explain why small increases in the employment rates are associated to continuously rising wage inequality in Europe, the hypothesis was put forward of a changing balance between decreasing labour market regulation (job and wage protection) and increasing income redistribution. The widening experienced by wage inequality in Europe during the 1990s might have been caused by labour market deregulation, under the permissive condition of income redistribution compensating for the fall in wage levels mainly at the bottom of the earnings distribution.

A regression model centred on the median voter's decisiveness on redistribution indicated that in Europe from mid-1980s to mid-1990s the worsening of income distribution in the market was partially reverted by income redistribution through tax-and-transfers, conditional on the degree of "risk insurance" desired in each of the four European clusters of countries. The econometric estimate of wage inequality was then conducted on the LIS and ECHP databases. The first regression model (LIS) highlighted the importance of labour market deregulation in the upsurge of wage inequality but has proven unable to provide reliable answers, mainly due to indicators for the four independent variables referring to the population at large. The second regression model (ECHP) allowed for the breakdown of the sequence from traditional to high-tech sectors and from low to high skill composition of the labour force, as well as more precise indicators for labour demand, regulation, redistribution and education. In fact, each of the three indicators for labour market institutions is linked to each specific worker, also warranting a better control for technical change as proxied by each individual's educational attainment.

Though with different characters across the clusters of European countries, the recovery in disposable *vis-à-vis* factor income distribution indicates that redistribution has compensated for the downward wage flexibility, in particular for the wage levels of low-skill workers. After that job and wage protection were eased in many European countries during the 1990s, institutional substitution between labour market regulation and income redistribution seems to back the upward trend in wage inequality. Overall, the degree of labour market governance does not seem to have substantially changed during the 1990s, but more redistribution traded off for regulation, thus allowing for higher wage inequality.

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