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October 2005

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OSA-Working paper WP2005-24

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Wage Mobility in Europe. A Comparative Analysis Using Restricted Multinomial Logit Regression*

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Abstract

In this paper, we investigate cross-country differences in wage mobility in Europe using the European Community Household Panel. The paper is particularly focused on examining the impact of economic conditions, welfare state regimes and employment regulation on wage mobility. We apply a log-linear approach that is very much similar to a restricted multinomial logit model and much more flexible than the standard probit approach. It appears that regime, economic conditions and employment regulation explain a substantial part of the cross-country variation. The findings also confirm the existence of an inverse U-shape pattern of wage mobility, showing a great deal of low and high-wage persistence in all countries.

Keywords: wages, wage mobility, wage dynamics, multinomial logit regression, log-linear models, welfare states
JEL classification: J31, C19

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* We would like to thank Didier Fouarge, Wilfred Uunk and Trudie Schils for their useful comments and suggestions. This paper was benefited by comments of the participants the EPUNet 2005 conference in Colchester and by comments of the participants of the Labour Group of CENTER/Tilburg University.

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1. Reviewing the measures of income and wage mobility

Different responses are to be expected when individuals are asked what changes in wages or incomes they would like to experience over time: some people would just wish to see their income rise in absolute levels (absolute mobility); another group would like to see its income improved compared to other people (relative mobility); others prefer their income to be stable and not to be too volatile (income risk). Following these differences in individual preferences, numerous definitions of wage mobility have been developed. These definitions correspond to different theories about the way income or wage changes affects the well-being of individuals (Fritzell, 1990).

According to standard economic theory, people are assumed to be primarily interested in the absolute changes of their (real) income. However, Hirsch (1995) suggested that even if someone cared only for the purchasing power of his own income, his rank in the distribution still matters, as it determines his ability to acquire "positional" (goods whose assigned value depends on how many other possess them) or status goods. Hence, the relative position of an individual in the distribution, referred to as 'relative positional' mobility, matters more. Other researchers, such as Duesenberry (1967) and Easterlin (1974) believe also that since preferences are endogenous, people tend to adapt them in view of what others have and want (the "keeping up" with the Joneses' aspect). The idea of "relative deprivation", according to which people always evaluate their income or living conditions in comparison to the conditions of their peers, was introduced by sociologists such as Runciman (1966). This theory suggests that an individual considers him or herself successful if

his(her) income remains stable while the income of the individuals (s)he compares him or herself with deteriorates. Psychologists such as Brickman et al. (1978), however, argue that individual income gains tend to diminish due to the rapid adjustment of people's preferences to the new situation and due to raising their expectations about the future. Therefore, they suggest that no gain in happiness or social welfare will occur in the end.

Most studies on wage mobility involve measures that include all the three aforementioned sorts of mobility (absolute mobility, relative mobility and income risk). Nevertheless, in many studies it is not always clear why these measures are selected (Headey and Muffels, 2003). As we want to compare wage mobility at the macro or country level, we have transformed these measures of individual mobility into measures of overall mobility in the society. At the aggregate level, absolute individual mobility translates into economic growth; relative individual mobility into income inequality or income dispersion, and income risk into income stability or income security. Fields (2000), dealing with macro-level mobility, argues that changes in the overall wage distribution might change the ranking of the individual in the distribution without changing his absolute level of income. In metaphorical terms, this is the question of what matters more: "changing rooms or rooms changing" addressed by Fields (2000) and Van Kerm (2001). The type of rank mobility, where individuals exchange their income positions while total income and overall income dispersion remain the same, is known as "exchange" mobility. "Exchange" mobility has to be distinguished from "structural" mobility that refers to the growth in absolute income of all people or to the mobility emerging from the increase in the income dispersion (Markandya, 1982; Markandya, 1982; Markandya, 1984; Fields and Ok, 1999). Yet, we can decompose this structural component of aggregate mobility, as in

the individual case, in a growth component (equal changes in the income of all people) and a dispersion or inequality component (a change in the dispersion without a change in the aggregate income of all people, Van Kerm, 2001).

2. Which mobility measure is most appropriate for the issue under study

The question now is what sort of mobility measure is most appropriate for the issue under study. This paper investigates the role of macro-economic conditions, regime type and labour market institutions in explaining cross-country differences in wage mobility. These labour market institutions are shaped according to policies whose aim is to raise the growth component and to reduce the dispersion and risk component of wage mobility in a country. For this reason, relative positional mobility, which is defined as the year-to-year change in the decile ranking, is chosen as our mobility measure. The advantage of the measure is that it really takes into account all three sorts of mobility components explained above: absolute (growth), relative (dispersion) and exchange mobility, although we cannot disentangle them. This can be shown with the following example:

Consider the case of a group of four people having wages in year 1 equal to 2,000, 3,500, 4,500 and 5,000 euros, respectively. Suppose that in year 2, the individual that ranks originally highest in the wage distribution, has still a wage of 5,000 euros in year 2, but the secondly, thirdly and fourthly ranked individual in the original distribution, have now wages of 6,900, 7,100 and 8,000 euros, respectively. Thus, the highest ranked individual in year 1 has now lowest rank in the wage distribution of year 2. In this example we could decompose the mobility into a growth, dispersion and exchange component in the following way.

Initial ranking	Year 1	Growth		Dispersion		Exchange	Year 2	Final ranking
1	2,000		5,000		5,000		8,000	4
2	3,500	→	6,500	→	6,900	→	6,900	2
3	4,500		7,500		7,100		7,100	3
4	5,000		8,000		8,000		5,000	1

The growth component is the equal absolute change in income with 3,000 euros for all people. The dispersion component results from a transfer of 400 euros from individual 3 to individual 2 and the exchange component is just an exchange of rank between individual 4 and 1 without a change in the aggregate income.

The inability to decompose mobility into a growth, dispersion or exchange component has likely to do with the fact that we only observe the rank change but not how it emanates from changes in the underlying components. Moreover, since we only measure rank changes, we cannot examine whether there is more upward or more downward mobility in a particular country. For the same reason, our measure of relative positional wage mobility renders little information about whether an increase in it leads to an increase or decrease of levels of wage inequality. It informs us, however, about the extent, at least in relative terms, of wage risk and wage volatility people experience and hence, about the overall level of wage stability. The more wages fluctuate over time the more equal they become in the medium and long-term.

High rates of immobility therefore, signal a high persistence of wage inequality levels over time.

Our measure of positional mobility

Our aggregate positional mobility measure is based on the year-to-year transitions of working individuals across deciles of the wage distribution within each country[1]. Our aim is particularly to explain the 10×10 table (Table 1), where cells represent frequencies. The index for the rows denotes the decile position in year 1, while the index for the columns represents the decile position in year 2. In a society with perfect mobility (PM) all cells per row have the same value ($x_{i,k} = \frac{\sum_{j=1}^{10} x_{i,j}}{10}$, for each $k = 1,...,10$), while in a perfectly immobile society (PI) all off-diagonal elements of the table are zero ($x_{ij} = 0$, if $i \neq j$). In our analysis, individuals whose destination state differs up to one decile from the origin state are considered immobile, because a transition of one decile could be the result of a light level of churning in the wage distribution (see Table 1).

[Insert Table 1 about here]

Outline of the paper

The paper is organized as follows. In Section 3 the literature on the subject is reviewed and some hypotheses about the dissimilarities in wage mobility patterns

[1] In order to test for the sensitivity of our analysis with respect to the clustering of incomes in deciles we repeated our analysis by clustering incomes in 20 categories. Results showed that country differences did not change.

across countries and welfare regimes are formulated. In section 4 the data and sampling from the European Community Household Panel is discussed. Section 5 begins with commenting on the results of the estimation of the standard probit regression. Further on, section 5 presents the results of the log-linear based restricted multinomial logit model, which are compared to the probit regression outcomes. Two models are estimated; the first one with country and another with regime type along with selected macro-economic and institutional indicators. The models are evaluated by comparing the parameter estimates, the fit indices and the explanatory power. Finally, the business cycle and time effects are investigated with respect to their contribution in explaining the observed country and regime type differences. The main conclusions of the study as well as the issues for further research are discussed in the last section of the paper.

3. Theory and research on wage mobility patterns across countries: hypotheses

Literature on wage mobility is rather poor compared to the amount of studies on income mobility. Furthermore, studies on wage dynamics focus more on the issues of wage growth, wage inequality and the volatility of wages over time rather than on wage mobility as such. From a policy point of view, this is not surprising as politicians are generally more concerned with fostering economic growth, reducing inequality and increasing stability and security than with increasing wage mobility per se. However, wage mobility seems to become a more important issue in both economics and policy making. Politicians confronted with a sluggish labour market seem to become aware of the fact that promoting mobility on the labour market

contributes to a more competitive and efficiently operating labour market, which may in turn raise productivity levels and therewith growth. (Table 2).

[Insert Table 2 about here]

Apart from wage mobility, wage dispersion should be also investigated, as except for the northern European countries, evidence to date suggests that from the mid 1980s until the mid 1990s wage inequality has risen steadily, although at a different level, in many Western countries. Specifically, from the mid 1980s on, wage inequality has showed a diverse pattern; it increased strongly in the UK and in Portugal (Cardoso, 1998; 2004), but showed moderate increases in continental countries and no increases or even decreases in Scandinavian countries (Gottschalk and Joyce, 1998; Aaberge, 2002; Acemoglu, 2003).

There are three leading theories for the explanation of these changes in the wage patterns: the increased international trade and increased migration suggesting that non-sheltered sectors in the US and in Europe face increased international competition by less developed (low wage) countries, which has an adverse downsizing effect on the wages of the low-skilled workers in these sectors (Borjas and Ramey, 1995) ; the rapid skill-biased technological change, which explains the increase in the dispersion of wages by the introduction and rapid spread of new technologies and the resulting increase in the demand of high skilled workers at the expense of their low skilled peers (Acemoglu, 2003; Acemoglu, 2003); the process of deregulation or removal of labour market regulations and institutions that allows wages to adjust more adequately and rapidly to market changes. This process of deregulation permits labour markets to become more flexible and to respond more

swiftly to ongoing changes. The tendency in policy to promote flexibilisation by removing institutional barriers to mobility is contented to account for the differences in both the trends and the levels of wage inequality between the US, the UK and the continental European countries (Blau and Kahn, 1996).

Gottschalk and Smeeding (1997) argue that much of the change in earnings inequality occurred at the bottom of the distribution due to the sharp increase of the skill premium for the better skilled. As Acemoglu (2002; 2003) has argued, the skill premium happened to be much larger in the US than in Europe, because in Europe supply responded more swiftly to the demand shifts caused by the process of skill-biased technological change than in the US. Lee (1999) suggests that the erosion of the minimum wage levels might account for the increase in wage inequality. It is apparent, however, that this variety of causes is hardly examined in empirical research, probably due to the lack of datasets and yardsticks to measure these complex processes.

Dominant perspectives in economic theory argue that the ongoing changes in the economy and in the labour market have resulted in a higher level of wage mobility over time that has dampened the short-term shocks in wage inequality. Although individuals are less income secure in the medium and long-term than they were in the past as wages are more volatile, workers also possess more opportunities for moving into a better-paid job. Ultimately, it is an empirical question how overall wage mobility, in terms of wage growth and wage dispersion, is balanced against less income security and stability. Nevertheless, whatever the balance is, there will be winners and losers in this process dependent on the demand and supply relationships, the level of their skills and their earnings capacities.

Recent studies show that increases in wage inequality are indeed not the result of short-term shocks in the wage distribution. Dickens (2000) concludes that they reflect a long-term increase in the wage disparities across individuals. He finds evidence of high and increasing (since the 1970s) levels of immobility, especially among the low-paid, in the UK. Burkhauser et al. (1997) conducted a comparative study of earnings mobility in the US and Germany in the 1980s. Although, the welfare systems and the labour markets of the two countries differ significantly, they find "a great deal of persistence" and a similar pattern of mobility in these two countries. Buchinsky and Hunt (1999) reached the same conclusion for the US, the country with the most liberal labour market. Cappellari (2002), using panel data from the Survey on Households Income and Wealth of the Bank of Italy, finds high levels of immobility among the low paid Italian workers. Buchinsky et al. (1998) corroborate these results for the French workers.

Comparative research

It is apparent that the literature concerning wage mobility patterns lacks a sufficient amount of cross-country comparative studies. In the 1990s, much of the comparative research in Europe was based on the LIS (Luxembourg Income Study) – a dataset that contains data for various countries. This dataset includes data for different time periods per country, although within the 1980s and the 1990s. The main disadvantage of LIS is that it consisted of repeated cross-section data rather than panel data. As researchers had no panel data – at least not for the majority of the countries – they needed to restrict their analyses to one component of wage mobility only, i.e. wage or earnings inequality. Later on, although panel data became available for a longer period of time, they covered a few countries only, namely the Netherlands, Germany

and the UK[2]. Finally, with the establishment of the European Community Household Panel (ECHP) a new and rich panel data source became available, covering 15 member states of the European Union. Despite of the fact that the ECHP started only in 1994 and covered a relatively short period of eight years, up to 2001, we make use this dataset as it covers a larger number of countries than any other longitudinal dataset. For this reason, it is a much more powerful tool for examining the impact of different institutional settings on wage mobility than any hitherto available.

The role of institutional constraints

There is a growing literature suggesting that labour market institutions and employment protection regulations account for the dissimilar mobility patterns in the labour market of different countries. Even when the institutions do not seem to differ considerably across countries, the dissimilarities emerge more outspokenly across particular clusters of countries. Countries with a more flexible labour market due to relatively low levels of employment regulation, such as the UK and Ireland, are believed to exhibit much more job and wage mobility than strongly regulated countries such as the Southern European countries, namely Greece, Italy, Portugal and Spain. This classification of countries according to the level of regulation seems to coincide remarkably well with Esping-Andersen's regime type classification (1990) that was based on his socio-political account of welfare state policies during the 1960s and 1970s and the degree of de-commodification (the level of public interference) by which these policies set themselves apart from each other. Translated into the labour

[2] Apart from these long-running national panels, some more national datasets, such as the Luxembourg (PSELL) and Belgium panel (PBSH), were developed since the mid and late 1980s, but they were hardly used for research on income mobility.

market this de-commodification notion concerns the degree to which the labour market is governed by laws, regulations (minimum pay, employment protection regulations, collective wage bargaining, union density etc.) and public interventions preventing the labour market from operating as a free market. Therefore, we will examine to what extent the level of regulation contributes to explaining the cross-country differences in wage mobility in Europe. In the employment report of (2003), the European Commission already pointed out that the wage distributions of EU member states seem to vary considerably due to differences that prevail among them with respect to different kinds and levels of employment protection.

More concisely, we contend that countries characterized by a low public interference and loose levels of employment protection legislation, denoted as liberal regimes by Esping-Andersen, are likely to attain higher levels of job and wage mobility. Southern European countries are believed to exhibit low levels of wage mobility due to the strictness of their employment protection legislation and despite the low union density. The segmented labour market of Southern European countries safeguards primarily the position of workers in the internal labour market. Likewise, low levels of wage mobility are expected in the continental European countries due to their strongly regulated labour market, high union density and strict compliance with collective wage bargaining. In Scandinavian regimes, notwithstanding the high union density and the high level of compliance with collective wage bargaining, wages seem to be more flexible than in the strongly regulated continental countries, although still less flexible than the lowly-regulated labour markets of the liberal countries (Muffels and Fouarge, 2002; Muffels and Luijkx, 2004).

Furthermore, we contend that in countries with high levels of minimum wages affecting a large share of the working population, such as in France, low levels of

wage mobility will be observed in the lower part of the wage distribution. On the contrary, in countries with no or low levels of minimum wages, such as in the UK, we expect higher levels of wage mobility at the lower ends of the distribution.

There are various ways to study the impact of institutional constraints; one is to use the "regime type" approach and to examine the role of "country clusters" in explaining wage mobility patterns. Another is to start from the institutions and regulations themselves and to examine to what extent they might have a bearing on the observed mobility patterns. In the second approach, the effects of institutional differences in terms of minimum wages, employment protection regulations, union density, contract compliance and the wage bargain on wage mobility patterns are observed. In this paper we also use the EPL-index as constructed by the OECD, which is a direct measure for the strictness of employment protection regulation in a country[3]. We would have preferred to include separate measures for minimum wage levels, union density and contract compliance at the industrial sector level, had we reliable sources to do so.

[3] The OECD (2004) developed an index to measure the strictness of the Employment Protection Legislation (EPL) in the various countries based on criteria concerning legislation on regular employment, temporary employment and collective dismissal'. However, the OECD itself raised doubts about the validity of the index because labour markets might react markedly different to the introduction of similar policy measures and legislation. For example, the relaxation of restrictions concerning fixed term employment in Spain and in Germany in the 1980s had rather dissimilar effects on the labour markets in these two countries. The index does not also take into account the important role of the informal sector in Southern Europe operating as a buffer against income losses due to involuntary unemployment and therefore affects wage mobility patterns.

Macro-economic conditions and time

A further aim of our paper is to scrutinize the extent by which wage mobility is affected by the business cycle. Therefore, we control for differences in the stage of the business cycle across countries. To do that efficiently, we included several indicators such as the unemployment rate, the yearly change of GDP per capita and the labour force participation rate for males aged 16-64 (Table 3).

[Insert Table 3 about here]

Although we use it as an indicator for the level of wage regulation in a country and for the extent that this regulation affects mobility patterns, "regime type" is still not a static concept. The classification of a country to a specific regime type might change, as wage regulations enacted through policies might shift over time. Due to these changes in policies and to the response of labour markets to them, regimes tend to converge or diverge over time. Therefore, it is important to study the evolution of cross-country differences over time.

Job and employment characteristics

A third topic covered in the paper is to what extent prevailing cross-country differences in wage mobility are associated with differences in the job and employment structure. Workers in the public sector face usually lower job turnover rates and experience relatively smaller wage changes, either upward or downward, than private sector workers. The more workers are employed in the public sector the lower wage mobility tends to be in a country. Workers with higher skills and educational qualifications experience usually a steeper career with faster wage

growth. In contrast, low educated workers are usually employed in low skilled jobs with little opportunities to improve their wage prospects. Therefore, the more the distribution of education and the reward to skills differ across countries the more the wage mobility patterns tend to diverge.

4. Data, main concepts and descriptive analysis

We use the European Community Household Panel (ECHP), which has been designed by EUROSTAT for income study purposes. It is a longitudinal database that contains comparable socio-economic data for individuals and households from 15 European countries for eight years, namely from 1994 to 2001. It includes information for approximately 60,000 households and 130,000 individuals per wave (EUROSTAT, 2001). ECHP data were collected by the "National Collection Data Units" according to a centrally designed questionnaire. However, some countries (Austria and Finland) lack data for the first or for the first two waves, as they stepped in later. Due to artifacts in the income data we excluded Belgium and Luxembourg. Sweden was also excluded, as the ECHP database includes repeated cross-section rather than panel data for this country. The first wave of ECHP (1994) was excluded from our analysis as, in the view of EUROSTAT, the income data for the first wave (1994) are much less robust than the data for the consecutive waves, also due to learning effects in dealing with longitudinal data sources. Hence, our sample consists of 7 waves and 12 countries.

The sample is restricted to male wage earners between 25 and 55 years old, appearing in the dataset for at least two subsequent years and declaring paid employment as their main economic activity for the year prior to the survey. The main

reason for restricting our analysis to male employees is that females tend to have more career breaks and more intermittent periods of temporary or permanent lay-off for very different reasons than males (e.g. caring obligations). Thus, we cannot include women in our analysis without controlling for the factors responsible for their different career paths, which goes beyond the scope of this paper. We excluded men younger than 25 years because most of them are in some kind of education. Men older that 54 years are also excluded from the sample as they often participate in early retirement schemes or reduce voluntarily working hours. Furthermore, due to our focus on wage earners we excluded the self-employed and the unemployed. Finally, in order to eliminate measurement error, individuals with extremely high and extremely low wage incomes were excluded from our sample[4].

Our basic unit of analysis is the working individual in the household and our main economic variable is total income from employment. This is the total personal net labour income after deduction of taxes and social contributions, with the reference year being the year prior to the survey. In order to construct our sample, we rank the wage income of individuals according to their decile position within a country and we examine the transitions between decile positions in year t and t+1. Our sample population consists of 12,709 individuals for the first pair of years (1995-1996), 13,746 for the second (1996-1997), 13,193 for the third (1997-1998), 15,379 for the fourth (1998-1999), 14,533 for the fifth (1999-2000) and 14,173 for the last (2000-2001)[5].

[4] Specifically, we excluded individuals having less than 10% and more than 3,000% of the median wage income.

[5] From now on the time points of our analysis will correspond to the year from which the data come from. For example when we refer to time point 1998-1999 data come from wave 7 (1999-2000) of the ECHP.

Descriptive analysis

A rough overview of the decile transitions workers experience can be observed in Table 4. This table presents origin-destination transitions pooled across countries and time periods. Observations seem to be concentrated along the main diagonal especially at the corners of the table. As we move away from the diagonal, frequencies become significantly lower. Therefore, the main finding of this table is the significant amount of persistence, especially at the low and high wage strata. Low- and high-wage earners seem to be experiencing hardly any wage change in a one-year period.

The relevant tables by welfare regime (Tables 4a-4d) reveal some interesting differences. Contrary to our expectations, wage earners in the Nordic countries (including the Netherlands) are apparently more mobile than average, while workers from the lowly regulated (liberal) countries, are seemingly less mobile than average. In the Southern welfare regimes immobility rates appear lower than average at least in the higher income strata.

[Insert Table 4 and Tables 4a-4d about here]

The data that we use in our analysis consists of a separate observed transition table per country (12 countries), time (6 time points: 1994-1995 up to 1999-2000), sector (2 sectors: private and public), and education (3 groups: lower than high school, high school and higher education) combination. As information on two countries is missing for the first time point and on one country for the second time point, we have in total 414 (instead of 432) transition tables. It should be noted that for the construction of

these transition matrices, deciles were defined per country and time period combination, which means that same definition applies across education and sector groups (within country-time combinations).

5. Models for explaining wage mobility patterns according to the transition matrices

A simple probit analysis

The method for analyzing the 414 10-by-10 transition tables needs to allow the detection of differences in relative positional wage mobility patterns across a large number of tables. The method should therefore be able to detect differences across countries (or regimes), time points, education groups and employment sectors in the tendency of individuals to move more than one decile in the wage distribution. Below we present a log-linear variant of the multinomial logit regression model that can be used for this purpose, but first we perform a simpler analysis, using a standard probit regression model that can serve as a benchmark for the other models. The dichotomous outcome variable indicates whether a change of more than one decile occurred or not. Country, time, time-country interaction, education and sector are used as categorical predictors in this probit regression.

[Insert Table 5 about here]

Rather than reporting all the details about the obtained parameter estimates, we summarize the main results in Table 5 as represented by the estimated average probability (the marginal effects) of moving more than one decile for each of the

combinations of country and time period. As can be seen, the highest probability of changing more than one decile in the wage distribution is found initially for Denmark, Italy and Greece, while the lowest rates are found for Portugal and France. Within the period of reference, however, the rank of countries changes: at the end of this period, Denmark, Ireland and Spain rank first while Portugal, France and Germany come last. By summing up the results with respect to welfare regimes, we observe that in southern European countries individuals face high (with the exception of Portugal) and decreasing (with the exception of Spain) levels of wage mobility. Nordic countries present either high (Denmark) or initially low but strongly increasing (the Netherlands and Finland) rates of wage mobility. Estimates for countries of the continental regime are situated somewhere in the middle (except for France that ranks lower) but they are uniformly decreasing. For the lowly regulated labour markets of the UK and Ireland we get contradicting results as Ireland has very high levels of wage mobility, while the UK has unexpectedly significantly lower levels. In both countries however, the probability of changing more than one decile does not change significantly during the reference period.

A restricted multinomial logit analysis

A limitation of this rather simple probit regression analysis is that all types of transitions are pooled; that is, it does account neither for the origin state from which a transition takes place, nor for the size or the direction of a transition. The analysis could be refined by doing a separate analysis per origin state and per direction of the move, and by taking into account the size of the move, for example, by means of an ordered probit model. This would, however, require many separate regressions. For this reason, we opt for a method that can account for all these aspects in a single

analysis. This method includes the application of a variant of the multinomial logit model that makes use of log-bilinear restrictions from the log-linear analysis field.

We specify a multinomial logit model for the probability that an individual is in a particular destination (D) state (decile) given his origin (O) state (his state in the previous year) and the subgroup (G) to which he belongs. This probability will be denoted by $P(D = d \mid O = o, G = g)$. With the term subgroup we mean one of the aforementioned 414 time, country, education, and sector combinations. The basic structure of the multinomial logit model we use is

$$P(D = d \mid O = o, G = g) = \frac{\exp\left(\beta_{d|g}^{D|G} + \beta_{od|g}^{OD|G}\right)}{\sum_{i=1}^{10} \exp\left(\beta_{i|g}^{D|G} + \beta_{oi|g}^{OD|G}\right)}$$

This model contains two types of regression parameters: $\beta_{d|g}^{D|G}$ and $\beta_{od|g}^{OD|G}$. The term $\beta_{d|g}^{D|G}$ is an intercept term for the destination state $D=d$ that may differ across subgroups. The other parameter - $\beta_{od|g}^{OD|G}$ - captures the strength of the origin-destination association that may also differ across subgroups. In our application, the term of main interest is this origin-destination association term. This size of this term indicates the amount of mobility (the smaller the association between the origin and destination state, the more mobility). What we are especially interested in is how much the size of this term varies across subgroups defined by country, time, sector, and education. However, if we would not further restrict the $\beta_{od|g}^{OD|G}$ term, we would have to estimate and interpret 81 (=9*9) association parameters for each of the 414 tables, which is, of course, not meaningful. For such situations, where there is a large number of association parameters (here 81) that vary across large numbers of subgroups (here 414), in the log-linear modeling field, restrictions have been proposed

for specifying parsimonious higher-order interaction terms. These methods involving the use of bilinear decompositions have been applied among others in the analysis of mobility tables (Hout, 1983; Luijkx, 1994; Vermunt, 1997; Goodman and Hout, 1998; Goodman and Hout, 2001). In our case, the following bilinear decomposition is used: $\beta_{od|g}^{OD|G} = a_{od}^{OD} + b_{od}^{OD} \cdot \phi_g^G$. This decomposition implies that the various tables have a common component a_{od}^{OD}, which serves as a kind of intercept or overall mean association term. The other component $b_{od}^{OD} \cdot \phi_g^G$ captures the differences in the origin-destination associations across tables, where the parameters b_{od}^{OD} can be regarded as "slopes" of the explanatory variables' effects; they indicate in which parts of the mobility table the largest differences across subgroups occur. The term ϕ_g^G is a scaling factor indicating whether mobility is higher or lower than average in a particular subgroup. In other words, differences in mobility across tables are described by a single coefficient per table. For reasons of normalization, we have to impose a location and a scaling restriction on the ϕ_g^G parameters. Here, we will use $\sum_g \phi_g^G = 0$ and $\sum_g \left(\phi_g^G\right)^2 = 1$, which implies that the ϕ_g^G parameters are centered and restricted to have a sum of squares of 1. For our analysis, we made use of the program LEM (Vermunt, 1997).

[Insert Table 6 about here]

Table 6 illustrates the values of the log-likelihood function and the BIC obtained by the various models that were estimated. The first two models serve as baseline models. In Model 0, both the a_{od}^{OD} and b_{od}^{OD} terms are restricted to be equal to

zero, which yields a model in which the destination state is assumed to be independent of the origin state. Model 1 assumes that b_{od}^{OD} is equal to zero for each *o-d* combination, yielding a *homogeneous* association model. Comparison of the log-likelihood and BIC values of Models 0 and 1 shows that the origin and destination states of individuals in the wage distribution are strongly correlated. Model 2, in which we use the bilinear decomposition described above, fits much better than Model 1 in terms of the log-likelihood, indicating that the origin-destination association is not equal across tables. In Models 3 to 6, we use several simplifying assumptions for the term b_{od}^{OD}. Among these models, the model that fits best according to the BIC criterion, Model 4, contains only nonzero b_{od}^{OD} parameters for the main diagonal and the first subdiagonals, while the subdiagonal parameters are also restricted to be symmetric (equal for upward and downward moves across the two same states). This model does not only present the best fit to the data according to the statistical indices, but it is also straightforward in its interpretation; Model 4 captures country differences in immobility (i.e., in the probability of changing at most one decile), which makes the results somewhat comparable with the results obtained by the probit regression. The added value of the multinomial logit analysis is its ability to discern cross-country differences in various parts of the wage distribution.

Nevertheless, Models 2-6 fit worse than the homogeneous model (Model 2) in terms of the BIC. This is probably due to the large number of parameters included in these models. Therefore, a more parsimonious version of Model 4 (Model 4a) was employed in which insignificant predictor effects have been omitted[6]. Model 4a fits much better than the homogeneous model in terms of log-likelihood and BIC values.

[6] The significance of the effects of model 4 is discussed later on in this section.

Findings for model 4a seem to establish the existence of differences in origin-destination association between tables defined by the predictors.

[Insert Table 7 about here]

Results of the multinomial logit regression

Table 7 reports the overall association terms – in their multiplicative form $\exp(a_{od}^{OD})$ – as obtained with Model 4. The numbers indicate how much more likely the "transition" concerned is compared to the perfect mobility situation. Perfect mobility is defined as the situation in which the origin and destination states are independent of one another. As can easily be seen, observations tend to be concentrated along the main diagonals, indicating large immobility. Moreover, even if the huge parameter estimates for cells (1,1) and (10,10), which may be the result of ceiling effects, are ignored, the bottom right and the upper left part of the table still contain the largest coefficients. This indicates that the highest levels of immobility emerge in the lower and especially in the higher parts of the wage distribution. For example, an individual being in the second lowest decile of the wage distribution in year t is almost 20 times more likely to remain in the same decile in year $t+1$ than expected under perfect mobility. In contrast, workers with wages in the middle part of the wage distribution are more likely to change their position in a one-year period. However, transitions of more than one decile are rather rare in the whole range of the distribution. Our results demonstrating that both low- and high-paid employees will almost surely retain their rank in the wage distribution in the subsequent year and that workers in the middle income classes face limited chances of improving or worsening their position are consistent with previous studies (Burkhauser, Holz-Eakin et al., 1997; Bigard,

Guillotin et al., 1998; Buchinsky, Fougere et al., 1998; Cappellari, 2000; Dickens, 2000; Hofer and Weber, 2002).

[Insert Table 8 about here]

The next question that has to be addressed is how much the pattern presented in Table 7 differs across countries and whether these cross-country differences evolve with time and vary across personal and job characteristics. In Table 8 the estimates for the b_{od}^{OD} coefficients obtained with Model 4 are presented. Each of the coefficients that was not a priori fixed to zero takes on a negative value; therefore these coefficients denote the tendency towards more mobility. This implies that a positive ϕ_g^G value corresponds to more wage mobility than average in the table concerned. The pattern of the estimates for b_{od}^{OD} shows that differences across subgroups (countries, time points, education and sector groups) are largest with respect to the mobility in the higher (-32.14) than in the lower (-6.38) wage deciles.

[Insert Table 9 about here]

The 414 ϕ_g^G coefficients obtained with Model 4 describe the differences across countries, time points, education groups, and sectors of employment. However, the interpretation of all ϕ_g^G coefficients is still unfeasible due to their large number. Therefore, ϕ_g^G coefficients were subjected to a further analysis in order to discern which of the main and interaction effects included among them, are worth to be thoroughly scrutinised and interpreted. More precisely, an analysis of variance

(ANOVA) was performed, the results of which are reported in Table 9. The first result is that the higher-order interaction terms are of little importance as the model with main effects and two-way interaction effects explain 77.6% of the variance in the ϕ_g^G terms. Secondly, country is by far the most important factor in the explanation of mobility differences across tables (its main effect accounts for 51.3% of the total variance). This might be an important result as it shows that it is not so much the common trends and structural factors explaining the dissimilarities in wage mobility but foremost the particular country characteristics indicating the relevance of institutional, socio-economic (education, demography, employment structure) and also cultural explanations. Moreover, we find that differences between the mobility patterns in the public and private sector are important determinants of the observed variance (5.3%). Although the time effect is not significant, the country-time interaction component is and it explains about 8.7% of the variation. Similar are the findings for education; even though no direct education effects are found, the country – education interaction effect explains a significant part of the overall variance (4.6%) indicating that differences in the education systems across countries constitute part of the explanation. This might resemble the impact of the knowledge economy and the positive effects investments in higher education exert on levels of wage mobility and therefore on economic performance. Also sector and the country-sector interaction explain a noticeable part of the variance. Again this might point to the significant impact the employment structure might exert on the wage mobility patterns.

[Insert Figure 1 about here]

Figure 1 depicts the mean value of ϕ_g^G per country in the first and in the last time point. As can be observed, there is no clear pattern that could associate cross-country differences with welfare state regimes. The hypothesis that in less regulated countries individuals experience higher levels of wage mobility is confirmed in the case of Ireland but has to be rejected in the case of the prototype lowly regulated country in Europe, the UK, where wage mobility seems to be much lower than expected and also lower than in most other EU countries. This is probably due to the fact that the Irish economy experienced a major boost during the 1990s. The difference in economic performance between Ireland and the UK is clearly depicted in table 3. In most southern European countries, which – according to the OECD's EPL index – have a rather high level of employment protection, wage mobility seems to be higher than we predicted. Given their segmented labour market, this might point to a high level of in-firm wage mobility in these countries. However, Portugal, exhibits the lowest level of wage mobility of all European countries. Except for Portugal and the UK, low levels of wage mobility are found for France and Finland, which are classified as belonging to the strongly regulated continental regimes or, as Finland, to the rather flexible Nordic countries. Finland therefore seems not to fit particularly well in this Nordic picture, probably due to a much less flexible labour market than its peers in this cluster and due to its underperforming economy during this period. The picture for Denmark, as being part of the Nordic cluster with one of the highest levels of wage mobility, confirms our prior conjectures with respect to this regime. This might be explained by the fact that the Danish labour market seems to be particularly successful in combining high levels of flexibility, while safeguarding simultaneously appropriate levels of income and work or employment security through active and activating labour market policy programmes (OECD, 2004). The strongly regulated

regimes of Austria and Germany seem to position themselves somewhere in the middle of the league table of countries according to the level of regulation and the balance of flexibility and income and work security that they were able to attain. A similar position is taken by the Netherlands that we classified as also belonging to the Nordic cluster, with medium levels of regulation and a fairly favourable balance between wage flexibility and income and work security..

In Figure 1, it can be seen that the ranking of countries with respect to the levels of wage mobility varies during the observation period. In the strongly regulated countries wage mobility decreases (steeply in Germany and Austria), whereas in the Nordic countries, with the exception of Finland, that exhibit a better record in balancing mobility and income security goals, a significant increase in the levels of wage mobility can be observed. What we might learn from this is that the better countries are capable of creating a flexible labour market with safeguarding appropriate levels of income and work security (income stability) the better their economic and employment record tends to be. Further to this, it appears that the more regulated the labour market is, as the results for the Southern European countries, with the exception of Spain show, the more likely it is to suffer from a lower wage mobility growth, or even worse to be confronted with steeply declining mobility rates. In lowly regulated regimes of the UK and Ireland, on the other hand, there is yet no clear and strong pattern, as in Ireland we observe a decrease in wage mobility whereas in the UK an increase took place but starting from rather low levels of mobility.

[Insert Figures 2 about here]

As Figure 2 illustrates, the estimates for the sector of employment confirm our prior expectations: Individuals working in the private sector experience higher levels of wage mobility than individuals working in the shielded public sector. Moreover, these differences increase during the observation period. However, comparing the sector effects across countries, some unexpected outcomes emerge: although wage mobility is lower in the public sector than in the private sector in most countries, this is not the case for Ireland, which belongs to the lowly regulated (liberal) cluster. Though we expect high rates of wage mobility in particularly the private but also the public sector in the UK, we observe markedly less mobility in the public than in the private sector. For the southern European countries our conjectures are confirmed, as the public sector exhibits much more immobility than the private sector. In the highly regulated continental and rather flexible Nordic cluster the levels of wage mobility in the private sector always exceeds the levels in the public sector.

[Insert Figure 3 about here]

Figure 3 demonstrates that the impact of education levels differs across countries. Highly skilled employees exhibit more wage mobility than their less educated peers in France, Germany, the Netherlands, Finland, the UK and Greece. In contrast, lower levels of education qualifications are associated with more wage mobility in Austria, Italy, Spain and especially in Denmark. No clear pattern is found in Ireland and Portugal. These results indicate that we have to be cautious to draw far reaching conclusions on the basis only of these partial analyses, as levels of education are not very well measured in surveys and are very difficult to compare due to the extremely large variation in education systems.

[Insert Figure 4 about here]

Educational effects, however, do not only vary across countries but also between sectors of employment. Figure 4 suggests that higher education is rewarded in terms of more wage mobility in the public sector but not in the private.

These macro-level analysis however tend to confirm the findings of micro-level analyses of many other researchers showing that investments in human capital formation pay off in terms of raising the employment opportunities, career opportunities and wage prospects but seemingly, though not unconditional, also in terms of higher wage mobility.

[Insert Table 10 about here]

Testing for the effects of regime type macroeconomic conditions and labour market regulations

The results presented above indicate that countries belonging to the same country cluster do not necessarily show similar mobility patterns. In order to obtain a more formal test as to whether the regime type variable explains differences in wage mobility, we performed the same ANOVA as before, but now with country replaced by regime type. Moreover, we added to the model four macroeconomic and employment protection indicators as covariates: the Labour Force Participation rate for men between 15-64 years old (LFP), the unemployment rate for males, the GDP per capita (GDPpc) and the OECD's Employment Protection Legislation index. The overall explained variance rises to 64.8%; the main effects of economic welfare, business sector, EPL and LFP emerge to be significant corroborating the results of

others. We also include the interaction effects between regime type and EPL, EPL and time, EPL and LFP and LFP and sector. Compared to our previous findings as reported in Table 9, regime still seems to explain a significant part of the country variance indicating that the way flexibility and income and work security is balanced plays a role in explaining country differences even after controlling for a number of important macro-economic and employment indicators. We also find that the effect of employment sector remained significant after controlling for these variables. Furthermore, the outcomes show that although the macroeconomic indicators and EPL on their own account are seemingly not very significant determinants of wage mobility, they still seem to contribute to explaining a large part of the country differences and particularly the evolution of these differences over time.

The results reported in Table 10 indicate that our regime model explains a significant part of the cross-country variation (77.6%). If we compare a model with regime and the viable interaction effects with time to a similar model with regime replaced by country the explained variance is about 94% of the explained variance in the country case[7]. This shows that the regime cluster classification is indeed an excellent candidate for explaining most of the country variance. Macroeconomic conditions explain apparently only a small part of the country variation but the findings reveal that they take over the interaction effect of country with time if that variable is removed from the model. For this reason and since the explained variance is reduced only slightly, we might safely assume that the macroeconomic conditions, although not particularly significant for the country variation itself, are particularly relevant for explaining the evolution of wage mobility differences across countries over time. The rising wage mobility levels, which we observed over time, coincide

[7] Results from this ANOVA are not presented in the paper.

apparently with a favourable economic development in a number of European countries during the late 1990s.

It turned out that the main effects of the labour force participation and employment protection legislation variables are insignificant whereas the relevant interaction effects with regime are both significant. This suggests that the labour force participation and employment protection legislation variables exert their effects on wage mobility variance across countries mainly because of its strong variation within the various regime types across countries.

[Insert Figure 5 about here]

Figure 5, shows that the ranking of welfare regimes varies across time points. The only expectation that is clearly confirmed is that wage mobility levels in the strongly regulated regimes (continental European countries) are lower than in all other regimes. In the southern strongly regulated regimes, wage mobility was initially high in the beginning of the period, in 1994-95, but decreased considerably thereafter until 1998-1999 to rise again in the years after. In the Nordic countries, the wage mobility was initially quite high, up to 1996 but decreased, to catch up again strongly up to 1999. In 1999-2000 it even ranked first with respect to the wage mobility level among all regimes. Individuals from the very flexible liberal welfare regime experience larger rates of wage mobility than individuals from the strongly regulated continental regimes but lower rates than the Nordic regime. It should, however, be noted that we should be cautious in drawing conclusions on the basis of these regime findings only, since our evidence also shows that there are large cross-country differences within the various regime types. On the other hand the outcomes elicit a common trend that

during the economic upturn period in the mid and late 1990s, wage mobility rates tend to decline unexpectedly and to recover only at the very end of the period but for two regime clusters only, namely the Nordic and the Southern countries. The slow wage mobility growth during this period might be due to the commonly rather low levels of flexibility and job mobility in the European labour markets.

6. Conclusions

In this paper we examine wage mobility patterns across countries and over time. We applied restricted multinomial logit regression models to investigate cross-country differences in relative positional wage mobility in Europe, using data from the ECHP for 1995-2001. The method we applied was sufficiently powerful to allow us to control for the full set of origin states of individuals in the year-to-year transitions. It also was flexible enough to impose a variety of restrictions to the association parameters of our model, which enabled us to interpret the covariate effects and their time patterns. Both properties of our approach are unique compared to the standard (probit) regression techniques, which we also applied and compared our results with.

Our findings suggest that although the clustering of countries in welfare regimes can account for a discernible part of cross-country differences in wage mobility, significant variation remains within the regime clusters. Cross-country variation is also only partially captured by differences in the macroeconomic conditions (business cycle effects) and the strictness of employment protection legislation, even though these variables seem to exert a significant effect on wage mobility differences. Regimes seem to play no particularly important role here while the evidence shows that there tends to be a lot of variation in these macro-level variables within regime

type. The lesson to be learned from it is that welfare regime and these macro-level variables not only tell us different parts of the story on the role of economic conditions and institutions on wage mobility, but also that separate indicators for institutional variation across countries such as the one on employment protection need to be taken into account.

Many of our expectations are not confirmed. As in previous studies, we find a strong state dependence for the lowest and the highest strata of the wage distribution. A low wage earner jumping to a highly paid managerial job, or a firm manager with a very high wage degraded to a minimum wage worker is a rather unlikely event. No deviation from this rule is observed in the liberal countries (especially in the UK). In the liberal regime, where the labour market is flexible and institutional constraints are absent, increased income risks do not seem to go hand-in-hand with better wage prospects for workers. On the contrary, we find that more flexibility of wages emerges unexpectedly in the Nordic countries (Denmark leading). When the strictness of employment protection legislation is high, as it is in Southern countries, we expect low levels of wage mobility but that appears not necessarily to be the case. Southern European countries (with the notable exception of Portugal) rank first with respect to their level of wage mobility in most time points. We might assume that a low level of wage mobility on the external labour market might be counterbalanced by a high level of in-firm or in-job wage mobility. Another hypothesis that might be put forward here involves the typical employment structure of the Southern regime with more self-employment and a large informal sector that might also exert a similar up-levelling effect on wage mobility. An important finding is that our conjectures with respect to the strictly regulated countries are largely accepted as the strongly regulated labour market ensures high levels of wage immobility to workers.

Our findings are in accordance with our predictions when investigating wage mobility among certain population subgroups. The public sector is found to be a safe resort for risk-averse individuals, as wage fluctuations are in this sector much smoother than in the private sector.

This paper had the intention to render an improved insight into cross-country differences in wage mobility over time. Our particular interest went to the role of institutional factors and we concluded that although welfare regime in itself is an important concept to explain cross-country differences, it only tells part of the story on the role of institutional differences on wage mobility patterns in Europe. Separate or more detailed measures of institutional variation are needed to account for the cross-country variation in wage mobility. We used a rather different methodological approach than has been used to date, but the results partly confirmed what others found, and partly rendered new insights into the role of these institutional phenomena. We addressed the question of state dependence and heterogeneity by using transition matrices analysis techniques, which we called restricted multinomial regression and which we will elaborate in the future by enriching our set of institutional indicators.

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Table 1

	Destination decile				
Origin decile	$x_{1,1}$	$x_{1,2}$	$x_{1,3}$	...	$x_{1,10}$
	$x_{2,1}$	$x_{2,2}$	$x_{2,3}$	...	$x_{2,10}$
	$x_{3,1}$	$x_{3,2}$	$x_{3,3}$	...	$x_{3,10}$
	$\vdots$	$\vdots$	$\vdots$		$\vdots$
	$x_{10,1}$	$x_{10,2}$	$x_{10,3}$	...	$x_{10,10}$

Table 2

Trends in Earnings Inequality

	Gottshalk et al (1997)		Acemoglu (2003)	
	Level	**Trend 1983-90**	**Level**	**Mid '80s – Mid'90s**
Denmark			moderate	(+) moderate
Sweden	low	(+) low	Low	no change
Finland	low	(+) moderate	Low	(-) slight
Netherlands	low	(+) slight	Low	(-) slight
France	moderate	(+) slight		
Germany	moderate	(+) slight	Low	(+) moderate
Belgium			Low	(-) slight
Ireland	high	no change		
UK	high	(+) high	high	(+) high

Table 3

Macroeconomic and institutional variables

Welfare state regime	Country	Labour force participation		Unemployment rate		GDP per capita		EPL
		Mean (1995-1999)	Mean annual change	Mean (1995-1999)	Mean annual change	Mean (1995-1999)	Mean annual change	
Continental	Germany	80.3	-0.03	8.3	0.2	104.2	-0.6	2.6
	Austria	80.9	-0.3	3.8	0.1	113.5	0	2.4
	France	74.8	0.3	9.9	-0.1	103.8	0.1	2.8
Nordic	Finland	77.2	0.2	12.4	-1.5	102	0.3	2.2
	Netherlands	82.3	0.6	4.3	-0.8	109.9	0.2	2.3
	Denmark	85.2	0.1	5.2	-0.4	114.6	0.1	1.8
Liberal	United Kingdom	83.1	-0.2	8.3	-0.9	103	0.4	1
	Ireland	78.9	0.5	9.6	-1.6	105.7	2.4	1.2
Southern	Italy	75	0.1	8.9	0	102.6	-0.3	3.1
	Greece	74.7	0.2	6.9	0.2	65.4	0.1	3.5
	Spain	77.3	0.5	15	-1.7	81.4	0.4	3
	Portugal	81.8	-0.2	5.3	-0.6	68.5	0.5	3.7

Source: OECD

Table 4

Overall transitions in the sample

Origin decile	Destination decile 1	2	3	4	5	6	7	8	9	10	SUM
1	53.0%	23.7%	8.7%	5.0%	3.4%	2.2%	1.4%	1.3%	0.9%	0.4%	**100%**
2	10.2%	51.1%	21.4%	7.4%	4.0%	2.7%	1.5%	0.9%	0.5%	0.2%	**100%**
3	3.3%	18.1%	58.3%	0.3%	9.9%	4.8%	2.8%	1.5%	0.7%	0.3%	**100%**
4	1.3%	4.1%	15.4%	42.1%	22.1%	8.2%	3.8%	1.8%	0.8%	0.3%	**100%**
5	1.0%	2.1%	4.9%	17.0%	40.6%	21.6%	7.9%	3.1%	1.3%	0.5%	**100%**
6	0.6%	1.2%	2.2%	5.3%	17.4%	40.7%	21.8%	7.3%	2.8%	0.8%	**100%**
7	0.6%	0.7%	1.1%	2.3%	5.5%	16.9%	43.4%	21.8%	6.3%	1.4%	**100%**
8	0.3%	0.4%	0.7%	1.1%	2.2%	5.8%	16.8%	47.9%	20.8%	3.8%	**100%**
9	0.2%	0.3%	0.4%	0.6%	1.0%	2.1%	4.3%	16.8%	58.0%	16.2%	**100%**
10	0.2%	0.2%	0.2%	0.4%	0.5%	0.7%	1.3%	2.5%	13.6%	80.4%	**100%**

Table 4a
Nordic

Origin decile \ Destination decile	1	2	3	4	5	6	7	8	9	10
1	44.3%	27.5%	11.1%	6.7%	4.2%	1.9%	1.5%	1.4%	0.9%	0.6%
2	10.7%	46.9%	21.5%	7.9%	4.4%	3.7%	2.5%	1.3%	0.6%	0.5%
3	3.0%	14.9%	44.4%	21.1%	7.9%	3.7%	2.5%	1.6%	0.6%	0.4%
4	1.8%	5.1%	13.9%	43.0%	21.3%	7.4%	3.8%	2.0%	1.1%	0.5%
5	1.5%	2.7%	4.9%	14.4%	40.5%	22.7%	8.2%	3.1%	1.2%	0.7%
6	0.6%	1.5%	2.4%	5.1%	16.8%	40.3%	22.0%	6.8%	3.3%	1.2%
7	1.0%	1.0%	1.4%	2.4%	5.2%	15.9%	42.3%	22.6%	6.4%	1.8%
8	0.4%	0.6%	0.9%	1.8%	2.5%	6.0%	17.0%	45.5%	21.8%	3.5%
9	0.3%	0.3%	0.4%	0.7%	1.3%	2.6%	4.1%	16.4%	56.8%	17.2%
10	0.3%	0.3%	0.2%	0.4%	0.7%	1.0%	1.4%	2.5%	13.1%	80.0%

Table 4b
Liberal

Origin decile \ Destination decile	1	2	3	4	5	6	7	8	9	10	SUM
1	56.4%	22.6%	7.6%	4.1%	2.6%	2.5%	1.6%	1.3%	0.9%	0.4%	100%
2	8.4%	55.9%	21.9%	6.8%	3.1%	1.9%	0.8%	0.6%	0.4%	0.1%	100%
3	1.9%	13.0%	50.3%	22.9%	6.0%	2.8%	1.8%	0.9%	0.3%	0.2%	100%
4	1.2%	3.2%	14.6%	45.3%	23.4%	7.5%	2.9%	1.1%	0.6%	0.1%	100%
5	0.6%	1.5%	3.5%	16.2%	44.0%	23.0%	7.2%	2.6%	1.1%	0.2%	100%
6	0.6%	0.7%	1.4%	4.7%	16.0%	44.9%	22.7%	7.0%	1.7%	0.3%	100%
7	0.6%	0.6%	0.8%	1.6%	4.8%	17.0%	45.0%	23.4%	5.3%	0.8%	100%
8	0.2%	0.2%	0.4%	0.8%	1.6%	5.5%	15.0%	52.4%	21.5%	2.3%	100%
9	0.2%	0.2%	0.1%	0.4%	0.8%	1.4%	3.4%	16.9%	61.6%	15.0%	100%
10	0.1%	0.2%	0.2%	0.2%	0.3%	0.3%	0.8%	1.3%	12.1%	84.6%	100%

Table 4c
Continental

Origin decile \ Destination decile	1	2	3	4	5	6	7	8	9	10
1	56.4%	22.6%	7.6%	4.1%	2.6%	2.5%	1.6%	1.3%	0.9%	0.4%
2	8.4%	55.9%	21.9%	6.8%	3.1%	1.9%	0.8%	0.6%	0.4%	0.1%
3	1.9%	13.0%	50.3%	22.9%	6.0%	2.8%	1.8%	0.9%	0.3%	0.2%
4	1.2%	3.2%	14.6%	45.3%	23.4%	7.5%	2.9%	1.1%	0.6%	0.1%
5	0.6%	1.5%	3.5%	16.2%	44.0%	23.0%	7.2%	2.6%	1.1%	0.2%
6	0.6%	0.7%	1.4%	4.7%	16.0%	44.9%	22.7%	7.0%	1.7%	0.3%
7	0.6%	0.6%	0.8%	1.6%	4.8%	17.0%	45.0%	23.4%	5.3%	0.8%
8	0.2%	0.2%	0.4%	0.8%	1.6%	5.5%	15.0%	52.4%	21.5%	2.3%
9	0.2%	0.2%	0.1%	0.4%	0.8%	1.4%	3.4%	16.9%	61.6%	15.0%
10	0.1%	0.2%	0.2%	0.2%	0.3%	0.3%	0.8%	1.3%	12.1%	84.6%

Table 4d
Southern

Origin decile \ Destination decile	1	2	3	4	5	6	7	8	9	10	SUM
1	54.0%	21.7%	8.7%	5.2%	3.9%	2.4%	1.6%	1.4%	0.8%	0.3%	100%
2	12.1%	47.9%	20.7%	8.3%	4.5%	3.0%	1.5%	1.1%	0.7%	0.2%	100%
3	3.3%	16.1%	39.8%	21.3%	9.6%	4.9%	2.6%	1.4%	0.8%	0.3%	100%
4	1.7%	4.8%	18.2%	35.8%	21.4%	9.5%	4.5%	2.6%	1.0%	0.4%	100%
5	1.1%	2.6%	6.5%	19.5%	36.6%	19.2%	8.6%	3.2%	1.8%	0.7%	100%
6	0.6%	1.5%	3.1%	6.3%	18.7%	36.5%	21.0%	7.9%	3.5%	0.9%	100%
7	0.6%	0.8%	1.3%	3.1%	6.2%	17.7%	42.2%	19.7%	6.9%	1.7%	100%
8	0.4%	0.7%	1.0%	1.2%	2.4%	6.3%	17.9%	46.0%	19.3%	4.9%	100%
9	0.2%	0.4%	0.6%	0.7%	1.1%	2.6%	5.7%	17.2%	55.4%	16.1%	100%
10	0.2%	0.1%	0.2%	0.3%	0.5%	0.9%	1.7%	3.5%	15.3%	77.4%	100%

Table 5

Probability of changing more than 1 decile

Country	Time					
	1994-1995	1995-1996	1996-1997	1997-1998	1998-1999	1999-2000
Austria		0.201	0.225	0.186	0.183	0.174
France	0.122	0.114	0.105	0.096	0.106	0.110
Germany	0.157	0.177	0.149	0.143	0.151	0.143
Denmark	0.281	0.290	0.324	0.290	0.305	0.331
Netherlands	0.152	0.157	0.168	0.171	0.208	0.241
Finland			0.134	0.120	0.148	0.161
UK	0.152	0.133	0.131	0.152	0.161	0.149
Ireland	0.258	0.283	0.219	0.245	0.262	0.239
Italy	0.281	0.259	0.265	0.226	0.201	0.236
Greece	0.289	0.293	0.261	0.248	0.182	0.185
Spain	0.228	0.238	0.218	0.244	0.263	0.275
Portugal	0.127	0.142	0.158	0.138	0.095	0.112

Table 6

Comparison of the models

	MODEL	Restrictions on a and b	Parameters	log-likelihood	BIC
0	Independence	$a_{od}^{OD} = b_{od}^{OD} = 0$	7,776	-368,598	825,482
1	Homogeneous association	$b_{od}^{OD} = 0$	7,938	-310,472	711,068
2	General	no	8,368	-307,350	717,779
3	Diagonal	$b_{od}^{OD} = 0 \quad if \quad o \neq d$	8,297	-309,083	712,367
4	Diagonal and 1 decile transition	$b_{od}^{OD} = 0 \ if \ \lvert o - d \rvert > 1 \ and \ b_{od}^{OD} = b_{do}^{OD}$	8,306	-308,560	711,423
5	Diagonal and 2 deciles transition	$b_{od}^{OD} = 0 \ if \ \lvert o - d \rvert > 2 \ and \ b_{od}^{OD} = b_{do}^{OD}$	8,314	-308,534	711,462
6	Symmetric associations	$b_{od}^{OD} = b_{do}^{OD}$	8,341	-308,517	711,734
4a	Only significant interaction effects	as Model 4	7,984	-308,910	708,466

Table 7

Homogeneous part of the association between origin and destination deciles

$$\exp\left(a_{od}^{OD}\right)$$

		Destination decile									
		1	2	3	4	5	6	7	8	9	10
Origin decile	1	27,59	5,91	1,67	0,89	0,59	0,40	0,34	0,30	0,30	0,56
	2	10,36	19,98	5,73	1,58	0,76	0,43	0,21	0,23	0,13	0,27
	3	2,37	6,88	10,10	3,96	1,18	0,56	0,31	0,23	0,17	0,19
	4	0,95	2,07	4,04	6,07	2,74	0,99	0,51	0,29	0,23	0,23
	5	0,67	0,85	1,33	2,92	5,00	2,81	1,03	0,43	0,29	0,24
	6	0,34	0,50	0,71	1,13	2,72	5,09	3,17	1,02	0,54	0,30
	7	0,31	0,25	0,33	0,58	1,12	2,76	6,74	3,86	1,27	0,66
	8	0,23	0,17	0,23	0,33	0,58	1,24	3,98	11,26	6,88	1,53
	9	0,23	0,16	0,18	0,22	0,34	0,56	1,52	5,86	29,15	13,75
	10	0,42	0,20	0,20	0,21	0,23	0,38	0,67	1,94	16,26	153,85

Table 8

Coefficients b_{od}^{OD} for the OD table

		Destination decile									
		1	2	3	4	5	6	7	8	9	10
Origin decile	1	-6,38	-7,84	0	0	0	0	0	0	0	0
	2	-7,84	-16,87	-9,71	0	0	0	0	0	0	0
	3	0	-9,71	-14,78	-8,96	0	0	0	0	0	0
	4	0	0	-8,96	-15,99	-9,14	0	0	0	0	0
	5	0	0	0	-9,14	-15,68	-10,75	0	0	0	0
	6	0	0	0	0	-10,75	-16,22	-8,18	0	0	0
	7	0	0	0	0	0	-8,18	-15,87	-10,74	0	0
	8	0	0	0	0	0	0	-10,74	-22,33	-14,87	0
	9	0	0	0	0	0	0	0	-14,87	-27,78	-19,41
	10	0	0	0	0	0	0	0	0	-19,41	-32,14

Table 9

Analysis of Variance for the country effects

	Number of obs	=	414	R-squared	0,776
Dependent Variable: EFFECT	Root MSE	=	0,028	Adj R-squared	0,683
Source	Partial SS	df	MS	F	Prob>F
Model	0,776	121	0,006	8,4	0
country	0,513	11	0,047	60,8	0
time	0,014	5	0,003	3,6	0
education	0,002	2	0,001	1,1	0,32
sector	0,053	1	0,053	69,4	0
country*education	0,046	22	0,002	2,7	0
country*time	0,087	52	0,002	2,2	0
country*sector	0,038	11	0,003	4,6	0
time*education	0,004	10	0,000	0,6	0,84
time*sector	0,002	5	0,000	0,6	0,71
education*sector	0,006	2	0,003	3,7	0,03
Residual	0,224	292	0,001		
Total	1	413	0,002		

Table 10

Analysis of Variance for the welfare regime effects

	Number of observations	414	R-squared	0.647	
	Root MSE	0.031	Adjusted R-squared	0.609	
Dependent Variable: EFFECT	Partial SS	df	Mean Square	F	Significance
Model	0.647	40	0.02	17.1	0
Regime	0.070	3	0.02	24.7	0
Sector	0.009	1	0.01	9.2	0
EPL	0.001	1	0.00	0.9	0.36
LFP	0.001	1	0.00	1.1	0.30
Unemployment	0.000	1	0.00	0.1	0.79
Regime*time	0.017	20	0.00	0.9	0.60
Regime*EPL	0.008	3	0.00	2.9	0.04
Regime*LFP	0.136	3	0.05	47.9	0
Sector*unemployment	0.002	1	0.00	2.2	0.14
LFP*sector	0.011	1	0.01	11.2	0
EPL*time	0.010	5	0.00	2.2	0.06
Residual	0.353	373	0.00		
Total	1	413	0.00		

Figure 1
The effect of countries in the first and in the last time period

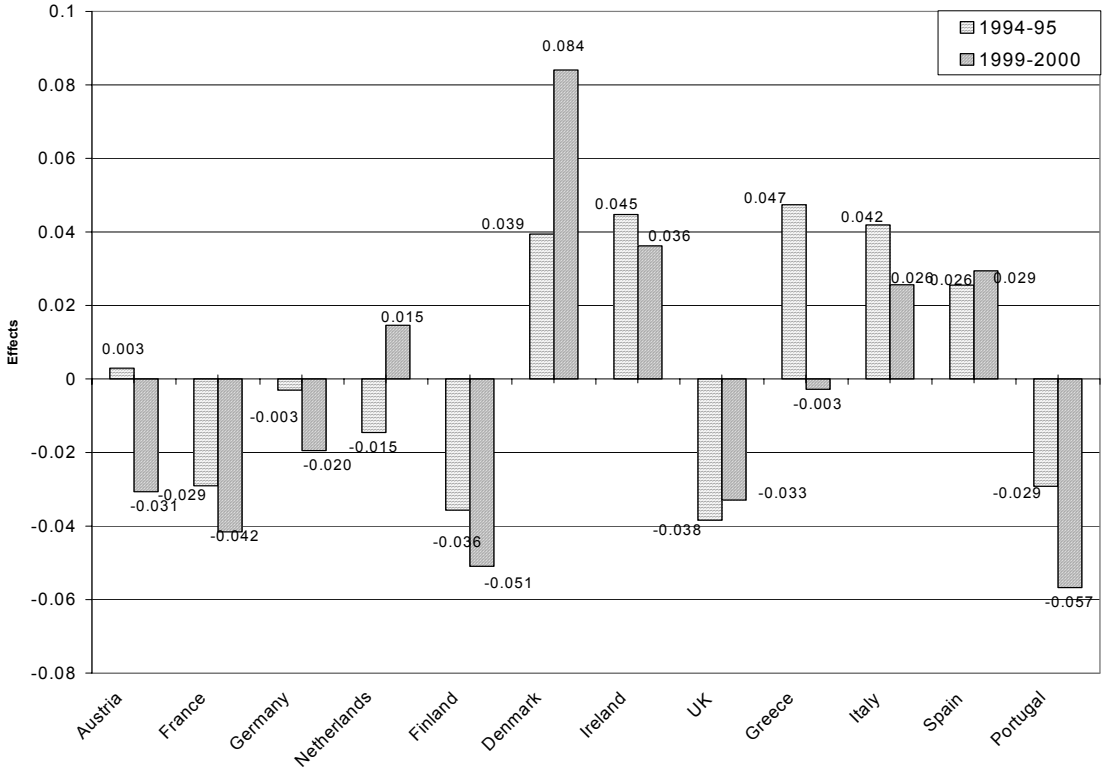

Figure 2
The effect of sector across countries

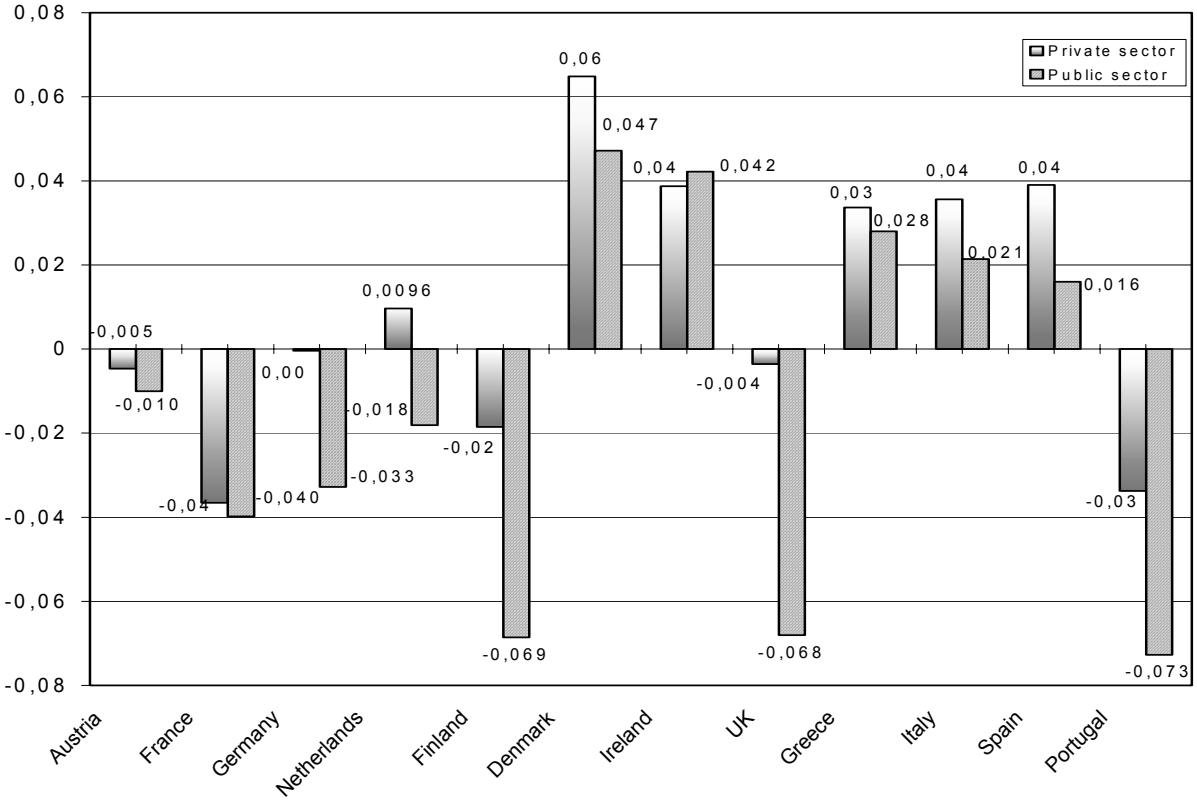

Figure 3
The effect of education across countries

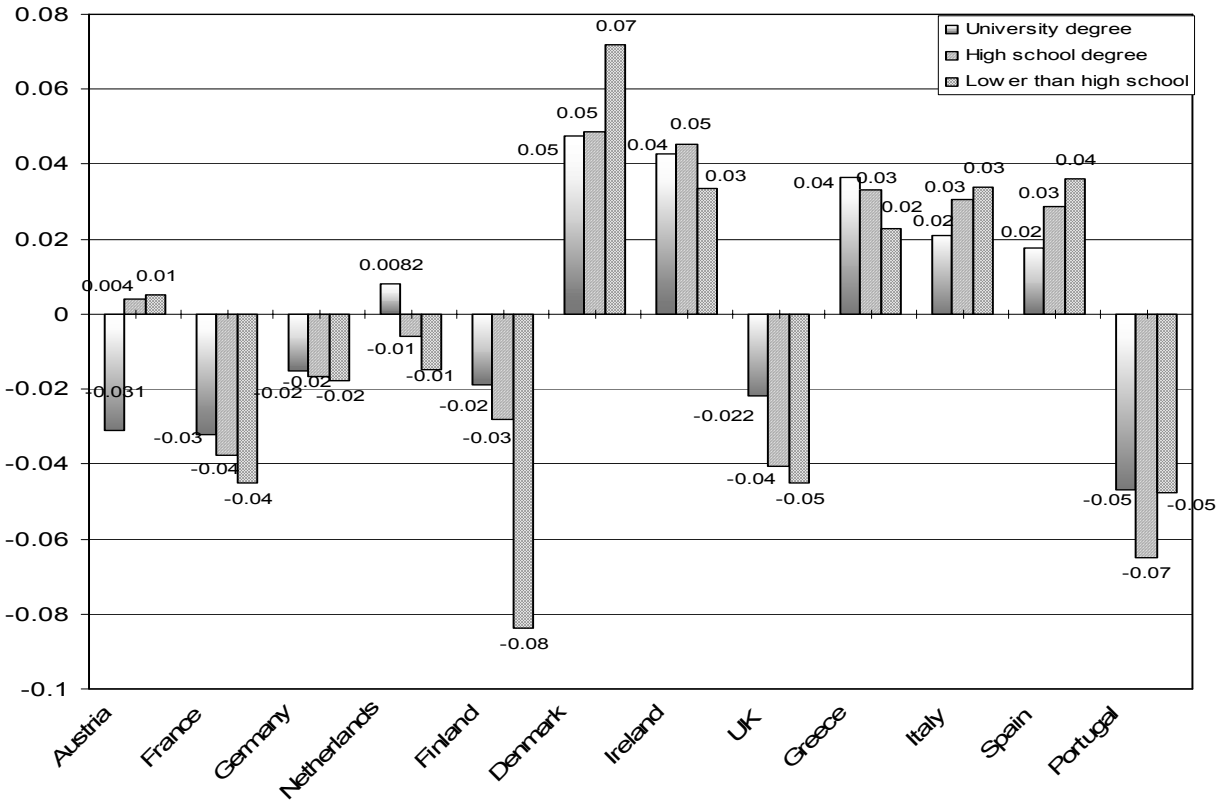

Figure 4
The effect of education across sectors

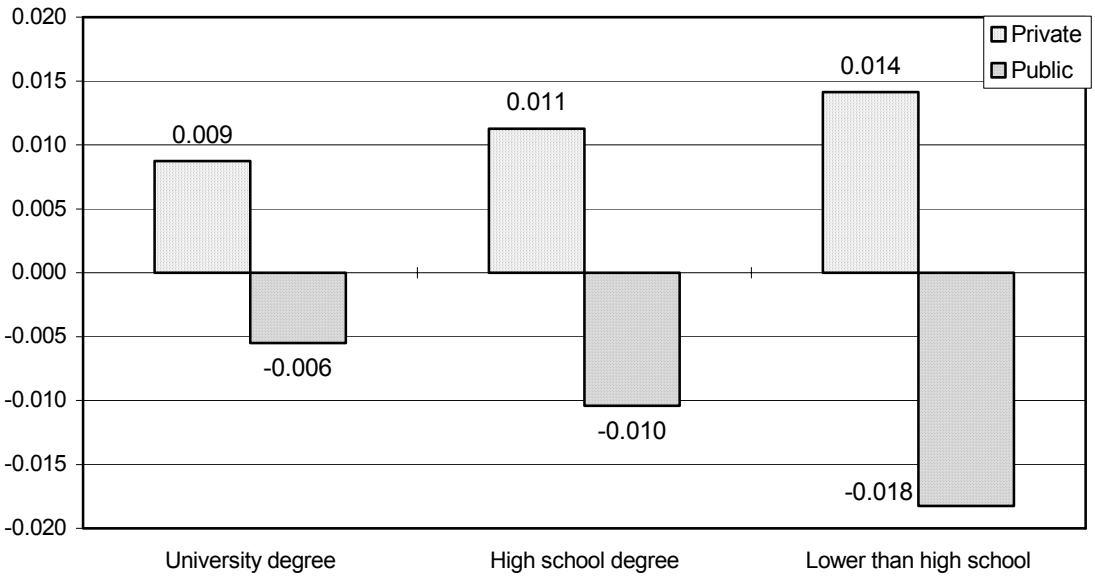

Figure 5
The effect of welfare regime across time