the review of income and wealth

Review of Income and Wealth
Series 62, Number 1, March 2016
DOI: 10.1111/roiw.12152

WAGE INEQUALITY AND WAGE MOBILITY IN EUROPE

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Using data from the European Union Statistics on Income and Living Conditions, this paper investigates wage inequality and wage mobility in Europe. Decomposing inequality into within- and between-group inequality, we analyze to what extent wage inequality and mobility can be explained by observable characteristics. Furthermore, we investigate which individual and household characteristics determine transitions within the wage distribution. We find that overall, mobility reduces wage inequality. While a large part of wage inequality is due to unobservable characteristics, the equalizing effect of mobility mainly occurs within groups. Furthermore, both personal and household characteristics play an important role for wage transitions. Finally, our findings reveal large cross-country differences across Europe.

JEL Codes: J6, J31, P52

Keywords: cross-country analysis, EU-SILC, wage inequality, wage mobility, wage transitions

1. Introduction

The labor markets of the EU Member States feature remarkable differences with respect to their degree of wage inequality (Gottschalk and Smeeding, 2000; Koeniger *et al.*, 2007). However, the inequality measures commonly used only provide a snapshot of the distribution of earnings at a particular point in time. Even if there exists high earnings inequality, it is possible that life-time earnings inequality is much smaller (Buchinsky and Hunt, 1999). Furthermore, measures of inequality do not give any insights into whether the same workers are always at the bottom of the income distribution or if those at the bottom of the income distribution have a chance of improving their income position.

Wage mobility, that is, the fact that individual earnings may change over time, plays a crucial role in this context for several reasons. First, it can contribute to an equalization of earnings (Buchinsky and Hunt, 1999; Dickens, 2000). Second, for

Note: We are grateful to Daniel Schnitzlein, as well as to participants of the 2nd European User Conference for EU-LFS and EU-SILC, the 2012 Annual Conference of the European Society of Population Economics, and of seminars at University of Mannheim and RWI for helpful comments. The paper expands on the results of the project "Studies on 'flexicurity' Lot 1: Study on various aspects of labour market performance using micro data from the European Union Statistics on Income and Living Conditions (EU-SILC)," which was carried out for the European Commission under the European Community Programme for Employment and Social Solidarity (PROGRESS) (2007–2013). The views expressed in this paper are the ones of the authors and do not necessarily reflect those of the European Commission.

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a given wage distribution, the degree of wage mobility by itself is important for worker welfare as high mobility is related to incentives to increase the own income position but also to a greater uncertainty regarding future income. Third, especially for countries that exhibit a high degree of wage mobility and thus a high degree of equality of opportunity, unequal wages may be more acceptable (Nozick, 1974; Rawls, 1999). Finally, wage mobility may have an impact on the demand for redistributive policies (Bénabou and Ok, 2001; Karabarbounis, 2011).

In this paper, we analyze the extent of wage inequality and wage mobility. We do so for almost all EU Member States using a representative and internationally comparable micro data set on individual workers, the European Union Statistics on Income and Living Conditions (EU-SILC). After providing an overview of wage inequality and wage mobility in the European Union, we decompose both measures into their between-group and within-group components, that is, the components which are due to differences in observable characteristics (age, gender, skill level) and the components which remain unexplained. This allows insights into the potential causes of the extent of wage inequality and wage mobility in the EU Member States. Finally, this analysis is extended by an in-depth investigation of the determinants of mobility within the wage distribution at the level of the individual worker.

Our study thus contributes to the literature in several respects. First, we give an overview of wage inequality and wage mobility for many EU Member States and thus update and complement the literature which has done so for some European countries, using the predecessor of the EU-SILC data set, the ECHP.[1] Second, we provide evidence on the role of within and between effects for wage inequality and wage mobility, as well as the individual-specific determinants of wage mobility. Therefore, we complement the results of Hofer and Weber (2002) and Raferzeder and Winter-Ebmer (2007) for Austria, Cholezas and Tsakloglou (2007) for some further European countries, and Buchinsky and Hunt (1999) for the U.S. Finally, EU-SILC enables us to take into account household information in the analysis of individual wage mobility, which provides interesting insights.

The paper is structured as follows. The next section gives an overview of the relevant literature. The third section describes the data set used as well as the routines used to generate our variables of interest, in particular monthly labor income. In the fourth section, we explain the measures of wage inequality and wage mobility used in the analysis, as well as the econometric methodology. The fifth section presents the empirical evidence. The final section summarizes and concludes the discussion.

2. Previous Research

Interest in the extent and evolution of inequality in industrialized countries has been fostered during the last decades by the widening of the earnings distribution in many of these countries (see Katz and Autor, 1999; Atkinson, 2002; Machin, 2008, for reviews of this strand of literature). Besides numerous studies on individual countries, mainly focussing on the U.K. and the U.S. (e.g., Juhn *et al.*,

[1]The next section provides a brief literature overview.

1993; Blanchflower and Slaughter, 1999; Goos and Manning, 2007), there exists a range of studies comparing earnings inequalities across a usually small selection of OECD countries (Burkhauser and Poupore, 1997; Aaberge *et al*., 2002; Hofer and Weber, 2002; Cardoso, 2006). The empirical findings of these studies reveal that there exist large country-specific differences, with the level of inequality and its increase over time being modest in Nordic and Continental European countries and exceptionally high in Anglo-Saxon countries.

The literature providing comparative evidence on wage inequality for a large set of countries is relatively small (some of the few studies on this issue are Koeniger *et al*. (2007), Gottschalk and Smeeding (2000), and Checchi and Garcia-Peñalosa (2008), for OECD countries; and Sologon and O'Donoghue (2012) and Cholezas and Tsakloglou (2007) for European countries). Two recent contributions are Checchi *et al*. (2010) and Van Kerm and Pi Alperin (2013) who provide an overview of wage inequality using EU-SILC data for 26 European countries. Both studies suggest that the most unequal earnings can be observed for Portugal and Eastern European countries, while more compressed earnings distributions can be found for the Scandinavian countries.

The number of studies addressing earnings dynamics and investigating the role of mobility in equalizing the earnings distribution is relatively large. Most of the existing research covers the earnings mobility in one specific country (e.g., Buchinsky and Hunt (1999) for the U.S.; Canto (2000) for Spain; and Jarvis and Jenkins (1998) for Britain). The general evidence is that individual earnings mobility leads to a convergence of wages and thus to a reduction of inequality. Moreover, mobility increases with the length of the time period considered and tends to be larger at the bottom of the earnings distribution than at the top.

Cross-country evidence on the impact of mobility on the earnings distribution is comparatively scarce. This is due to the limited availability of personal longitudinal data which is needed to calculate the percentage reduction in single-year inequality when earnings are averaged over several years (see Section 4). Thus, comparative studies predominantly cover small sets of countries (e.g., Burkhauser and Poupore, 1997; Aaberge *et al*., 2002; Hofer and Weber, 2002; Gregg and Vittori, 2008). One of the few studies providing evidence for a large number of countries is Van Kerm and Pi Alperin (2013), employing recent EU-SILC data. The findings of these cross-country analyses reveal that despite the large differences in earnings inequality, the patterns of earnings mobility are rather similar. Countries with relatively unequal earnings exhibit somewhat lower mobility rates, while the opposite is the case for countries with a more compressed earnings distribution. In contrast to Van Kerm and Pi Alperin (2013), we follow the methodology of Buchinsky and Hunt (1999) for a large set of European countries, which allows a clear link between the measurement of inequality and mobility; we explicitly analyze earnings transitions, both descriptively and econometrically; and we extend the time period under consideration to 2011.

Inequality can be driven by wage differentials between demographic groups such as age, skill level, and gender, as well as by wage differentials within these groups. Decomposing inequality into these two components, Katz *et al*. (1995) show that Britain and the U.S. both experienced substantial increases in between- and within-group wage inequality in the 1980s. According to Buchinsky

and Hunt (1999), the larger part of inequality in the U.S. is due to inequality within groups. Similarly to inequality, wage mobility can be decomposed into a component which reflects the effect of mobility on inequality within demographic groups, and a component which mirrors the effects on between-group wage differences (Section 4). Within-mobility seems to be decisive for the equalization of wages in the U.S. (Buchinsky and Hunt, 1999).

Although the specific transitions within the wage distribution determine overall wage mobility, evidence in this area is scarce. One of the few papers dealing with this issue is Raferzeder and Winter-Ebmer (2007), who analyze the role of individual characteristics for the probability of making an upward or downward transition in the earnings distribution in Austria. Their findings suggest that the lower the starting position of an individual worker, the higher his chance of making an upward transition. Furthermore, white-collar workers have advantages, and changing jobs entails a higher probability of making an upward or downward transition.

There are two main explanations for the observed cross-country differences and the increasing dispersion of the wage distribution over time. The first explanation is the long-run growth in the relative demand for skilled workers induced by globalization and technological change, which in the U.S. has interacted with the rise in the relative supply of skilled workers (Katz and Murphy, 1992). However, as the processes of globalization and technological change have been pervasive across developed economies, these factors are not able to fully account for variations across countries (Acemoglu, 2003).

The second major explanation for differential inequality levels and trends is country differences in institutional settings. Cross-country studies using aggregated data suggest that stronger institutions, in particular those affecting the wage-setting process, as well as more generous redistributive policies tend to reduce the dispersion of earnings (OECD, 2004; Koeniger *et al*., 2007; Checchi and Garcia-Peñalosa, 2008). Employing ECHP data on 14 European countries for the time period 1994–2001, Sologon and O'Donoghue (2012) provide one of the few studies on the role of labor market policies in explaining cross-country differences in inequality. Their findings suggest that especially the strictness of employment protection legislation, the degree of corporatism and union density, as well as the interplay of these institutional factors are important in determining the country-specific patterns in earnings inequality.

3. Data

The empirical analysis in this paper is based on EU-SILC, which provides representative and internationally comparable cross-sectional and longitudinal data for all EU Member States (except Malta) as well as for Norway and Iceland (EUROSTAT, 2010). In this paper, we use the longitudinal version of EU-SILC, a rotational household panel, for the time period 2004–11.[2] This data set provides information on individual household members for a maximum of four years, which allows us to follow individuals over time. For all household members aged

[2]The different longitudinal files are merged together following Engel and Schaffner (2012).

16 and above, the EU-SILC data provide three types of information: yearly information on various individual characteristics (sex, age, skill level, etc.) and household characteristics (size, composition, etc.) at the time of the interview; and information on the employment status of the respondent for each month of the calendar year preceding the interview; and information on the labor income of the respondent for the year preceding the interview, separately for income from paid work (which includes all types of income from paid labor)[3] and from unemployment insurance and other benefit payments. In order to ensure international comparability and for reasons of data availability, we use the information on gross income contained in the data set. Furthermore, we eliminate all observations indicating negative or zero income.[4]

Given that the income information is provided on a yearly basis, we need to compute monthly earnings in order to make this information comparable across individuals who are employed for a differing number of months (Engel and Schaffner, 2012). In order to do so, we exploit the fact that the labour income and the employment status are reported for the same time period, that is, the year preceding the interview. We thus combine the information on yearly labor earnings and the monthly employment status and assign labor income to the 12 calendar months as follows:

1. For workers with only one full-time or part-time employment spell, we divide earnings by the number of months of this spell.
2. If a worker features at least one employment interruption during one year, we extrapolate the monthly earnings computed in the first step to the following (previous) months of the next (preceding) year if the employment status has not changed from one year to the next.
3. If after step 2, an employment spell remains which has not been assigned a monthly income, yearly earnings are reduced by the sum of the earnings assigned to all other employment spells in the respective year. This figure is divided by the number of months of this spell, which gives the monthly income for the employment spell under consideration.

Finally, to preserve the yearly structure of the data set, we focus on one month of employment that is parallel to the quarter of the interview (the month of the interview is not known).

In the following analysis, we focus on full-time employed individuals aged between 16 and 64 living in private households who are not working as soldiers (occupation group "armed forces"). Due to data shortcomings we exclude Iceland, Ireland, and Greece from the analysis.[5] In addition, our analysis of wage mobility requires information on workers during three consecutive years. We therefore restrict our analysis to individuals who are full-time employed in at least three consecutive years. This leads to a drop in the number of observations and an

[3]For the sake of readability, we use the terms "wages," "earnings," "labor income," and "pay" synonymously in the following.

[4]This only affects 2.5 percent of our observations. Further data quality issues are discussed in Iacovou *et al.* (2012).

[5]Ireland is excluded since the income reference period is different to all other countries, and especially different to the calendar data. Therefore, calculation of monthly income is more biased. Iceland and Greece are characterized by small sample sizes that make them too vulnerable to outliers to use them in our analyses.

exclusion of Croatia, Germany, and Sweden, as for all three countries (income) information is available for less than three years. To reduce measurement error we exclude for each country the observations with the highest and lowest percentile of income. The final sample comprises 24 European countries with a total of 328,666 observations.

4. Measurement of Inequality and Mobility

In order to examine wage inequality, we calculate different inequality measures, each of them focusing on specific parts of the earnings distribution. We focus on three members of the Generalized Entropy (GE) class, differing in sensitivity to changes in various parts of the distribution depending on the chosen parameter α. The mean log deviation (MLD, corresponding to $\alpha = 0$) gives more weight to inequality at the bottom; at the opposite side is the Theil 2 index of inequality (corresponding to $\alpha = 2$) which is more sensitive to changes at the top of the earning distribution. The three indices under consideration are defined as follows:

$$GE(\alpha = 0) = I_{\text{mld}}(w) = \frac{1}{N}\sum_{i=1}^{N} log\left(\frac{\bar{w}}{w_i}\right), \tag{1}$$

$$GE(\alpha = 1) = I_{\text{theil1}}(w) = \frac{1}{N}\sum_{i=1}^{N} \frac{w_i}{\bar{w}} log\left(\frac{w_i}{\bar{w}}\right), \tag{2}$$

$$GE(\alpha = 2) = I_{\text{theil2}}(w) = \frac{1}{2N}\sum_{i=1}^{N}\left[\left(\frac{w_i}{\bar{w}}\right)^2 - 1\right], \tag{3}$$

where w_i refers to the earnings of individual i, and $\bar{w}$ to the mean earnings of all individuals.

These inequality measures provide a snapshot of inequality in a single time period, but they are not informative about the persistence of inequality at the individual level. Individuals might change their relative position in the distribution, leading to an equalization of earnings over time. Thus, it is plausible that earnings averaged over several years are less unequal than single-year earnings. To capture these dynamic influences, we follow Buchinsky and Hunt (1999) and calculate the mobility index M, measuring the percentage reduction in single-year inequality when earnings are averaged over T years:

$$M = 1 - \frac{I\left(\frac{1}{T}\sum_{t=1}^{T} w_t\right)}{\left(\sum_{t=1}^{T} \eta_t I(w_t)\right)} \tag{4}$$

where η are earnings occurring in year t as proportion of earnings occurring in the T-year time horizon, and w_t is the vector of individual wages in year t. In our empirical analysis, we use three-year averages, because in most countries

individuals cannot be observed for a longer time period. In practice, this does not constitute a strong constraint for the analysis, as the inequality-reducing effect of mobility has be shown to be highest when averaging wages over a few years. For the U.S., for example, taking averages over a longer period of time does not lead to a strong additional reduction in inequality (Buchinsky and Hunt, 1999).

A decomposition of inequality measures into between and within components allows us to investigate the quantitative importance of observable and unobservable characteristics in this context. Inequality indices that belong to the family of generalized entropy measures can be decomposed as follows (Buchinsky and Hunt, 1999):[6]

$$I = \underbrace{\sum_k v_k \left(\frac{\bar{w}_k}{\bar{w}}\right) I^k}_{I^W} + \underbrace{\frac{1}{k}\sum_{k=1}^{k}\left(\frac{\bar{w}_k}{\bar{w}}\right)\log\left(\frac{\bar{w}_k}{\bar{w}}\right)}_{I^B},$$

where $\bar{w}$ denotes mean earnings. v_k is the weight and I^k is the inequality measure of group k. w_k refers to the group-specific mean earnings, which are predicted by regressing workers' wages on the yearly individual characteristics sex, age, age squared, and skill level (low, medium, and high skills). Using predicted wages instead of group mean wages has the advantage that the problem of small group sizes is avoided. The part of overall inequality which can be attributed to observable group characteristics is referred to as inequality between groups, I^B. On the other hand, the within component, I^W is the earnings inequality that occurs within groups and thus remains unexplained.

Similarly to the inequality measures, the wage mobility index can be decomposed into between mobility (M^B) and within mobility (M^W):

$$M = \underbrace{\left[1 - \frac{I^B\left(\frac{1}{T}\sum_{t=1}^{T} w_t\right)}{\sum_{t=1}^{T}\eta_t I^w(w_t)}\right]\frac{\sum_{t=1}^{T}\eta_t I^B(w_t)}{\sum_{t=1}^{T}\eta_t I(w_t)}}_{M^B S_T^B} + \underbrace{\left[1 - \frac{I^w\left(\frac{1}{T}\sum_{t=1}^{T} w_t\right)}{\sum_{t=1}^{T}\eta_t I^B(w_t)}\right]\frac{\sum_{t=1}^{T}\eta_t I^w(w_t)}{\sum_{t=1}^{T}\eta_t I(w_t)}}_{M^W S_T^W}.$$

In contrast to wage inequality, which is additively decomposable, the two components of wage mobility are weighted with the share of between and within inequality in total single-year inequality S_T^B and S_T^W, respectively.

In order to gain further insights into wage mobility and its determinants, we examine individual transitions between the deciles of the wage distribution. In order to do so, the country-specific wage distribution of each year in the observation period is divided into deciles, based on which we rank individuals in the earnings hierarchy. This allows us to generate transition matrices to capture the patterns of wage mobility. From these transition matrices, we can identify whether, from one year to the next, a worker stays in the same decile of the wage distribution, whether he experiences an upward or whether he experiences a downward transition.

[6]In this paper, we only display the decomposition of inequality and mobility measures based on the Theil 1 index, as it is most sensitive to inequality at both extremes of the earnings distribution. Using the Theil 2 and the MLD indices yields very similar results, which are available from the authors upon request.

We analyze the three corresponding transition probabilities explicitly using a multinomial logit model. As explanatory variables we consider individual characteristics (gender, age, educational level, marital status), household characteristics (number of small children, school-children and elderly in the household, employment status of partner), and job-related characteristics (occupation, dummy variables indicating whether individual has changed jobs directly or indirectly). To take into account time- and country-specific effects, we also include time and country fixed effects.

5. Empirical Evidence

5.1. *Summary Measures of Wage Inequality and Wage Mobility*

A comparison of wage inequality across EU Member States reveals that, independently of the selected type of index, the pay distribution is most equal in Denmark (Table 1 in the online appendix). Low inequality with respect to all parts of the earnings distribution can also be observed in Belgium, Finland, Malta, and the Netherlands. In all countries inequality measured with the Theil 2 index is higher than for the other indices. This finding suggests that inequality at the top of the wage distribution is higher than at the bottom or the middle of the wage distribution. This relationship is most pronounced for Portugal, and can also be largely observed for Estonia, Hungary, and Poland. However, the overall ranking of countries is almost unaffected by the choice of measure. The highest inequality in all three indices can be observed for Portugal, which is in line with OECD (2002, 2010). In addition, the Baltic States are characterized by relatively high levels of inequality.

In order to examine the persistence of wage inequality as well as the equalizing effect of wage mobility, we calculate country-specific mobility indices as described in Section 4. These indices show that across all countries inequality is reduced by between 10.5 percent (Theil 1 index) and 11.4 percent (MLD index) when wages are averaged over three years (Table 1 in the online appendix). With all three types of indices showing reductions of less than 3 percent, Cyprus and the Netherlands are the countries with the highest persistence of wage inequality. They are followed by Finland and Portugal, exhibiting low wage mobility both at the bottom as well as at the top of the wage distribution. The largest equalizing effect of mobility can be observed for Austria, Bulgaria, Latvia, Lithuania, Norway, Slovakia, and Spain. In Austria and Norway mobility reduces wage inequality particularly at the bottom of the wage distribution.

As inequality may be more acceptable with a higher degree of wage mobility, we analyze the link between wage inequality and wage mobility. Figure 1 illustrates this relationship for each country of our data set. In the following we restrict our analysis to the Theil 1 index. First, there is a weak positive relationship between inequality and mobility, with Cyprus and Portugal being outliers. Therefore, over the EU-SILC countries considered, higher wage inequality at the country level is associated with lower inequality regarding 3-year-averaged wages.

Second, the relationship between inequality and wage mobility seems to be more favorable for some country groups than for others. For example, Norway

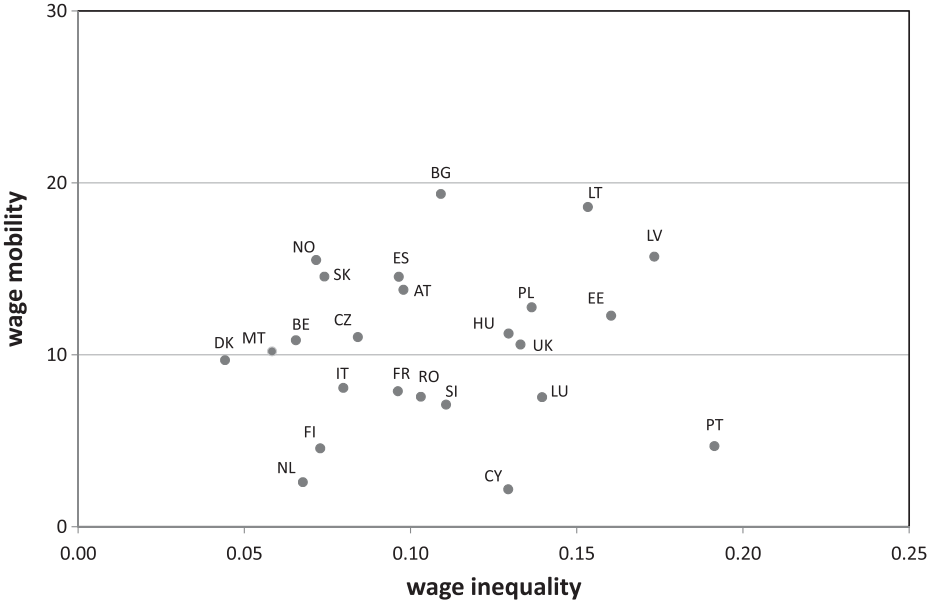

Figure 1. Relationship between wage inequality and wage mobility (total)

Source: EU-SILC, own calculations.

Note: The measures of wage inequality and wage mobility are based on the Theil 1 index.

and Slovakia display a relatively low inequality-to-mobility ratio. This is particularly true for Bulgaria, Lithuania, and Latvia, featuring a relatively low or medium degree of wage inequality and an exceptionally high degree of wage mobility. By contrast, inequality relative to mobility is higher for Finland, Luxembourg, the Netherlands, and especially Cyprus and Portugal. These countries are characterized by relatively high inequality and low mobility.

5.2. *Decomposing Wage Inequality and Wage Mobility*

In order to investigate the quantitative importance of observable person characteristics, we decompose wage inequality and wage mobility into their within and between components.[7] With respect to wage inequality, the cross-country evidence reveals that for most countries in our data set, only a small part of inequality is due to inequality between groups and can therefore be explained by sex, age and educational level, while a much larger part occurs within groups and therefore remains unexplained (Table 2 in the online appendix).

The decomposition of wage inequality reveals that for EU-SILC on average, about 30 percent of inequality is due to differences in observables. However, there are large cross-country differences. The lowest inequality between groups can be observed for Bulgaria, where about 15 percent of wage inequality can be attributed to observable characteristics. In this country sex, age, and skill premia seem to play

[7]We only present the results for the Theil 1 index since differences to the other two indices are small. The latter results are available from the authors upon request.

a minor role compared to wage differentials which are due to unobservables. This finding is in line with Buchinsky and Hunt (1999), who observe for the U.S. that only a small part of inequality can be explained by observable characteristics. By contrast, in Cyprus, Finland, Luxembourg, the Netherlands, Portugal, and Slovenia the between component makes up about 40 to 54 percent of aggregate inequality and is thus much higher.

Similarly to inequality, wage mobility can be decomposed into a within and a between component. The results reveal that for Europe in general, overall wage mobility is almost exclusively driven by within mobility (Table 2 in the online appendix). This means that the effect of wage mobility, which is overall equalizing, is solely induced by the convergence of wages within groups, but not between groups. Looking at the country level, it becomes apparent that in the majority of countries, between mobility is close to zero. However, between mobility is quite substantial in some countries, Romania and Slovakia in particular. In those countries inequality decreases since the differences between groups become smaller when wages are averaged over time. Slovakia is characterised by both high between and high within mobility. By contrast in Norway and the Netherlands, mobility even leads to an increase of wage inequality between groups.[8]

Turning to the link between the components of inequality and mobility, Figure 2 shows that there is a positive relationship between within-group inequality and mobility at the country level. Bulgaria, Latvia, and Lithuania are characterized by high within-group inequality, but also by relatively high within-group mobility. Most of the former EU-15 countries have lower within-group inequality, but also lower within-group mobility. Given their levels of within-group inequality, Cyprus and Portugal feature relatively low within-group wage mobility. By contrast, Norway is characterized by a very high within mobility in relation to within inequality.

Compared to within-group inequality, between-group inequality is more evenly distributed across countries. Therefore, a clear link between between-group inequality and between-group mobility is more difficult to establish (Figure 3). There seems to be a small positive relationship between between-group inequality and mobility, with Portugal being an outlier.

5.3. *Transitions between Wage Deciles*

In this section, we analyze the personal and household characteristics that are correlated with the probability to move up or down the wage distribution. Furthermore, we want to gain better insights into the importance of job mobility for pay transitions. In order to do so, in a first step we compute a transition matrix for movements between earnings deciles from one year to the next (Table 3 in the online appendix). It becomes evident that pay transitions feature strong state dependence, that is, between 36 and 76 percent of all workers remain in the same decile of the earnings distribution from one year to the next, with the tenth decile featuring by far the highest figure.

[8]Note that the estimated between and within mobility indices do not add up to the overall mobility measure since they are not weighted by the shares of between and within inequality.

Figure 2. Relationship between wage inequality and wage mobility (within)

Source: EU-SILC, own calculations.
Note: See notes to figure 1.

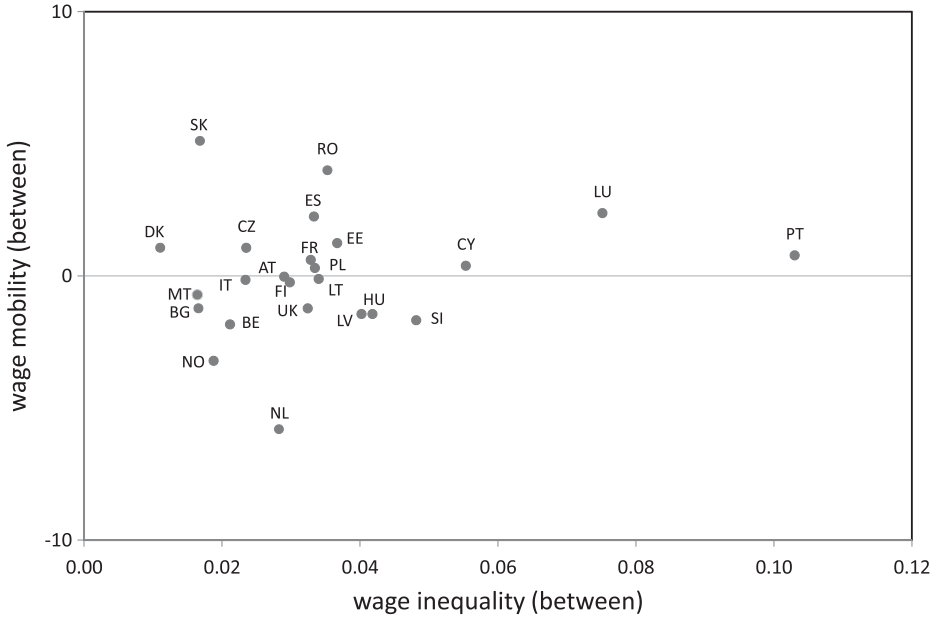

Figure 3. Relationship between wage inequality and wage mobility (between)

Source: EU-SILC, own calculations.
Note: See notes to figure 1.

TABLE 1
Estimation Results: Up- and Downward Earnings Transitions

	Downward transition		Same decile		Upward transition	
	Marg. Effect	SE	Marg. Effect	SE	Marg. Effect	SE
Gender (Ref: Female)						
Male	–0.0043***	0.0011	–0.0042***	0.0015	0.0084***	0.0008
Age group (Ref: Age 15–24)						
Age 25–54	–0.0135***	0.0035	0.0152***	0.0048	–0.0017	0.0017
Age 55–65	–0.0108***	0.0025	0.0130***	0.0034	–0.0021	0.0022
Education level (Ref: Medium skilled (ISCED 3–4))						
lowskill	0.0093***	0.0007	–0.0035**	0.0015	–0.0058***	0.0010
highskill	–0.0145***	0.0013	0.0023	0.0018	0.0121***	0.0011
Household composition						
Number of children (<=4)	0.0044***	0.0008	–0.0067***	0.0013	0.0022***	0.0006
Number of children (5–14)	–0.0001	0.0005	–0.0002	0.0007	0.0003	0.0003
Number of elderly (>=65)	0.0047***	0.0010	–0.0049***	0.0010	0.0002	0.0004
Partner's employment status (Ref: Single)						
Inactive/unemployed	–0.0007	0.0011	–0.0015	0.0010	0.0022***	0.0029
Part-time employed	–0.0062***	0.0009	0.0052***	0.0016	0.0010	0.0056
Full-time employed	–0.0019	0.0016	0.0004	0.0021	0.0015	0.0031
Job change (Ref: no job change)						
direct job change	0.0182***	0.0064	–0.0336***	0.0091	0.0154***	0.0029
indirect job change	0.0745***	0.0139	–0.0967***	0.0173	0.0222***	0.0056
Year (Ref: 2006)						
2005	0.0022	0.0029	–0.0075	0.0055	0.0036	0.0031
2007	0.0050**	0.0022	–0.0037	0.0029	0.0011	0.0017
2008	0.0045	0.0041	–0.0044	0.0066	0.0002	0.0033
2009	0.0002	0.0024	0.0076	0.0047	0.0072***	0.0026
2010	–0.0019	0.0034	0.0116*	0.0060	0.0087***	0.0032
Original decile (Ref: 5th decile)						
1st	–0.3792***	0.0054	0.3693***	0.0061	0.0095***	0.0026
2nd	–0.0269***	0.0023	0.0242***	0.0030	0.0026*	0.0015
3rd	–0.0126***	0.0024	0.0075**	0.0029	0.0049***	0.0011
4th	–0.0054***	0.0020	0.0028	0.0019	0.0025***	0.0007
6th	0.0030**	0.0014	0.0012	0.0018	0.0041***	0.0008
7th	–0.0009	0.0020	0.0119***	0.0024	–0.0106***	0.0008
8th	–0.0038**	0.0017	0.0214***	0.0020	0.0168***	0.0007
9th	–0.0108***	0.0019	0.0364***	0.0025	0.0245***	0.0011
10th	–0.0060***	0.0017	0.4199***	0.0039	0.4145***	0.0013
Pseudo-R^2	0.1031					
No. of obs.	328,666					

Source: EU-SILC, own calculations.
Notes: Multinominal logit model; also contains country dummies; a ***/**/* indicates a 1%/5%/10% level of significance.

In a second step, we present descriptive evidence and estimate a multinomial logit model examining the following three categories: downward mobility (moving down the income distribution by one or more deciles), upward mobility (moving up by one or more deciles), and no mobility (Table 1).[9] The descriptive evidence and the regression results for personal characteristics confirm the results generally found in the literature. First, we find that men are more likely to move up the earnings distribution than women. Second, the evidence suggests a lower wage mobility for

[9]The descriptive evidence is presented in Table 4 in the online appendix.

older workers. Third, lower skills are correlated with a higher probability of moving down or up the wage distribution, and a lower probability of staying in the same wage decile. For high-skilled workers, the probability of downward transitions is lower while the probability of upward transitions is higher.

The analysis of the household variables yields some interesting insights. First, the presence of an inactive or unemployed partner (relative to single households) is positively correlated with the probability of an upward transition. This suggests that in many countries under consideration, the household head often plays the role of the only breadwinner in the household. Separate regressions for men and women show that this result is driven by the male individuals in the sample (Tables 2 and 3). Second, the presence of young children in the household seems to be a significant risk factor, as households with more children display a lower earnings stability (i.e., a lower probability of remaining in the same decile of the earnings distribution) and a higher probability of a downward transition. However, the probability of an upward transition also significantly rises with more young children in the household. Regressions by gender show that these effects can be observed for both men and women. Third, the presence of elderly persons in the household is significantly correlated with an increased probability of a downward transition, which is again true for men and women. This suggests that elderly persons in the household are another risk factor for the earnings dynamics of an individual.

The fact that a worker has experienced a job change is significantly correlated with the probabilities of moving up or down the wage distribution. Relative to no job change, direct job changes are positively correlated with the probability of making either an upward or a downward transition, with the coefficients being similar in magnitude. A positive correlation with an upward transition is expected from standard job search theory, which posits that job-to-job transitions often occur for voluntary reasons, that is, workers move to better jobs (Pissarides, 1994). The positive correlation between direct job changes and downward transitions can be explained by two factors. First, direct job changes can also occur for involuntary reasons, especially when employment security regulations are strict and layoffs do not immediately lead to an inflow into unemployment (Boeri, 1999). Second, given the yearly data structure of our data, indirect job changes imply a comparison between wages which are (at least) two years apart. This may make a straightforward application of job search theory difficult. As for indirect job changes, they are much more strongly correlated with the probability of a downward transition than with the probability of an upward transition. This can be explained by indirect job changes being more likely to occur for involuntary rather than for voluntary reasons.

The estimation results on the original earnings decile reveal that the earnings persistence is higher in the tails of the distribution. The probability to move down the earnings distribution is the lowest for individuals with earnings in the first decile, as for those individuals downward transitions are not possible. Due to the same reason, the lowest probability to move up the earnings distribution can be observed for the tenth decile. Individuals with earnings in the fifth or sixth decile are most likely to make any type of transition. This is quite intuitive since the deciles are the most narrow in the middle of the distribution.

TABLE 2
Estimation Results: Up- and Downward Earnings Transitions, Men

	Downward transition		Same decile		Upward transition	
	Marg. Effect	SE	Marg. Effect	SE	Marg. Effect	SE
Age group (Ref: Age 15–24)						
Age 25–54	–0.0217***	0.0064	0.0222***	0.0069	–0.0005	0.0011
Age 55–65	–0.0152***	0.0052	0.0163***	0.0053	–0.0011	0.0011
Education level (Ref: Medium skilled (ISCED 3–4))						
lowskill	0.0158***	0.0014	–0.0126***	0.0015	–0.0032***	0.0005
highskill	–0.0296***	0.0022	0.0233***	0.0023	0.0064***	0.0009
Household composition						
Number of children (<=4)	0.0043***	0.0010	–0.0049***	0.0011	0.0006**	0.0003
Number of children (5–14)	–0.0005	0.0013	0.0001	0.0014	0.0004**	0.0002
Number of elderly (>=65)	0.0096***	0.0021	–0.0096***	0.0021	0.0000	0.0002
Partner's employment status (Ref: Single)						
Inactive/unemployed	–0.0057*	0.0029	0.0037	0.0029	0.0020***	0.0004
Part-time employed	–0.0164***	0.0026	0.0148***	0.0031	0.0016***	0.0006
Full-time employed	–0.0082**	0.0041	0.0062	0.0043	0.0020***	0.0005
Job change (Ref: no job change)						
direct job change	0.0372***	0.0130	–0.0458***	0.0147	0.0086***	0.0019
indirect job change	0.1278***	0.0194	–0.1383***	0.0201	0.0105***	0.0029
Year (Ref: 2006)						
2005	0.0040	0.0033	–0.0064*	0.0037	0.0023	0.0015
2007	0.0100*	0.0052	–0.0095*	0.0050	–0.0005	0.0007
2008	0.0095*	0.0057	–0.0088	0.0064	–0.0006	0.0011
2009	0.0012	0.0042	0.0033	0.0049	–0.0044***	0.0013
2010	–0.0027	0.0063	0.0079	0.0071	–0.0052***	0.0014
Original decile (Ref: 5th decile)						
1st	–0.3794***	0.0010	0.3718***	0.0023	0.0076***	0.0016
2nd	–0.0531***	0.0050	0.0490***	0.0050	0.0040***	0.0012
3rd	–0.0258***	0.0046	0.0214***	0.0044	0.0044***	0.0007
4th	–0.0108**	0.0046	0.0086**	0.0044	0.0023***	0.0007
6th	0.0036	0.0031	–0.0011	0.0030	–0.0025***	0.0006
7th	–0.0030	0.0045	0.0088*	0.0047	–0.0057***	0.0005
8th	–0.0076**	0.0038	0.0163***	0.0040	–0.0087***	0.0005
9th	–0.0226***	0.0032	0.0358***	0.0033	–0.0132***	0.0006
10th	–0.0130***	0.0022	0.4311***	0.0026	–0.4181***	0.0018
Pseudo-R^2	0.1094					
No. of obs.	189,541					

Source: EU-SILC, own calculations.
Notes: Multinominal logit model; also contains country dummies; a ***/**/* indicates a 1%/5%/10% level of significance.

6. Conclusion

In this paper, we analyze the extent of wage inequality and wage mobility of employed workers in the EU Member States. In doing so, we use a representative and internationally comparable panel data set at the worker level. We decompose both wage inequality and wage mobility into their between and within components, that is, the components which are due to differences in observable characteristics (age, skill, sex) and the components which remain unexplained. Furthermore, we examine the determinants of wage mobility at the individual level.

Concerning the extent of wage inequality and mobility, our findings suggest large differences between EU Member States. Furthermore, wage mobility reduces inequality in all the countries analyzed, although to varying degrees. For most

TABLE 3
Estimation Results: Up- and Downward Earnings Transitions, Women

	Downward transition		Same decile		Upward transition	
	Marg. Effect	SE	Marg. Effect	SE	Marg. Effect	SE
Age group (Ref: Age 15–24)						
Age 25–54	–0.0062***	0.0020	0.0120**	0.0060	–0.0057	0.0048
Age 55–65	–0.0057***	0.0014	0.0118	0.0086	–0.0061	0.0088
Education level (Ref: Medium skilled (ISCED 3–4))						
lowskill	0.0053***	0.0009	0.0130**	0.0052	–0.0184***	0.0044
highskill	–0.0057***	0.0007	–0.0287***	0.0028	0.0345***	0.0025
Household composition						
Number of children (<=4)	0.0049***	0.0007	–0.0193***	0.0046	0.0143***	0.0039
Number of children (5–14)	0.0003	0.0003	0.0009	0.0022	–0.0012	0.0021
Number of elderly (>=65)	0.0016***	0.0004	–0.0027	0.0028	0.0011	0.0026
Partner's employment status (Ref: Single)						
Inactive/unemployed	0.0011***	0.0003	–0.0041	0.0034	0.0029	0.0034
Part-time employed	–0.0002	0.0012	0.0072	0.0145	–0.0070	0.0141
Full-time employed	0.0001	0.0004	0.0007	0.0031	–0.0008	0.0031
Job change (Ref: no job change)						
direct job change	0.0059***	0.0022	–0.0433***	0.0069	0.0374***	0.0051
indirect job change	0.0323***	0.0076	–0.0970***	0.0240	0.0647***	0.0186
Year (Ref: 2006)						
2005	–0.0015*	0.0008	–0.0067	0.0110	0.0082	0.0108
2007	0.0016*	0.0009	0.0033	0.0086	–0.0049	0.0080
2008	–0.0011	0.0014	–0.0045	0.0166	0.0055	0.0161
2009	–0.0020**	0.0008	0.0190**	0.0094	–0.0170*	0.0090
2010	–0.0014	0.0013	0.0230*	0.0133	–0.0216*	0.0127
Original decile (Ref: 5th decile)						
1st	–0.3671***	0.0019	0.3488***	0.0107	0.0183**	0.0089
2nd	–0.0098***	0.0008	0.0148**	0.0065	–0.0051	0.0059
3rd	–0.0041***	0.0011	0.0007	0.0055	0.0034	0.0045
4th	–0.0017***	0.0006	0.0010	0.0042	0.0007	0.0040
6th	0.0019***	0.0005	0.0067*	0.0037	–0.0086**	0.0035
7th	0.0005	0.0006	0.0299***	0.0022	–0.0304***	0.0020
8th	–0.0009	0.0006	0.0542***	0.0022	–0.0533***	0.0023
9th	–0.0029***	0.0010	0.0757***	0.0048	–0.0727***	0.0040
10th	–0.0013	0.0014	0.3960***	0.0029	–0.3947***	0.0017
Pseudo-R^2	0.0965					
No. of obs.	139,125					

Source: EU-SILC, own calculations.
Notes: Multinominal logit model; also contains country dummies; a ***/**/* indicates a 1%/5%/10% level of significance.

countries we find a positive relationship between wage inequality and mobility, that is, countries with a high degree of wage inequality feature a high degree of wage mobility.

Our decomposition of inequality and mobility reveals that within-group inequality is larger than between-group inequality in virtually all the countries analyzed, that is, unobservable characteristics are more important than observable characteristics in this context. The inequality-reducing effect of wage mobility is found to work mainly through wage mobility within, rather than between, groups. This result indicates that wage differences due to unobservables become smaller over time. This may be due to employer learning about the true productivity of workers, but could also be explained by shocks (e.g., business cycle effects) being reduced over time. Furthermore, between-group inequality becomes a larger part

of overall inequality when a longer time perspective is applied. Therefore, age, skill, and gender are more important determinants of inequality regarding life-time income than in cross-sections. These results are in line with both evidence from the U.S. (Buchinsky and Hunt, 1999) and earlier evidence for Europe using the ECHP (Cholezas and Tsakloglou, 2007).

Exploring which factors contribute to wage inequality, our analysis of wage transitions identifies several factors which are associated with a higher risk of making a downward transition: low skills, the presence of young children or of elderly persons in the household, and job changes, especially when they occur for involuntary reasons. From a policy point of view, these results call for more and better facilities both with respect to child care and with respect to care for elderly persons, as such facilities have the potential to reduce downward wage transitions, particularly for women.

The results of our analysis raise at least two further research questions. First, given the importance of within-group inequality, it would be interesting to explore which unobservable factors contribute to earnings mobility. This would be possible with richer micro data sets containing relevant information, for example on the locus of control of an individual person, or on the social context a person lives in. Second, our analysis is confined to an equalization of earnings over a three-year horizon, which has been shown to be the most relevant time period for earnings equalization by Buchinsky and Hunt (1999). Given the large cross-country differences revealed in our analysis, it seems important to examine whether the speed of equalization differs between countries. Third, also with respect to cross-country differences, it seems important to explore the role of institutions further. These questions are however beyond the scope of this paper.

References

Aaberge, R., A. Björklund, M. Jäntti, M. Palme, P. J. Pedersen, N. Smith, and T. Wennemo, "Income Inequality and Income Mobility in the Scandinavian Countries Compared to the United States," *Review of Income and Wealth*, 48(4), 443–69, 2002.

Acemoglu, D., "Cross-Country Inequality Trends," *Economic Journal*, 116(485), 121–49, 2003.

Atkinson, A. B., "The Distribution of Earnings in OECD Countries," *International Labour Review*, 146(1–2), 41–60, 2002.

Bénabou, R. and E. A. Ok, "Social Mobility and the Demand for Redistribution: The Poum Hypothesis," *Quarterly Journal of Economics*, 116(2), 447–87, 2001.

Blanchflower, D. G. and M. J. Slaughter, "The Causes and Consequences of Changing Income Inequality," in A. Fishlow and K. Parker (eds), *Growing Apart: The Causes and Consequences of Global Wage Inequality*, Council on Foreign Relation Press, Washington DC, 67–94, 1999.

Boeri, T., "Enforcement of Employment Security Regulations, On-the-Job Search and Unemployment Duration," *European Economic Review*, 43(1), 65–89, 1999.

Buchinsky, M. and J. Hunt, "Wage Mobility in the United States," *Review of Economics and Statistics*, 81(3), 351–68, 1999.

Burkhauser, R. V. and J. G. Poupore, "A Cross-National Comparison of Permanent Inequality in the United States and Germany," *Review of Economics and Statistics*, 79, 10–17, 1997.

Canto, O., "Income Mobility in Spain: How Much Is There?" *Review of Income and Wealth*, 46(1), 85–102, 2000.

Cardoso, A. R., "Wage Mobility: Do Institutions Make a Difference?" *Labour Economics*, 13(3), 387–404, 2006.

Checchi, D. and C. Garcia-Peñalosa, "Labour Market Institutions and Income Inequality," *Economic Policy*, 23(56), 601–49, 2008.

Checchi, D., V. Peragine, and L. Serlenga, "Fair and Unfair Income Inequalities in Europe," IZA Discussion Papers 5025, Institute for the Study of Labor (IZA), 2010.

Cholezas, I. and P. Tsakloglou, "Earnings Inequality in Europe: Structure and Patterns of Inter-Temporal Changes," IZA Discussion Papers 2636, Institute for the Study of Labor (IZA), 2007.
Dickens, R., "Caught in a Trap? Wage Mobility in Great Britain: 1975–1994," *Economica*, 67(268), 477–97, 2000.
Engel, M. and S. Schaffner, "How to Use the EU-SILC-Panel to Analyse Monthly and Hourly Wages," Ruhr Economic Paper 386, Rheinisch-Westfälisches Institut für Wirtschaftsforschung, 2012.
EUROSTAT, "Description of Target Variables: Cross-Sectional and Longitudinal. EU-SILC 065 (2008 operation)," Technical Report, Directorate F: Social Statistics and Information Society, Luxembourg, 2010.
Goos, M. and A. Manning, "Lousy and Lovely Jobs: The Rising Polarization of Work in Britain," *Review of Economics and Statistics*, 89(1), 118–33, 2007.
Gottschalk, P. and T. M. Smeeding, "Empirical Evidence on Income Inequality in Industrialized Countries," in A. B. Atkinson and F. Bourguignon (eds), *Handbook of Income Distribution*, North Holland, Amsterdam, 261–307, 2000.
Gregg, P. and C. Vittori, "Exploring Shorrocks Mobility Indices Using European Data," The Centre for Market and Public Organisation 08/206, Department of Economics, University of Bristol, UK, 2008.
Hofer, H. and A. Weber, "Wage Mobility in Austria 1986–1999," *Labour Economics*, 9(1), 563–77, 2002.
Iacovou, M., O. Kaminska, and H. Levy, "Using EU-SILC Data for Cross-national Analysis: Strengths, Problems and Recommendations," Technical Report, ISER Working Paper Series, 2012.
Jarvis, S. and S. P. Jenkins, "How Much Income Mobility is There in Britain?" *Economic Journal*, 108, 428–43, 1998.
Juhn, C., K. Murphy, and B. Pierce, "Wage Inequality and the Rise in Returns to Skill," *Journal of Political Economy*, 101, 401–42, 1993.
Karabarbounis, L., "One Dollar, One Vote," *Economic Journal*, 121(553), 621–51, 2011.
Katz, L. F. and D. H. Autor, "Changes in the Wage Structure and Earnings Inequality," in O. Ashenfelter and D. Card (eds), *Handbook of Labor Economics*, Elsevier, Amsterdam, 1463–555, 1999.
Katz, L. F. and K. M. Murphy, "Changes in Relative Wages, 1963–1987: Supply and Demand Factors," *Quarterly Journal of Economics*, 107, 1232–66, 1992.
Katz, L. F., G. W. Loveman, and D. G. Blanchflower, "A Comparison of Changes in the Structure of Wages in Four OECD Countries," in *Differences and Changes in Wage Structures*, NBER Chapters, National Bureau of Economic Research and University of Chicago Press, Chicago, 25–66, 1995.
Koeniger, W., M. Leonardi, and L. Nunziata, "Labour Market Institutions and Wage Inequality," *Industrial and Labour Relations Review*, 60(3), 340–56, 2007.
Machin, S., "An Appraisal of Economic Research on Changes in Wage Inequality," *LABOUR*, 22, 7–26, 2008.
Nozick, R., *Anarchy, State, and Utopia*, Basic Books, New York, 1974.
OECD, *OECD Employment Outlook 2002*, Technical Report, OECD Publishing, Paris, 2002.
———, *OECD Employment Outlook 2004*, Technical Report, OECD Publishing, Paris, 2004.
———, *OECD Employment Outlook 2010*, Technical Report, OECD Publishing, Paris, 2010.
Pissarides, C. A., "Search Unemployment with On-the-Job Search," *Review of Economic Studies*, 61(3), 457–75, 1994.
Raferzeder, T. and R. Winter-Ebmer, "Who Is on the Rise in Austria: Wage Mobility and Mobility Risk," *Journal of Economic Inequality*, 5(1), 39–51, 2007.
Rawls, J., *A Theory of Justice*, Harvard University Press, Cambridge, MA, 1999.
Sologon, D. M., and C. O'Donoghue, "Equalizing or Disequalizing Lifetime Earnings Differentials? Earnings Mobility in EU: 1994–2001," in J. Bishop (ed), *Inequality, Mobility, and Segregation: Essays in Honor of Jacques Silber*, Research in Economic Inequality, Vol. 20, Emerald Group Publishing, 2012.
Van Kerm, P. and M. N. Pi Alperin, "Inequality, Growth and Mobility: The Intertemporal Distribution of Income in European Countries 2003–2007," *Economic Modelling*, 35, 931–9, 2013.

Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

Appendix Table 1: Wage inequality and mobility by country
Appendix Table 2: Decomposition of wage inequality and mobility, Theil 1
Appendix Table 3: Transitions between earnings deciles
Appendix Table 4: Transitions between wage deciles by worker characteristics