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ABSTRACT

Earnings Dynamics and Inequality among Men across 14 EU Countries, 1994-2001: Evidence from ECHP

This paper analyses the dynamic structure of individual earnings across 14 EU countries over the period 1994-2001 using ECHP. Understanding wage mobility and its link with the evolution of cross-sectional earnings inequality is important from a welfare perspective, particularly given the large variety in national cross-sectional wage inequality. This is highly relevant in the context of the changes that took place in the EU labour market policy framework after 1995 under the incidence of the 1994 OECD Jobs Strategy, which recommend policies to increase wage flexibility, lower non-wage labour costs and allow relative wages to better reflect individual differences in productivity and local labour market conditions. What is the source of earnings variation? Did the increase in cross-sectional wage inequality observed in some countries result from greater transitory fluctuations in earnings and individuals facing a higher degree of earnings mobility? Or is this rise reflecting increasing permanent differences between individuals with mobility remaining constant or even falling? Are there common trends in earnings inequality and mobility across countries? Equally weighted minimum distance methods are used to estimate the covariance structure of earnings, decompose earnings into a permanent and a transitory component and conclude about their evolution. As expected, a notable change was an increased country heterogeneity, which translated itself in the level and evolution of the cross-sectional earnings inequality components. The decrease in cross-sectional inequality was accompanied by an increase in mobility, and therefore a decrease in the importance of the permanent component relative to the transitory component in Denmark, Belgium and Spain, and by a decrease in earnings mobility in Germany, France, UK, Ireland and Austria. In Luxembourg, Italy, Greece, Portugal, and Finland, the increase in cross-sectional inequality was accompanied by a decrease in mobility, whereas in Netherlands by an increase.

JEL Classification: C23, D31, J31, J60

Keywords: panel data, wage distribution, inequality, mobility

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1. INTRODUCTION

Interest in the extent of individual earnings dynamics has increased greatly in recent years and was fuelled mainly by the rise in earnings inequality experienced by many developed countries during the 1980s and 1990s, which triggered a strong debate with respect to the driving factors and the implications of this increase.

This paper analyses the dynamic structure of individual earnings in order to explain what is happening behind the changes in the distribution of labour market income across 14 EU countries over the period 1994-2001 using ECHP. More precisely, the aim is to examine the extent to which changes in cross-section earnings inequality reflect transitory or permanent components of individual lifecycle earnings variation. So far, at the EU level, no study attempted to analyse and to understand in a comparative manner earnings dynamics and the contributions of changes in permanent and transitory components of earnings variation to the evolution of cross-sectional earnings inequality.

Understanding wage dynamics is vitally important from a welfare perspective, particularly given the large variation in the evolution of cross-sectional wage inequality across Europe over the period 1994-2001. It is highly relevant to understand what the source of this variation is. Did the increase in cross-sectional wage inequality observed in some countries result from greater transitory fluctuations in earnings and individuals facing a higher degree of earnings mobility? Or is this rise reflecting increasing permanent differences between individuals with mobility remaining constant or even falling? What about countries that recorded a decrease in cross-sectional earnings inequalities, what lessons can we learn from them? Is this decrease the effect of an increase in mobility which helped individuals improve their income position in the distribution of permanent income? Are there common trends in earnings inequality and mobility across different countries? Understanding the contributions of the changes in permanent and transitory components of earnings variation to increased cross-sectional earnings inequality is very useful in the evaluation of alternative hypotheses for wage structure changes and for determining the potential welfare consequences of rising inequality. (Katz and Autor 1999)

These questions are relevant in the context of the changes that took place in the EU labour market policy framework after 1995 under the incidence of the 1994 OECD Jobs Strategy and the 2000 Lisbon Agenda, which recommended policies to increase wage flexibility, lower non-wage labour costs and allow relative wages to better reflect individual differences in productivity and local labour market conditions. (OECD 2004) Before 1995, Europe could have been described as making labour more expensive, accompanied by a decline in employment and an increase in productivity. Starting at different dates for different policies, Europe began the process of shifting toward making labour less expensive, accompanied by higher employment per capita but lower average productivity per hour.(Dew-Becker and Gordon 2008) This appears to have worsened the apparent trade-off between a strong employment performance and a more equal distribution of earnings, consistent with relative labour demand having shifted towards high-skilled workers. OECD (2004)

Dew-Becker and Gordon (2008) analyzed the background changes that were implemented in the European labour market under the two strategies and their impact on employment per capita after 1995. These strategies were aimed to turnaround the trends imposed by the labour market policies implemented in Europe in the 1970s and 1980s to reduce employment per capita. The reasoning behind reducing employment per capita was to fight unemployment (see Nickell et al. 2005). To alleviate the high unemployment, governments increased the generosity and duration of unemployment benefits. To limit the increase in unemployment, they attempted to regulate layoffs through employment protection legislation (EPL). To spread the available jobs across the population, they resorted to legislation favouring early retirement and shorter hours of work, the so called "work sharing" (Alesina, Glaeser et al. 2006).

The turnaround in the institutional and policy framework occurred more or less after 1995, and the main catalyst was the 1994 OECD Jobs Strategy. The shift was moved from alleviating unemployment to policies aimed to increase employment per capita. For a detailed description of the changes in the policy and institutional variables refer to Dew-Becker and Gordon (2008) and OECD (2004). Here are just a few of them. The tax wedge, defined as the total percentage rate of personal income and payroll taxation, exhibited a high turnaround at exactly 1995 for all the countries except the continental ones. The largest decline was in the Anglo-Saxon countries, followed by Nordic and Mediterranean countries. The OECD index of employment protection legislation (EPL), which is considered to be a key factor in generating labour market rigidity, also exhibited a sharp turnaround at the same time: it was relatively flat until the early 1990's and then exhibited a substantial decline in the Nordic and Mediterranean countries. In the Continental countries it started decreasing after 1995 and continued until early 2000s. The index of product market regulation (PMR) declined through almost the entire period, though the decline began at varying times in the different country groups. Union density shows similar behaviour. Unemployment benefits rose. The possible static effects of these policies are raising employment and reducing productivity, whereas the possible dynamic effects are raising investment following the raise in employment and raising incentives for adoption of new technologies, which implied a shift in the demand for skills.

OECD (2004) reported that there has been a steady decline of trade union density in most OECD countries over the past few decades, except for Belgium, Denmark, Finland and Sweden. Regarding the collective bargaining coverage, which measures the real extent to which salaried workers are subject to union-negotiated terms and conditions of employment, most countries are characterized by stable or increasing coverage rates. Regarding the level of the bargaining structures, all OECD countries moved towards greater decentralization, which could result in greater inter-firm wage differentials. As concluded by the OECD (2004) report, a high union density and bargaining coverage, and a high centralisation/co-ordination of wage bargaining tend to go hand-in-hand with lower overall wage inequality.

As pointed out both by Dew-Becker and Gordon (2008) and OECD (2004), the most notable change after 1995 in Europe has been increased country heterogeneity. We will investigate how this heterogeneity translates itself in the level and components of the cross-sectional earnings inequality. Equally weighted minimum distance methods are used to estimate the covariance structure of earnings, decompose earnings into a permanent and a transitory component and conclude about their evolution.

The structure of this paper is as follows. Section two introduces the theoretical background for wage differentials. Section three provides a description of the data. Section three describes of the dynamic structure of individual log earnings for 14 EU countries under analysis. Section four introduces the econometric specification and estimation method of covariance structures. Section five fits the error components models to the covariance structure for each country, decomposing the change in inequality into that accounted for by the change in the permanent and transitory components. Lastly, section six offers some conclusions.

2. THEORETICAL MODEL OF THE DETERMINANTS OF WAGE DIFFERENTIALS

As pointed out by Katz and Autor (1999), the existing literature contains many explanations for the rise in earnings inequality experienced by many developed countries during the 1980s and 1990s. However they are not generally applicable to all countries.

The theory regarding the determinants of wage differentials goes back to Adam Smith, which provided a comprehensive discussion in his capital work, The Wealth of Nations. It was emphasized that wage differentials are determined by competitive factors relating to the workplace (e.g. cost of training), by innate abilities and by labour market institutional factors, which regulated wages, restricted wages and labour mobility. The tension between the demand and supply factors and the institutional factors affecting wage structures that emerged from Adam Smith's analysis has remained until today one of the key themes of research on the wage structure. Following Freeman and Katz (1994), this supply-demand-institutions (SDI) explanation for the changes in the wage structure has three parts.

The first part assumes that different demographic and skill groups are imperfect substitutes in production, which implies that shifts in the demand and supply for labour skills can alter wage and employment outcomes. Potential important sources of shifts in the relative demand among skill groups include skill-biased technological change and a complementary increase in the prices of other inputs, and forces of globalization (trade and outsourcing). Sources of relative supply include cohort size variation, changes in access to education, immigration.

The second part states that the shock in the demand and supply may have different effects on wages and employment, depending on different wage-setting mechanisms and other labour market institutional factors. The stronger the wage-setting mechanism is, meaning the higher trade union density, the higher the union coverage and the higher the centralisation/co-ordination of wage bargaining, the less impact these shocks have on wages. As argued by OECD (2004), there is strong evidence that unions reduce wage inequality and that this compression effect is strongest in countries where union membership and bargaining coverage are high, and bargaining is centralised and/or co-ordinated (Aidt and Tzannatos, 2002; Blau and Kahn, 1999, 2002; OECD, 1997a). National labour markets characterized by decentralized wage bargaining experience also a higher skill premia and a higher responsiveness of wages to local conditions, therefore a higher wage inequality.

Thirdly, institutional changes, such as changes in the degree of unionization or the degree of centralization/co-ordination of collective bargaining can have an impact on the wage structures.

Katz and Autor (1999) used the SDI model to look at cross-country differences in wage structure changes. The shift in demand for more skilled workers did not result in a sharp increase in wage dispersion for all OECD countries. The differences in the growth of skills supply appear to be an important factor in explaining cross-country differences. The same holds for labour market institutions. Countries in which unions, wage bargaining structure play a larger role in the determination of wages recorded smaller increases in inequality. However, the key issue in the interplay between demand, supply and institutions is the erroneous assumption that institutional change is exogenous. The reality is that institutions are influenced by labour market forces. As argued by Freeman and Gibbons (1995), shifts in supply and demand that raise relative wage differentials are expected to reduce the strength of the centralized collective bargaining and lower union influence on the wage setting mechanism.

2.1.Permanent and transitory components of earnings inequality

Following the terminology introduced by Friedman and Kuznets (1954), individual earnings are composed from a permanent and a transitory component. The permanent component of earnings reflects personal characteristics, education, training and other systematic elements. The transitory component captures the chance and other factors influencing earnings in a particular period and is expected to fade off over time. Following the structure of individual earnings, the overall inequality is composed from the inequality in the transitory component and the inequality in the permanent component of earnings.

One approach for explaining changes in wage differential is to decompose overall wage inequality into the permanent and transitory components. The evolution of the overall earnings inequality is determined by the cumulative changes in the two inequality components. The change in each of the components could be linked with factors from the SDI model. An increase in the cross-sectional earnings inequality could reflect a rise in the permanent and/or transitory component of earnings inequality. The rise in the inequality in the permanent component of earnings may be consistent with increasing returns to education, on-the-job training and other persistent abilities that are among the main determinants of the permanent component of earnings, meaning enhanced relative earnings position of the highly skilled individuals. (Mincer 1957; Mincer 1958; Mincer 1962; Mincer 1974; Hause 1980). The increase in the inequality of the transitory component of earnings may be attributed to the weakening of the labour market institutions (e.g. unions, government wage regulation, and internal labour markets), increased labour market instability, increased competitiveness, a rise in the temporary workforce which increase earnings exposure to shocks. A period of skill-biased technological change with the spread of new technologies can on the one hand increase the demand for skills, and on the other hand it can increase earnings instability. (Katz and Autor 1999). Rodrik (1997) argued that also globalization and international capital mobility can increase wage instability. Overall, the increase in the return to persistent skills is expected to have a much larger impact on long-run earnings inequality than an increase in the transitory component of earnings. (Katz and Autor 1999; Moffitt and Gottschalk 2002)

Next we introduce several models of earnings dynamics that have been dominating the literature on transitory and permanent earnings inequality over the past 30 years. To begin with, we introduce the simplest specification, which in spite of its simplicity provides a very intuitive insight into the decomposition of earnings into their permanent and transitory components. Based on this specification earnings are being decomposed as follows:

$$Y_{it} = \mu_i + v_{it}, \quad \mu_i \sim iid(0,\sigma_\mu^2), \quad v_{it} \sim iid(0,\sigma_v^2), \quad t = 1,...,T_i,\ i = 1,...,N \tag{1}$$

where μ_i represents the permanent time-invariant individual specific component and v_{it} represents the transitory component, which is independent distributed both over individuals and time. This model imposes very rigid restrictions on the covariance structure of earnings:

$$Cov(Y_{it}, Y_{is}) = \begin{cases} \sigma_\mu^2 + \sigma_v^2, & t = s \\ \sigma_\mu^2, & t \neq s \end{cases}$$

Because μ_i is assumed to incorporate the effect of lifetime persistent individual specific characteristics such as ability, the variance of the permanent component σ_μ^2 represents the persistent dispersion of earnings or the inequality in the permanent component of earnings. The transitory shocks are captured by the transitory variance σ_v^2 and are assumed to persist only one year.

This model facilitates the understanding of the inequality decomposition into its permanent and transitory components. The variance of earnings at a certain point in time, as a measure of earnings dispersion, is composed both from a permanent and transitory dispersion ($\sigma_\mu^2 + \sigma_v^2$). The covariances, on the other hand, are determined solely by the permanent component (σ_μ^2). Therefore, the assessment of the relative importance of the two components in the overall earnings dispersion is straightforward: the ratio $\sigma_\mu^2 / \sigma_y^2$ captures the relative importance of the permanent component, whereas the ratio σ_v^2 / σ_y^2 captures the relative importance of the transitory component.

Notwithstanding its attractive features, the empirical evidence rejected the rigid restrictions imposed by model (1). One of the main drawbacks of model (1) is that it does not allow for changes in earnings inequality over time. Other studies ((Katz 1994; Moffitt and Gottschalk 1995) took the model complexity further by allowing the covariance structure of earnings to vary over time. To account for these time effects, these models considered also time specific loading factors or shifters on both components, which allow the parameters of the process to change with calendar time.

$$Y_{it} = \lambda_{1t}\mu_{it} + \lambda_{2t}v_{it} \tag{2}$$

$\lambda_{kt}, k = 1,2$ are time-varying factor loadings on the permanent and transitory components of earnings. The variance of Y_{it} implied by this model takes the form:

$$Var(Y_{it}) = \lambda_{1t}^2\sigma_\mu^2 + \lambda_{2t}^2\sigma_v^2 \tag{3}$$

An increase in either time loading factors generates an increase in the cross-sectional earnings inequality. The nature of the change in inequality depends on which of the loading factors changes. On the one hand, a persistent rise in λ_{1t} increases the permanent or long-run inequality (inequality in earnings measured over a long period of time, such as lifetime earnings). As λ_{1t} can be interpreted as time-varying return to skills or skill price, its increase suggests that the relative labour market advantage of high skill workers is enhanced. In this situation, the autocovariances grow in greater proportion that than the variance, causing the autocorrelation to increase. As a consequence, the increase in overall cross-sectional inequality is accompanied by a decrease in mobility. On the other hand, an increase in λ_{2t} without a change in λ_{1t} increases cross-sectional earnings inequality by increasing the transitory inequality, but without any impact on long-run or permanent inequality. In this situation the rise in the variances is not accompanied by a rise in the autocovariances, hence autocorrelations decrease and the increase in the overall inequality is accompanied by an increase in mobility. (Baker and Solon 2003) As pointed out by Katz and Autor (1999), λ_{1t} maintains the rank of the individuals in the earnings distribution, but causes a persistent increase in the spread of the distribution and an increase in λ_{2t} changes the rank of the individual in the short-run. In other words an increase in the time parameters associated with the permanent component of earnings indicates a growing earnings inequality with no impact on the relative position of individuals in the distribution of permanent earnings, whereas an increase in the transitory time parameters indicates an increase in earnings mobility.

Although model (2) incorporates changes over time in the permanent and temporary components of earnings inequality, it disregards other important features of earnings dynamics. Firstly, it disregards the cohort effects. As argued by Katz and Autor (1999), the increased wage inequality may arise from increased dispersion of unobserved labour quality within recent entry cohorts, steaming from unequal school quality. Some studies brought evidence against the hypothesis that the return to education is the same for different cohorts. These changes could be attributed either to the cohort effects or to the larger impact of the labour market shocks on younger than on older cohorts of workers. In the same line of thought, Freeman (1975) put forward the "active labour market" hypothesis, which postulates that changes in the labour market conditions, such as changes in the supply and demand for skills, affect mainly new entrants in the labour market. To account for these cohort effects, these models considered also cohort specific loading factors or shifters on both components, which allow the parameters of the process to change with cohort.

$$Y_{it} = \gamma_{1c}\lambda_{1t}\mu_{it} + \gamma_{2c}\lambda_{2t}v_{it} \tag{4}$$

where $\gamma_{jc}, j = 1,2$ are cohort specific loading factors.

Secondly, regarding the permanent component, some studies brought evidence in favour of the "random growth rate model" or the "profile heterogeneity model": (Hause 1977; Lillard and Weiss 1979; MaCurdy 1982; Baker 1997; Cappellari 2003)

$$\mu_{it} = \mu_i + \varphi_i age_{it}, \quad \mu_i \sim iid(0,\sigma_\mu^2), \quad \varphi_i \sim iid(0,\sigma_\varphi^2), \quad E(\mu_i,\varphi_i) = \sigma_{\mu\varphi} \tag{5}$$

According to this model, which is consistent with labour market theories such as human capital, and matching models, each individual has a unique age-earning profile with an individual specific intercept (initial earnings μ_i) and slope (earnings growth φ_i) that may be systematically related. The variances σ_μ^2 and σ_φ^2 capture individual heterogeneity with respect to time-invariant characteristics and age-earnings profiles. The covariance between μ_i and φ_i, $\sigma_{\mu\varphi}$, represents a key element in the development of earnings differentials over the active life. A positive covariance between μ_i and φ_i implies a rising inequality in the permanent component of earnings over the life cycle, which is consistent with the school-matching models where the more tenure one individual accumulates, the more is revealed about his ability. Thus highly educated people are expected to experience a faster growth in their earnings as the quality of the match is revealed to their employers. A negative covariance implies that the two sources of heterogeneity offset each other, which is consistent with the on-the-job training hypothesis (Mincer 1974; Hause 1980). A negative covariance is expected to generate mobility within the distribution of the permanent component of earnings. (Cappellari 2003)

This structure is equivalent to a random coefficient model where the intercept and the coefficient on age in model (5) are randomly distributed across individuals. Therefore, because earnings evolve along an individual specific age profile, a good prediction of future earnings requires additional information besides the current earnings.

An alternative/additional specification for the permanent component of earnings is the "random walk model" or the "unit root model", which is used in the literature to accommodate earnings shocks that might have permanent effects: (MaCurdy 1982; Abowd and Card 1989; Moffitt and Gottschalk 1995; Dickens 2000).

$$u_{ia} = u_{i,a-1} + \pi_{ia}, \quad \pi_{ia} \sim iid(0, \sigma_\pi^2), \quad E(u_{i,a-1}, \pi_{ia}) = 0 \tag{6}$$

Equation (6) specifies the random walk process, where the current value depends on the one from the previous age and an innovation term π_{ia}, which represent white-noise non-mean-reverting shocks to permanent earnings. In other words, π_{ia} accommodates any permanent re-ranking of individuals in the earnings distribution. As argued by Baker (1997), the intuition for this model is not obvious, but the high persistency of the unit root model might result from low rates of depreciation on human capital investments or labour market conditions through implicit contacts. In this model, current earnings are a sufficient statistic for future earnings.

Thirdly, regarding the transitory component of earnings, previous research has brought evidence that transitory earnings might be serially correlated. Therefore, a more general autocorrelation structure is called for, that relaxes the restriction on v_{it}'s from the canonical model. For the construction of such a structure, longitudinal studies on earnings dynamics turned to error processes from the literature on time series analysis. Based on MaCurdy (1982), the structure of the transitory component, v_{it}, is assumed to follow an ARMA(p,q) process:

$$\sum_{j=0}^{p} \rho_j v_{it-j} = \sum_{j=0}^{q} \theta_j \varepsilon_{it-j}, \quad \varepsilon_{it} \sim iid(0, \sigma_\varepsilon^2), \quad v_{i0} \sim (0, \sigma_{0,c}^2), \tag{7}$$

ε_{it} is assumed to be white noise with mean 0 and variance σ_{ε}^2. The variance $\sigma_{0,c}^2$ measures the volatility of shocks at the start of the sample period and σ_{ε}^2 the volatility of shocks in subsequent years. ρ_j is the autoregressive parameter with $\rho_0 = 1$, which measures the persistence of shocks. θ_j is the moving average parameter with $\theta_0 = 1$., which accommodates sharp drops of the lag-j autocovariance compared with the other autocovariances. In this model, the autoregressive and moving average parameters are assumed to be constant over time.

2.2.Earnings Mobility

Another aspect relevant to the evolution of earnings differentials is earnings mobility, defined by Katz and Autor (1999) as the rate at which individuals shift positions in the earnings distribution. Earnings mobility is closely related to the importance of the permanent and transitory components in earnings variation. A large contribution of the permanent component implies that individual earnings are highly correlated over time and individuals do not change their income position to a large extent experiencing low rates of earnings mobility. Therefore, the changes in earnings mobility are determined by the extent to which the changes in cross-sectional inequality are driven by changes in the permanent or transitory variance. A rise only in the permanent inequality is associated with a decline in mobility rates, whereas a rise only in the transitory variance is associated with an increase in mobility. Equal proportional increases in both components will leave mobility unchanged in spite of increasing overall cross-sectional inequality. It becomes obvious that the question regarding the link between earnings mobility and earnings inequality does not have a straight forward answer. As underlined by Dickens(1999), “changes in earnings mobility could either work to offset or to increase changes in cross-sectional dispersion”, with very different implications for permanent earnings inequality. Indeed, mobility is beneficial when it helps low paid individuals to improve their income position in the long-term income distribution.

There are many approaches to measuring mobility. In this study, mobility is measured by the ratio between the permanent and transitory inequality.

2.3.Literature Review

The existing literature on earnings dynamics is predominantly based on US data. (Atkinson, Bourguignon et al. (1992) provide a comprehensive survey of the literature on earnings dynamics until 1992. Earlier work focused on fitting statistical models to the earnings process. E.g. Lillard and Willis (1978), Lillard and Weiss (1979), MaCurdy (1982), Abowd and Card (1989) fitted models to the autocovariance structure of earnings and hours, but they did not account for the changes in the autocovariance structure of earnings over time.

Later work, Moffitt and Gottschalk (1995; 1998; 2002) used PSID to estimate the permanent and transitory components of male earnings and how it evolved over time. In Moffitt and Gottschalk (1998), the earnings process was fit by a permanent component, modelled as a random walk in age and a highly persistent serially correlated transitory component, with weights on these components for each year. They found that the increase in the cross-sectional inequality of individual earnings and wage rates in the U.S. between 1969-1991 has been roughly equally composed of increases in the variances of the permanent and transitory components of earnings, with little change in earnings mobility rates. Since most of the theoretical explanations for the increase in inequality have been aimed at explaining increases in the variance of the permanent component of earnings (e.g. increases in the price of skills), they found their result surprising and unexpected. Therefore, in their most recent study, Moffitt and Gottschalk (2008), estimated the trend in the transitory variance of male earnings using PSID from 1970 to 2004. They found that the transitory variance increased substantially in the 1980's and remained at the same level until 2004, for both less and more educated workers. Moreover, the transitory variance appears to have a strong cyclical component: its increase accounts for between 30 and 65 of the rise in the overall inequality, depending on the period.

Using the PSID, Baker (1997) compared two competing specifications for the permanent component of earnings: the "profile heterogeneity or the random growth model" and the "random walk model". In spite of the increased popularity of the latter, Baker (1997) proved that the profile heterogeneity model provides a better representation of the data.

Baker and Solon (2003) decomposed the growth in earnings inequality into its persistent and transitory components using longitudinal income tax records from Canada. The earnings process was fit by a permanent component, modelled as mixed process composed of a random growth and a random walk in age and a highly persistent serially correlated transitory component, with weights on these components for each year. They found that growth in earnings inequality reflects both an increase in the long-run inequality and an increase in earnings instability.

Up until recently, little work has been carried out in Europe on the dynamic nature of individual earnings. Dickens (2000) analysed the pattern of individual male wages over time in Great Britain using the New Earnings Survey (NES) panel data set for the period 1975-1995. This study divided the data into year birth cohorts and analysed the auto-covariance structure of hourly and weekly earnings for each cohort. In the tradition of Moffitt and Gottschalk (1998), the earnings process was fit by a permanent component, modelled as a random walk in age and a highly persistent serially correlated transitory component, with weights on these components for each year. The results showed that about half in the rise of the overall cross-sectional inequality can be explained by the rise in the permanent variance and the rest by the rise in the persistent transitory component.

Ramos (2003) analysed the dynamic structure of earnings in Great Britain using the British Household Panel Study for the period 1991-1999. The earnings specification followed a similar specification with Baker and Solon (2003). Using information on monthly earnings of male full-time employees, this study decomposed the covariance structure of earnings into its permanent and transitory components and concluded that the increase in inequality over the 1990's was due to increased in earnings volatility. Moreover, the relative earnings persistent was found to decline over the lifecycle, which implies a lower mobility for younger cohorts. These findings are at odds with previous literature on earnings dynamics both for Great Britain and the OECD. Unlike previous literature, this study accounted also for the effect of observed characteristics and found that human capital and job related characteristics account for nearly all persistent earnings differences and that the transitory component is highly persistent.

Kalwij and Alessie (2003) examined the variance-covariance structure of log-wages over time and over the lifecycle of British men from 1975 to 2001, controlling cohort effects. Their model follows closely the specification used by Abowd and Card (1989), Dickens (2000) and Baker and Solon (2003) accounting also for cohort effects. They showed that the increase in the cross-sectional inequality was caused mainly by the increase in the transitory component of earnings and to a lesser extent by an increase in the permanent wage inequality. Thus the increase in cross-sectional inequality was accompanied by an increase in earnings mobility.

Cappellari (2003) used the Italian National Social Security Institute for the period 1979-1995 and decomposed the male earnings autocovariance structure into its long-term and transitory components using a model specification similar with Moffitt and Gottschalk (1995) and Backer (1997). The model included a permanent component, modelled as a random growth in age and a highly persistent serially correlated transitory component, with weights on these components for each year and cohort. The findings showed that growth was determined by the long-term earnings component. Other evidence on the contribution of permanent and transitory earnings components to cross-sectional inequality has become available in recent year in Sweden (Gustavson, 2004).

3. DATA

The study is conducted using the European Community Household Panel (ECHP)[1] over the period 1994-2001 for 14 EU countries. Not all countries are present for all waves. Luxembourg and Austria are observed over a period of 7 waves (1995-2001) and Finland over a period of 6 waves (1996-2001). Following the tradition of previous studies, the analysis focuses only on men.

A special problem with panel data is that of attrition over time, as individuals are lost at successive dates causing the panel to decline in size and raising the problem of representativeness. Several papers analysed the extent and the determinants of panel attrition in ECHP. A. Behr, E. Bellgardt, U. Rendtel (2005) found that the extent and the determinants of panel attrition vary between countries and across waves within one country, but these differences do not bias the analysis of income or the ranking of the national results. L.Ayala, C. Navrro, M.Sastre (2006) assessed the effects of panel attrition on income mobility comparisons for some EU countries from ECHP. The results show that ECHP attrition is characterized by a certain degree of selectivity, but only affecting some variables and some countries. Moreover, the income mobility indicators show certain sensitivity to the weighting system.

In this paper, the weighting system applied to correct for the attrition bias is the one recommended by Eurostat, namely using the "base weights" of the last wave observed for each individual, bounded between 0.25 and 10. The dataset is scaled up to a multiplicative constant[2] of the base weights of the last year observed for each individual.

For the empirical analysis, individuals are categorized into four birth cohorts, which are followed through time. Ideally, one should use birth cohorts formed from people born in a particular year.

[1] The European Community Household Panel provided by Eurostat via the Department of Applied Economics at the Université Libre de Bruxelles.

[2] The multiplicative constant equals e.g. p*(Population above 16/Sample Population). The ratio p varies across countries so that sensible samples are obtained. It ranges between 0.001-0.01.

The limited number of observations forces us to group more birth years in one birth cohort. The first birth cohort are people born between 1940 and 1950, the second one people born between 1951-1960, the third cohort people born between 1961 and 1970 and lastly people born between 1971-1981. This grouping allows the analysis of the earnings covariance structure for individuals of the same age, followed at different points in time.

For this study we use real log hourly wage adjusted for CPI of male workers aged 20 to 57, born between 1940 and 1981. Only observations with hourly wage lower than 50 Euros and higher than 1 Euro were considered in the analysis. The resulting sample for each country is an unbalanced panel. The choice of using unbalanced panels for estimating the covariance structure of earnings is motivated by the need to mitigate the potential overestimation of earnings persistence that would arise from balanced panels where the estimation is based only on people that have positive earnings for the entire sample period. Details on the number of observations, inflows and outflows of the sample by cohort over time for each country are provided in **Table 1** to Table 14 in the Annex 8.4.

4. THE DYNAMIC AUTOCOVARIANCE STRUCTURE OF HOURLY EARNINGS

To begin with, it is informative to have a description of the dynamic structure of individual log hourly earnings for all 14 countries under analysis. The autocovariance structure of earnings is computed for each cohort separately, as well as overall. The overall autocovariance structure of earnings is displayed in Figure 1, whereas the structure by cohort is included in Annex 8.4, Figure 2. Based on these trends we will establish the main characteristics of the model aimed to fit the autocovariance structure of earnings for all cohorts and formulate main expectations.

The overall autocovariance structure of earnings displays both similar and diverging patterns across countries. In the beginning of the sample period, the overall inequality appears to be the highest in Portugal, followed by Ireland, Spain, France, Luxembourg, UK, Greece, Germany, Austria, Italy, Belgium, Netherlands, Finland and Denmark. In 2001, Portugal still records the highest inequality, followed by Luxembourg, France, Greece, Spain, UK, Italy, Germany, Ireland, Netherlands, Finland, Belgium, Austria and Denmark.

The general picture is that the variance of log hourly earnings appears to decrease over the sample period in Germany, Denmark, Belgium, France, UK, Ireland, Spain and Austria, to increase in Netherlands, Luxembourg, Greece, Portugal and Finland. The purpose of this paper is to decompose the variance for each country into the permanent and transitory variance, and conclude which of these components were the main factor triggering the evolution of overall inequality over time.

The common pattern across all countries is that all lags autocovariances show in general similar pattern as the variance. They are positive and quite large in magnitude relative to the variances. The distance between autocovariances at consecutive lags falls at a decreasing rate. The biggest fall is registered by the lag-1 autocovariance, after which the covariances appear to converge gradually at a positive level. Variances reflect both the permanent and the transitory components of earnings, whereas higher order covariances reflect the permanent component of earnings. Therefore, the evolution of the covariances, at all orders, suggests the presence of a permanent individual component of wages and a transitory component which is serially correlated. Moreover, the sharp decline of the first lag autocovariance is consistent with the presence of a moving average process of first order.

Both mean earnings and all lags autocovariances vary over time, which provides a first sign suggesting the presence of nonstationarity in the dynamic structure of earnings.

In all countries, the autocovariances display different patterns across cohorts, supporting the hypothesis of cohort heterogeneity with respect to individual earnings dynamics. The general picture is that, in all countries, the variance for all cohorts appears to follow the evolution of the overall variance, but the evolution is not monotonous and the rate of change differs among cohorts. In general, in countries that record a decrease in the variance, the older the cohort, the steeper the decrease. For those that record an increase in the variance over time, the older the cohort, the steeper the increase is. Moreover, the younger the cohort is the lower the autocovariances are. Hence, given that higher order autocovariances capture the permanent component of earnings, it is reasonable to expect that in all countries, for younger cohorts, the transitory variance plays a larger role in the earnings formation than the permanent component compared with older cohorts.

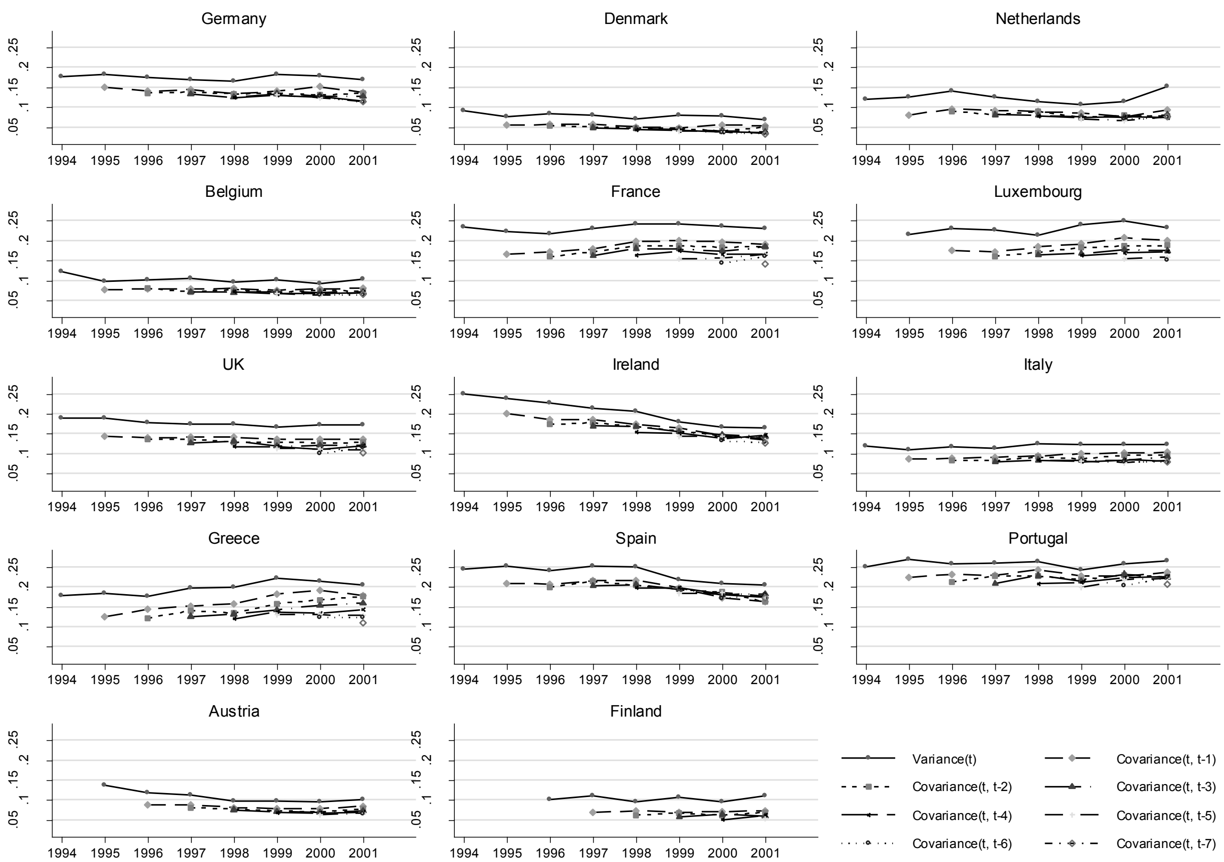

Figure 1. Overall Autocovariance Structure of Hourly Earnings: Years 1994-2001

For all cohorts, all lags autocovariances show in general similar pattern as the variance, in line with the overall pattern. The evolution of the covariances, at all orders, suggests the presence of a permanent individual component of wages and a transitory component which is serially correlated. Moreover, the sharp decline of the first lag autocovariance is consistent with the presence of a moving average process of first order. Similar with the overall trend, there is evidence of nonstationarity in the dynamic structure of earnings by cohort.

The evolution of the autocovariance structure of earnings provides a first clue with respect to the contribution of the permanent and transitory inequality to the overall inequality. Given that higher order autocovariances capture mainly permanent differentials, the transitory variance can be approximated by the difference between the variance and high order autocovariances. Therefore we can build some hypothesis regarding the evolution of the two components across the 14 EU countries. First, the relative contribution of high order covariances appears to be very high (more than roughly 50%) in Germany, Netherlands, France, Luxembourg, UK, Ireland, Italy, Spain, Portugal and Austria, suggesting that in these countries the inequality in the permanent component of earnings accounts for more than 50% from the overall inequality. Therefore these countries are expected to exhibit a high persistency in earnings inequality due to enhanced relative labour market advantage of high skill workers, strong wage setting mechanisms and strict EPL.

Second, among the countries that record a decrease in the variance of earning inequality, we expect a decrease in the permanent inequality and an increase in the transitory inequality in Germany, Spain and Belgium, implying also an increase in mobility. A decrease in both components is expected in Denmark with unexpected results on mobility, whereas in France, UK, Ireland and Austria we expect an increase in the permanent component and a decrease in the transitory component, which implies a decrease in mobility. For the countries that recorded an increase in the overall inequality over the sample period we expect this to be the result of an increase in both the permanent and transitory inequality in Netherlands with unknown effects on mobility, of an increase in the permanent inequality and decrease in the transitory inequality in Luxembourg, Italy, Greece, Portugal and Finland, with a negative effect on mobility.

To look at these lifecycle effects more clearly, it is necessary to remove the time effect that is present in these within cohort autocovariances. The figures illustrating lifecycle autocovariances can be provided upon request from the authors. In all countries, all lags autocovariances of log real gross hourly earnings show a similar pattern as the variance. They are positive and evolve parallel with the variance, at different rates over the life cycle. They rise sharply over the life cycle until the late 30s and early 40s, after which they have a rather stable evolution up until late 50s, when more noise can be observed in the variance-covariance structure. The diminishing rate of increase of all lags autocovariances, which characterizes the life cycle from the age of 20 until the late 50s, is consistent with the presence of a permanent component of earnings that rises with age at a diminishing rate. (Dickens, 2000) Moreover, the autocovariances display a noisy evolution over the lifecycle which increases with age, which might suggest also the presence of a random walk in age.

Comparing across years, the life cycle profile of the auto-covariances of log gross hourly earnings appears to become steeper over time in France, Luxembourg, Ireland, Italy, Greece, Portugal and Finland. The slope of the life cycle profile can be interpreted as the returns to the permanent component of earnings, therefore steeper slopes in later years imply increasing returns to the permanent component of earnings over time.

To sum up, the description of the dynamic structure of individual earnings for men suggests five main features of the data. First, the covariance elements are not the same at all lags. They decrease with the lag at a decreasing rate and converge gradually at a positive level, suggesting the presence of a transitory element which is serially correlated and of a permanent individual component of earnings. The most popular specification for the serially correlated term is the AR(1) process. However, the fact that the lag-1 autocovariance drops to a larger extent compared with the other autocovariances and that the autocovariances at high orders decline very slowly suggest that earnings cannot be modelled simply as a first-order autoregressive process. Therefore a more complex ARMA (p, q) process might be a better choice, where p represents the order of the autoregressive process and q the order of the moving average process. Second, as the autocovariances and mean earnings vary over the sample period, they cannot be assumed to be stationary over sample period. The stationarity assumption was tested and rejected using the methodology introduced by MaCurdy (1982). One way to capture this feature is to incorporate period specific parameters, meaning that the permanent individual component and the transitory component of earnings are allowed to vary with time. Third, as autocovariances vary with age controlling for the period effect, they cannot be assumed to be stationary over the life cycle. This non-stationarity can be captured by modelling the permanent individual component as random walk and/or random growth in age. Lastly, the variance covariance structure appears to be cohort specific, which can be incorporate by parameters that allow the permanent and transitory components to vary between cohorts.

5. Econometric specification and Estimation method of covariance structures

After having presented the trends in the individual male earnings across 14 EU countries, the aim of this section is to fit a parsimonious model to the autocovariance structure of earnings for all cohorts and for all countries. This model can be use to analyse the changes in the permanent and transitory components of earnings over the sample period and their impact on the overall level of earnings inequality.

This section is structured as follows. The first part provides an overview of some parsimonious error component models exiting in the literature. The second one explains the econometric specification for the earnings model. The third part introduces the specification of the covariance structure of earnings residuals and the equally weighted minimum distance method used to fit the model to the covariance structure for each cohort. Finally, the estimation results are presented.

5.1. Econometric Earnings Specification

In order to differentiate lifecycle dynamics from secular changes in earnings inequality, the earnings differentials are analysed within the four cohorts defined in the previous section. The first step is to de-trend earnings for each cohort. The empirical specification of earnings follows the structure:

$$Y_{ict} = \overline{Y_{ct}} + r_{ict}, \quad t = 1,...,T_i,\ i = 1,...,N_c \qquad (8)$$

where Y_{ict} is the natural logarithm of real hourly earnings of the ith individual, from the cth cohort in the tth year, $\overline{Y_{ct}}$ is the year-cohort specific mean and r_{ict} is an error term which represents the individual-specific deviation from the year-cohort specific mean. The demeaned earnings r_{ict} are assumed to be independently distributed across individuals, but autocorrelated over time. Earnings differentials within each cohort can be characterised by modelling the covariance structure of individual earnings $VarCov(Y_{ict}) = E(r_{ict}, r_{ict-s}),\ s = 0,...,T_c - t_{0c}$.[3]

This study approaches the problem of choosing a longitudinal process for the demeaned earnings, r_{ict} following the methodology used by MaCurdy(1981) and MaCurdy (1982), meaning in a similar manner with time series. The inspection of the covariance structure of demeaned earnings suggested the following features of the data: (i) the elements of the autocovariance structure decrease with the lag at a decreasing rate and (ii) they converge gradually at a positive level; (iii) the lag-1 autocovariance drops to a larger extent compared with higher order autocovariances, which decline more gradually; (iv) the autocovariances and mean earnings vary over the sample period, so they cannot be assumed to be stationary over sample period; (v) the autocovariances vary with age controlling for the period effect, hence they cannot be assumed to be stationary over the life cycle; (vi) the variance covariance structure appears to be cohort specific.

Each of these features are incorporated in our model. Feature (i) suggests the presence of an AR(1) process, but the presence of feature (iii) calls for a more complex ARMA (1, 1) or ARMA(1, 2) process. Feature (ii) can be captured by the presence of the permanent component. Feature (vi) is captured by incorporating period specific parameters, meaning that the permanent individual component and the transitory component of earnings are allowed to vary with time. The life cycle non-stationarity of the autocovariance structure of earnings mentioned in feature (v) can be captured by modelling the permanent individual component as random walk and/or random growth in age. Cohort heterogeneity is incorporate by parameters that allow the permanent and transitory components to vary between cohorts.

The idea is to start with a broad class of models for r_{ict} and employ preliminary data analysis procedures to choose among competing specifications. In this way one avoids choosing a model specification that is broadly inconsistent with the data. The following general specification encompasses all the relevant aspects of earnings dynamics considered above.

$$\begin{aligned} &Y_{ict} - \overline{Y_{ct}} = r_{ict} = \gamma_{1c}\lambda_{1t}[\mu_i + \varphi_i age_{it} + u_{iat}] + \gamma_{2c}\lambda_{2t}v_{it} \\ &\mu_i \sim iid(0,\sigma_\mu^2), \quad \varphi_i \sim iid(0,\sigma_\varphi^2), \quad E(\mu_i,\varphi_i) = \sigma_{\mu\varphi} \end{aligned} \tag{9}$$

$$u_{iat} = u_{i,a-1,t-1} + \pi_{ia}, \quad \pi_{ia} \sim iid(0,\sigma_\pi^2), \quad E(u_{i,a-1,t-1},\pi_{iat}) = 0 \tag{10}$$

$$v_{it} = \rho v_{it-1} + \varepsilon_{it} + \theta\varepsilon_{it-1}, \quad \varepsilon_{it} \sim (0,\sigma_\varepsilon^2), \quad v_{i0} \sim (0,\sigma_{0,c}^2) \tag{11}$$

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[3] T_c and t_{0c} represent the total number of years and the first year observed for each cohort.

Based on equation (9), earnings can be decomposed into a permanent component $\gamma_{1c}\lambda_{1t}[\mu_i + \varphi_i age_{it} + u_{iat}]$ and a transitory component $\gamma_{2c}\lambda_{2t}v_{it}$. The component $\mu_i + \varphi_i age_{it}$ models an individual profile heterogeneity as a function of age, called also a random growth (see (Baker 1997), (Moffitt and Gottschalk 1995)), where μ_i and φ_i are time invariant individual intercept and slopes with variance σ_μ^2 and σ_φ^2. Besides the random vector of intercepts and slopes (μ_i, φ_i), the parameterization of individual earnings dynamics includes also a random walk process (Equation (10)). (Moffit and Gottschalk (1995), Baker and Solon (2003)) The variance of the first period shock (assumed to be at age 20, which is also the lowest age observed in our dataset) is estimated together with the σ_μ^2 and is considered part of the unobserved heterogeneity.

Equation (11) specifies the transitory component of earnings which evolves as an ARMA(1,1) process, where the serial correlation ρ parameter captures the decreasing rate of decay of the covariances with the lag, the moving-average parameter θ captures the sharp drop of the lag-1 autocovariance compared with the other autocovariances, and ε_{it} are white-noise mean-reverting transitory shocks. The variance $\sigma_{0,c}^2$ measures the volatility of shocks at the start of the sample period, σ_ε^2 the volatility of shocks in subsequent years and ρ the persistence of shocks. Measurement error in this model is captured by this transitory component.

The non-stationary pattern of earnings is accommodated using time specific loading factors, both on the permanent and transitory component of earnings, $\lambda_{kt,\ k=1,2;\ t=0,7}$, normalized to 1 in the first wave for identification[4]. Cohort heterogeneity is accommodated by allowing both the permanent and the transitory component to vary with the cohort. $\gamma_{jc},\ j=1,2$ are cohort loading factor, normalized to 1 for the cohort born in 1940-1949 for identification.

5.2.Specification of the Covariance Structure of Earnings

When working with ARMA(p,q) processes in the context of panel data, MaCurdy (1981), MaCurdy (1982) and Anderson and Hsiao (1982) underlined the need for a treatment of initial conditions[5]. As illustrated in equations (13) and (14), the autoregressive process induces a recursive structure in the moments: the variance-covariance in year *t* depends on the transitory variance-covariance in year *t-1*. If one tracks the recursion back to the first sample year for each cohort, this raises the question of what is the transitory variance for each cohort in that year. In earlier stage of the literature on earnings dynamics, it was common to restrict the initial transitory variance to be the same for all cohorts. In line, with the most recent literature on earnings dynamics, our model acknowledges that earnings volatility varies across cohorts because they illustrate different stages of the lifecycle and have experienced different period effects, therefore such a strong assumption is untenable. Following MaCurdy (1981), MaCurdy

[4]1994 refers to t=0

[5] See Macurdy(1982, page 92/93)

(1982), we treat the initial transitory variances of the 4 cohorts as 4 additional parameters to be estimated. The complete specification of the covariance structure of earnings is included in Annex 8.1. The covariance structure for the first sample period takes the form:

$$Var(Y_{ic0}) = E(r_{ic0}r_{ic0}) = \sigma_\mu^2 + \sigma_\varphi^2 E(age_{i0}^2) + 2\,\mathrm{cov}(\mu_i\varphi_i)E(age_{i0}) + (a-20)\sigma_\pi^2 + Var(v_{i0}) \;\; if\; t=0 \quad (12)$$

The covariance structure for subsequent years can be expressed as follows:

$$\begin{aligned} Var(Y_{ict}) = E(r_{ict}r_{ict}) = \gamma_{1c}^2\lambda_{1t}^2[\sigma_\mu^2 + \sigma_\varphi^2 E(age_{it}^2) + 2\,\mathrm{cov}(\mu_i\varphi_i)E(age_{it}) + \sigma_\pi^2(a-20)] + \\ + \gamma_{2c}^2\lambda_{2t}^2[\rho^2 Var(v_{it-1}) + \sigma_\varepsilon^2(1+2\rho\theta+\theta^2)] \;\; if\; t>0 \end{aligned} \quad (13)$$

$$\begin{aligned} &Cov(Y_{ict}Y_{ict-s}) = E(r_{ict}r_{ict-s}) \\ &= \gamma_{1c}^2\lambda_{1t}^2\{\sigma_\mu^2 + \sigma_\varphi^2 E(age_{it})E(age_{it-s}) + \mathrm{cov}(\mu_i\varphi_i)[E(age_{it}) + E(age_{it-s})] + \sigma_\pi^2(a-s-20)\} + \\ &+\gamma_{2c}^2\lambda_{2t}\lambda_{2t-s}[\rho Cov(v_{it-1}, v_{it-s})] \;\; if\; t>0 \;\;\&\;\; s>1 \end{aligned} \quad (14)$$

$$\begin{aligned} &Cov(Y_{ict}Y_{ict-1}) = E(r_{ict}r_{ict-1}) = \\ &= \gamma_{1c}^2\lambda_{1t}^2\{\sigma_\mu^2 + \sigma_\varphi^2 E(age_{it})E(age_{it-1}) + \mathrm{cov}(\mu_i\varphi_i)[E(age_{it}) + E(age_{it-1})] + \sigma_\pi^2(a-1-20)\} \\ &+\gamma_{2c}^2\lambda_{2t}\lambda_{2t-1}\{\rho Var(v_{it-1}) + \theta\sigma_\varepsilon^2)\} \;\; if\; t>0 \;\;\&\;\; s=1 \end{aligned} \quad (15)$$

5.3. Estimation of Covariance Structures

Covariance structures are models that specify a structure for the covariance matrix of the regression error. They can be used to model structures for error dynamics and measurement error. The goal is to estimate the parameters of the covariance structure of earnings for all cohorts. This can be used to analyse the changes in the permanent and transitory components of earnings over the sample period.

The parameters of the models are fit to the covariance structure for each cohort using equally weighted minimum distance methods of estimation. The methodology used is the same as that utilized by Cappellari (2003), Baker and Solon (2003), Ramos (2003), Kalwij and Alessie (2003), Dickens (2000), Baker (1997), Abowd and Card (1989), Cervini and Ramos (2006) adapted to unbalanced panels. The technical details are included in Annex 5.3.

6. RESULTS

The general specification of the error component model outlined in the previous section that encompasses all relevant aspects of earnings dynamics considered above is fit to the elements of the covariance matrix for all four cohorts pooled together[6] for each country separately. For choosing the best model for each country we follow a general to specific strategy. The strategy used to choose between competing models is included in Annex 8.3.

[6] i.e. 144 auto-covariances for countries observed over 8 waves, 122 for those with 7 waves and 84 for those with 6 waves.

We present only the models that fit data the best for each country. The estimation results are illustrated in Table 15, Annex 8.4. Following Dickens (2000), all variances are restricted to be positive by estimating the variance equal to the exponent of the parameter. The reported variance estimates in Table 15 represent the exponent of the parameter and the reported standard errors correspond to the parameter estimates.

The formulation of the permanent component of earnings differs between countries. In Germany, Netherlands, UK, Ireland, Italy, Greece, Spain and Finland it follows a random growth model with time and cohort specific loading factors. The estimated coefficients for the permanent component of earnings show that time-invariant heterogeneity and age-earning profile heterogeneity plays a significant role in the formation of long-term earnings differentials in all these countries. Individual specific heterogeneity plays the highest role in Germany, followed by Spain, Netherlands, Greece, UK, Ireland and Italy, which suggests that in Germany there is a higher dispersion in the time-invariant individual specific attributes that determine wage differentials.

The estimated random slope variance implies that hourly earnings growth for an individual located one standard deviation above the mean in the distribution of φ is the largest in Germany, where it is with 4.89%[7] faster than the cohort mean, followed by Greece, Spain, Netherlands, Ireland, UK and Finland with rates between 1% and 1.41% and Italy with 0.89%. All these countries have a negative covariance between the time invariant individual specific effect and the individual specific slope of the age-earning profile, which implies that the initial and lifecycle heterogeneity are negatively associated. This negative association corresponds to the trade-off between earnings early in the career and subsequent earnings growth and is consistent with the on-the-job training hypothesis (Mincer, 1974). Therefore, this suggests the presence of mobility within the distribution of permanent earnings over the sample period. These findings reinforce the results from previous studies.

Therefore for these countries the evolution of the permanent component without the time loading factors could be either increasing or decreasing. The time-specific loading factors for the permanent component are highly significant with values close to 1 in all countries. The trends of the returns to the permanent component vary to a large extent across countries. One common feature is that they reflect, as was emphasized before, trends in the high-order autocovariances in the data. These estimates show that overall, controlling for age and cohort effects, the returns to skills decreased over the sample period in Netherlands, UK, Ireland, Italy, Greece, Spain and increased in Germany and Finland. The trends over one year intervals differ between countries, some records a smooth evolution, others noisier. For example, Netherlands experienced decreases in returns almost every second year. In UK, the returns increased in 1997 and 2001 and decreased in the rest. Ireland recorded more noise in the first half of the period and a clear decline after 1997. In Italy, 1998 and 1999 appear to be years with increases in return to skills, in Greece every second year, in Spain 1996 and 1998. Germany experienced increasing returns to human capital until 2000, and Finland in 1997 and 2001. Therefore, in these years, the relative position of the highly skilled individuals was enhanced.

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[7] $4.89 = 100 \cdot \sqrt{\sigma_{\varphi}^{2}}$

In Denmark, France and Portugal the permanent component follows a random walk in age. The variance of the innovation in the random walk is significantly larger than zero in all these countries. As the variance of a variable that follows a random walk is the sum of the variances of the innovation term, this finding implies that permanent inequality increases over lifetime. In Denmark, the variance at the age of 20 is higher than the variance at subsequent ages, suggesting the presence of larger permanent shocks at younger ages, which is consistent matching models, in which the information revealed about a worker's ability increases with time. In France and Portugal, the variance of the initial shock at the age of 20 does not play a significant role in the formation of the permanent component of earnings. The variance of the innovation term is the highest in Portugal, followed by France and Denmark, which suggests that in Portugal there is a higher variety of earnings shocks that change the ranking of individuals in the permanent component of earnings. The final trend in the permanent variance depends on the period specific loading factors, which reveal that overall, the relative position of the highly skilled individuals decreased over the sample period in Denmark, and France, and increased Portugal. The year to year evolution was smooth in Denmark, where they decreased until 2000 and in France, which experienced increasing returns to skills before 1997 and decreasing thereafter. In Portugal, the loading factors decreased every second year.

In Belgium, Luxembourg and Austria the persistent dispersion of earnings follows the canonical model, where the permanent component is time-invariant. The highest variance in the time invariant characteristics is recorded in Luxembourg, followed by Austria and Belgium. In this case, the time-specific loading factors determine the final trend of the permanent differentials: they decreased in Belgium and Austria, and increased in Luxembourg. With respect to the yearly evolution, Luxembourg records an increase in the return to skills until 2000, Belgium in 1995 and 2001, and Austria during most of the period except 1998-1999.

The estimates of the cohort-specific shifters for the permanent earnings are highly significant in all countries. However, the trends suggested by these estimates differ between countries. The permanent component of earnings appears to increase over the life cycle in Germany, Luxembourg and Austria. In Denmark, Netherlands, Belgium, Spain and Portugal the permanent component of earnings has an inverted-U shape evolution over the life cycle. These trends confirm the expectation that permanent earnings differentials play a much larger role in the formation of overall earnings differentials of older cohorts compared with younger ones, which experience higher earnings volatility due to temporary contracts. We expect the opposite to hold in the case of cohort-specific shifters for the temporary earnings.

The permanent component of earnings appears to decrease over the life cycle in France, UK, Ireland, Italy, Greece and Finland. One possible explanation is that younger cohorts have more heterogeneous skills. Another explanation is that younger cohorts might experience larger permanent shocks even if they do not have a larger dispersion of skills. This could be the case if the labour market has become tougher over time, such as in the case of the Italian labour market, which is characterised by high rates of youth unemployment.

The formulation of the temporary component of earnings differs between countries. It follows an AR(1) process with time and cohorts loading factors in all countries, except for Italy, Greece and Spain, where it follows an ARMA(1,1). Except for Ireland, Spain and Austria, where all cohorts share the same initial conditions, the other countries are characterized by heteroskedastic initial conditions. The estimated coefficients for the transitory component of earnings are all significant, suggesting that the initial variance(s), the AR(1) process, respectively the ARMA(1,1) process and the time and cohort loading factors contribute significantly to earnings volatility in all countries.

The variance of initial conditions, which represents the accumulation of shocks up to the starting year of the panel, is smaller than that of subsequent shocks in all countries. However, the pattern of the heteroskedstic initial conditions differs between countries. In Denmark, Luxembourg, UK Italy, Portugal and Finland it follows the inverted-U shape: the variance of initial conditions increases over the lifecycle and decreases at the end. In Germany, Netherlands, France and Finland the pattern of the heteroskedstic initial conditions illustrates a general decreasing trend over the lifecycle, suggesting that the initial variance plays a larger role in the formation of earnings differentials for the youngest cohort compared with the oldest. In Belgium the reverse holds: the heteroskedastic cohort initial conditions appear to play the largest role in the formation of earnings differentials for the oldest cohort and the smallest for the youngest cohort.

The magnitude of the autoregressive parameter varies between countries. A large autoregressive parameter, which suggests that shocks are persistent, is recorded in Spain with 26.9% of a shock still present after 8 years, in Portugal with 8.5% and in Austria with 5.7%. These are countries where the wage-setting mechanisms and EPL were not strong enough to reduce the impact of shock earnings. A moderate autoregressive parameter suggesting that shocks die out rather quickly is recorded in Italy with 2.8% of a shock still present after 8 years, in Belgium with 2.4%, and in Greece with 1.4%. A very small autoregressive parameter is present in Luxembourg, Ireland, Finland, Netherlands, Germany, France, UK and Denmark, where between 0.0008% and 0.8% of a shock is still present after 8 years. The negative sign of the MA component implies that the autocovariances decline sharply over the first period, confirming the trends observed in the previous section, for Italy, Greece and Spain.[8]

The time-specific loading factors for the transitory component are highly significant and display a higher variation than for the permanent component in all countries. The trends of the transitory inequality vary to a large extent across countries. These estimates show that overall the transitory variance decreased over the sample period in Germany, Denmark, Netherlands, Belgium, France, UK, Italy, Greece, Spain, Portugal, Austria and Finland. It increased in Luxembourg and Ireland.

The estimates of the cohort-specific shifters for the transitory earnings are highly significant in all countries. The estimates of the cohort-specific shifters for the temporary component indicate that earnings volatility appears to be higher for younger cohorts, thus confirming the pattern observed in the dynamic description of the autocovariance structure of earnings, where autocovariances were found to be lower for younger cohorts. This result is expected, given that younger people experience in general more frequent job changes, and consequently less stable earnings.

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[8] For the other countries, the MA component was either rejected by the data or could not be identified due to the low number of waves.

Having estimated a suitable error component model for earnings in each of the EU countries under analysis, next the purpose is to use these parameters estimates to decompose the variance-covariance structure of earnings into its permanent and transitory components, assess their relative importance and analyse their contribution to the evolution of the overall inequality over the sample period. In other words, the aim is to understand the extent to which changes in the distribution of lifetime earnings and transitory fluctuations contribute to the evolution of cross-sectional differentials. Basically, we want to assess which is the component that plays the largest role in the declining/rising overall cross-sectional inequality between 1994 and 2001.

The decomposition of the variance, together with the actual and predicted variance of earnings by cohort are presented in Figure 3. A summary of the evolution of the two components is offered in Figure 4 which illustrates the ratio between the average across cohorts of the permanent variance and the transitory variance. Finally, Figure 5 illustrates the relative decomposition of the overall predicted variance of earnings into its permanent and transitory components. The main findings for these figures are summarized below.

For all countries, the evolution of the predicted variance follows closely the evolution of the actual variance, which is not surprising given the high fit of the models indicated by the very low sum of square residuals. Earnings inequality measured by the actual variance decreased overall in Germany except for the cohorts born in 1941-1950 and 1961-1970 where it increased, in Denmark, in Belgium except for the youngest cohort where it increased, in France except for the cohort born in 1961-1970, in UK except for the youngest two cohorts where it increased, in Ireland, in Spain except the youngest cohort and in Austria. Earnings inequality measured by the actual variance increased overall for all cohorts in Netherlands, Luxembourg, Italy, Greece, Portugal and Finland except the youngest cohort, which are countries where wages are more responsive to market forces.

The highest permanent inequality is recorded in Portugal, Spain, Germany, France and Luxembourg, which record also a low to moderate level of trade union density, a high level of collective bargaining coverage, a high level of centralization/co-ordination and a strict EPL. At the other end, the lowest permanent inequality is observed in Finland and Denmark. These countries exhibit a high trade union density, a high level of collective bargaining, a high centralization/co-ordination and a low to medium strictness of the EPL. Hence it appears that the stricter the EPL and the lower the trade union density is, the higher is the inequality in the permanent component of earnings.

The pattern of decomposition of the overall variance varies between cohorts and countries. Inequality in the permanent component of earnings appears to account for a higher share of the overall variance the older the cohort is, which is consistent with the evidence of lifecycle earnings divergence showing that older cohorts experience a lower earnings volatility compared with younger cohorts. Moreover, inequality in the temporary component of earnings accounts for the highest share for the youngest cohort, which reinforces the expectation that earnings volatility is higher at younger ages. This pattern is valid for most countries.

The decrease in cross-sectional inequality was accompanied by a decrease in the importance of the permanent component relative to the transitory component, and consequently an increase in mobility in Denmark, Belgium and Spain. Wage immobility appears to be higher in Spain than in

Belgium and Denmark. This is consistent with the fact that Spain is characterised by a degree of permanent inequality, which is more than twice the value for the other two countries, and a higher share of the permanent component.

In Denmark, the decrease in cross-sectional inequality appears to be the result of decreasing both permanent and transitory differentials. Permanent differentials reduced to a higher extent than temporary differentials; therefore we can conclude that mobility helped individuals to change their position in the income distribution by reducing permanent differentials. Moreover, the structure of inequality was affected the most for older cohorts, which recorded a larger noise over time. But overall, in 2001 the structure of inequality did not change much compared with 1994. In 2001, for the oldest two cohorts the persistent variance accounts for roughly 50%-60% of the overall variance, for the cohort born between 1961-1970 40%, whereas for the youngest cohort the variance is mostly transitory (90%).

The decrease in the transitory component might signal the presence of strong wage bargaining structures. This is supported by OECD (2004) findings: among all 14 EU countries, Denmark has one of the higher collective bargaining and trade union density. Moreover it was among the only ones, together with Belgium and Finland, which recorded an increase in trade union density. The outstanding performance of the labour market in Denmark which assured a decreasing cross-sectional inequality by a reduction in both components, might be due to the so called "flexicurity approach" (OECD(2004)), which represents an interesting combination of high labour market dynamism and relatively high social protection. This is the combination of flexibility (a high degree of job mobility thanks to low EPL), social security (a generous system of unemployment benefits) and active labour market programmes, which allows individuals to improve their position in the permanent income distribution by reducing permanent income differentials, maintain at the same time a low degree of earnings volatility.

In Belgium and Spain, the decrease in cross-sectional inequality appears to be determined by a decrease in the permanent variance and an increase in the transitory variance. Permanent differentials reduced to a larger extent compared with the increase in the transitory inequality, which lowered overall inequality. This suggests the presence of increasing wage mobility which allowed individuals to improve their position in the permanent income distribution. In Belgium, the structure of inequality did not change much in 2001 compared with 1994, whereas for Spain we observe a clear increase in the share of the transitory component. In Belgium, the rates are similar with Denmark for the oldest two cohorts and higher with roughly 10 percentage points for the rest. In Spain, the share of the permanent component is higher with roughly 10 percentage points for the oldest two cohorts and with roughly 20 percentage points for the youngest two than in Belgium.

The puzzling thing is that, Belgium, despite the fact that recorded an increase in trade union density and a stable collective bargaining coverage, its transitory inequality recorded an increase over the sample period. Moreover, Belgium records one of the highest strictness of the employment protection legislation among all OECD countries, which has not decreased over the sample period. However, one labour market factor that could have contributed to the increase in the transitory variance is the decrease in the degree of centralization from relatively centralized to intermediate. Spain has a stricter employment protection legislation than Belgium, but the decrease in trade union density and centralization/co-operation coupled with the stable evolution of the collective bargaining coverage might explain the increase in transitory inequality. Yet another factor that can be linked with the increase in the transitory variance, both in Spain and Belgium, is an important recent innovation in European labour markets: temporary job contracts. This type of contract allows employees to be hired without the previous restrictions imposed by the regulations against firing, therefore allowing for a higher mobility in the labour market and implicitly in wages. Finally, the increased immigration might be a contributing factor.

In Germany, France, UK, Ireland and Austria, the decrease in cross-sectional inequality was accompanied by an increase in the importance of the permanent component relative to the transitory component, and therefore a decrease in earnings mobility. Therefore, in these countries, mobility cannot be considered the driving force for the decrease in overall inequality. Wage immobility appears to be the highest in Ireland and Germany. The highest persistent inequality is recoded in France, Germany and Ireland, which also record among the highest shares of the permanent inequality.

In Germany the trends differ a lot between cohorts: the oldest and the second youngest cohorts are characterised by increasing permanent and transitory differentials, the second oldest by decreasing permanent and transitory differentials and the youngest by decreasing transitory and increasing permanent differentials. The same for the structure of inequality: the share of permanent earnings inequality in the overall inequality had an overall decreasing trend for the oldest cohort, a rather constant trend for the second oldest cohort and an increasing trend for the youngest two cohorts. Controlling for the cohort effect, Germany records an increasing trend in the permanent differentials and a decreasing trend in the transitory differentials. In 2001, in Germany compared with Spain, the share of the permanent component for the oldest two cohorts is higher with roughly 10 percentage points, roughly equal for the second youngest cohort and higher with 10 percentage points for the youngest. Therefore, in Germany, the persistency of earnings is higher than in Spain, and implicitly than in Belgium and Denmark. This result is not surprising given the high level of strictness in the employment protection legislation, which did not change much over time, and the low level of labour market dynamics. The different trends observed between cohorts might be due to the difference in regulating temporary and permanent employment. Germany is among the countries with the strictest regulation for temporary employment, which might affect new entrants in the labour market. This might be an explanation for the increasing share in the permanent inequality for the youngest cohorts. For regular contracts, Germany does not have particularly stringent provisions. Trade union density decreased, collective bargaining coverage increased and. centralisation/co-operation decreased.

In France, the decrease in the overall variance was determined by decreasing transitory and increasing permanent inequality. Transitory variance reduced to a larger extent compared with the increase in the permanent variance, which suggests a decrease in earnings mobility. The structure of inequality modified to a large extent and is characterised by increasing shares of the permanent component of earnings. In 2001, the share of the persistent component is very similar with Germany. The increase in the permanent component might signal increasing returns to skills over the sample period, whereas the decreasing transitory component might signal a labour market mechanism put in place to reduce transitory inequality and prevent overall inequality from rising. The level of strictness in the employment protection legislation is higher than in Germany and increased slightly over time. On the one hand this might explain the increase in permanent inequality. On the other hand, together with the low level of labour market dynamics, it may explain the reduction in transitory inequality and mobility. Moreover, France ranks the lowest on union density (France), but managed to increase coverage levels after the introduction of legislation promoting collective bargaining and is now among the countries with the highest coverage rates of 90% and above, together with Austria, Belgium and Finland.

Mixed trends are present also for UK: permanent variance decreased slightly for the oldest and youngest cohort and increased slightly for the other two cohorts. The transitory variance decreased for all cohorts, except for the youngest one. Therefore, the decreasing trend of the overall inequality can be the result of decreasing transitory differentials. This might signal the strengthening of the labour market institutions. The structure of inequality changed over time and was characterized by an increase in the the share of the permanent variance for all cohorts, except for the youngest one. In 2001, the share of the persistent differentials was similar with Spain. UK labour market is characterized by a low strictness in the employment protection legislation, which appears to increase slightly over time, thus explaining the decrease in the transitory variance. Other evolution in the labour market are the decrease in trade union density and collective coverage bargaining. Centralization/co-operations remained constant at a very low level.

In Ireland, the decreasing trend in cross-sectional inequality appears to be the result of different factors before and after 1997. The first half of the sample period was characterised by an increase in the permanent earnings inequality. This might be the effect of the remarkable economic boom that started in 1994. Moreover, earnings volatility decreased over this period, which signals the strengthening of the labour market institutions. The highly centralized nature of the wage bargaining in Ireland was the main driving force which kept inequality from rising in line with the remarkable economic growth. Between 1997 and 2001 permanent earnings inequality started to decrease slightly. This period coincides with the slowing down of the Celtic Tiger. The rise in earnings mobility shows that people move more freely in the income distribution and manage to reduce the permanent differentials, up to a level that remains still higher than in 1994, for all cohorts except the oldest one. However, the overall increase in the permanent differentials over the sample period was counteracted by the wage bargaining structures, which managed to reduce to larger extent the transitory inequality, and bring inequality at a lower level in 2001 compared with 1994.

To conclude about Ireland, the economic growth was a shock that accentuated the permanent differentials between individuals. The labour market institutions managed to reduce the transitory component of earnings to a larger extent than the increase in the permanent component, which led to a decrease in the overall wage inequality over the sample period. The structure of inequality over the sample period changed to a large extent and led to an increase in the share of the permanent component of earnings, increase which was the result of a sharp increase over 1994-1997 and a slight decrease thereafter. In 2001, the structure of inequality is similar with Germany, except for the youngest cohort where the share of the permanent component is almost double, suggesting a lower earnings volatility for Irish youngsters. This might be to the low incidence of temporary contracts on the Irish labour market and the moderate strictness of the EPL for permanent contracts, which represents a good incentive for firms to hire youngsters with a permanent contract and increase their employability. Other trends that were present in the labour market is a slight increase in the overall strictness of the EPL, which is consistent with decreasing transitory differentials, a low labour market mobility, consistent with the decrease in earnings mobility, a decrease in the union density and a trend towards deregulation.

In Austria the decrease in the overall variance appears to be the result of decreasing permanent and transitory differentials. However, something appears to change dramatically after 1998. Until 1998, the share of the permanent inequality increases sharply and was accompanied by a large drop in wage mobility. During 1999, Austria has experienced a considerable rise in employment and a further decline in unemployment, which was the effect of the labour market initiatives pursued by the Austrian Government. This explains the increase in inequality after 1999: higher employment is usually accompanied by higher inequality. These measures appear to have favoured earnings mobility, which increased in 1999 and remained constant thereafter. Permanent differentials, both in absolute value and as share of the overall inequality reduced in 1999 and remained constant through the end of the sample period. Transitory differentials increased in 1999 and remained constant thereafter, both in absolute value and as a share of the overall inequality. After all these developments, in 2001 the level of mobility settled at a level below the one from 1994.

The structure of inequality modified greatly over time, especially before and after 1998. Overall, the share of the permanent component increased. For the oldest three cohorts the structure evolved from an equal share of the two components in 1995 to a great increase in the permanent component in 1998, then a sharp drop in 1999, followed by a stable evolution thereafter. For the youngest cohort, the two components have a apparently converging trend until 1998, followed by a divergence thereafter. In 2001, the permanent differentials account for 60% of the overall variance for the oldest three cohorts and for 20% for the youngest one, which indicates Austria as the country with the lowest earnings persistency among the countries which recorded a decrease in earning inequality over the sample period.

For Austria, the trend in inequality after 1998 is as expected given the trends in the labour market after 1998: decrease in trade union density, increase in collective bargaining, which placed Austria as the highest, a decrease in overall EPL to a moderate level and consequently a moderate job mobility and moderate labour market performance. Comparing between types of contracts, the permanent contracts are more regulated than temporary one, which also recorded a decrease and might have pushed more people in temporary employment. This might explain the reduction in the permanent inequality: because firms' reluctance to invest in training for temporary employees, the returns to human capital are reduced. These trends also explain the increase in the temporary variance after 1998.

The increase in cross-sectional inequality was accompanied by a decrease in mobility in Luxembourg, Italy, Greece, Portugal, and Finland, and by an increase in mobility in Netherlands. In 1994, wage mobility was the lowest in Portugal, followed by Italy, Netherlands, Greece and Finland whereas in 2004, Italy and Portugal were the least mobile, followed by Finland and Greece. As expected, the countries with the lowest mobility are also the ones with the highest share of the permanent inequality.

In general, in Luxembourg, Italy, Greece and Finland the increase in the overall cross-sectional inequality appears to be the result of a combined effect of an increase in the permanent component of earnings and a decrease in the transitory component. For Portugal, both appear to increase. The permanent component increased to a larger extent relative to the transitory component, leading to a decrease in earnings mobility. Therefore the increase in cross-sectional inequality was triggered mainly by an exacerbation of the permanent differentials, meaning increasing returns to skills. The structure of inequality changed over time. What can be observed is an increase in the incidence of the permanent inequality in the overall inequality for all four countries. In 2001, Luxembourg has the highest shares of the permanent component among all countries recording an increase in overall inequality: roughly 80% for the oldest three cohorts and 40% for the youngest one. Next in line in terms of earnings persistency we find Italy, with slightly lower shares for all cohorts. Portugal, the structure in 2001 is very similar with Italy, except for the youngest cohort, for which the share is with almost 20% lower, signalling a higher earnings volatility for youngsters in Portugal. In Greece, in 2001, the share of the persistent component is lower with roughly 10 percentage points for the oldest two cohorts, similar for the second youngest cohort and more than double for the youngest cohort than in Portugal. This suggests that earnings volatility for the youngest cohort is lower than in Portugal and is similar with Luxembourg and Italy. In Finland, the share of the permanent component for the oldest two and the youngest cohorts is similar with Greece, whereas for the second youngest the share is higher with roughly 10 percentage points than in Greece.

These trends are consistent with the evolution of the wage-setting and employment protection legislation. All these countries recorded a decrease in overall EPL, some from high levels, such as Italy, Portugal and Greece, and the rest from moderate levels. Split by type of contract, we can observe that, except for Finland, where the EPL for temporary contracts staid constant, the other countries recoded a decrease. . In Italy and Greece, the EPL for temporary contracts decreased to a much larger extent than for permanent contracts. However EPL for permanent contracts was still less strict than for temporary contracts, which might signal that employers prefer to hire with permanent contracts. This trend might be an explanation the increase in the permanent inequality. On the other hand, the increase in the collective coverage bargaining might be an explanation for the decrease in the transitory inequality In Portugal permanent contracts have much higher EPL than temporary contracts, which represents an incentive for firms to hire with temporary contracts, affecting mainly youth employment. This is consistent with the fact that Portugal displays the highest volatility for the youngest cohort. In rest, these three countries display similar features of the wage-setting and employment protection legislations: high level of EPL accompanied as expected by low labour market dynamics which is consistent with the decrease in earnings mobility, a decrease in trade union density and in collective bargaining coverage and a high level of centralization/co-ordination.

In Finland, the permanent contract EPL reduced, allowing for a higher employment rate, and therefore a higher permanent inequality or a setting for increasing returns to skills. The other trends, such as the increase in trade union density and collective bargaining coverage, the very high level of centralization, might explain the decrease in transitory inequality.

In Luxembourg, the approval of the National Action plan for employment in 1998 appears to have affected the structure of wage differentials to a large extent. This plan was aimed to increase the employment of young, older workers and women. This was accomplished by training and activation policies, aimed to increase their employability. Immediately after 1998, transitory inequality started to increase, exacerbating already increasing permanent differentials. This is not surprising, given that these activation policies were aimed to increase human capital for these low-wage categories and include them in the active labour market, thus increasing permanent differentials.

In Netherlands, transitory inequality was exacerbated over the time for all cohorts, whereas the trends in the permanent inequality differ to a large extent between cohorts. Overall, mobility appears to increase. But in this case, mobility actually exacerbates overall cross-sectional inequality, suggesting an increase in the earnings volatility. This conclusion is supported also by the evolution in the structure of inequality, which illustrates that the share of the permanent inequality decreased over time. In 2001, the share of the permanent components is the lowest among all countries recording an increase in overall inequality. These trends could be triggered by the evolution of EPL. Netherlands is characterized by a moderate EPL, which did not change over time. The same holds if we look by type of contract. However, the permanent employment had a higher EPL than temporary employment, which represents an incentive for hiring people with low employability. This might explain the increase in the transitory inequality. The increase in permanent inequality might be explained by the high level of collective bargaining coverage which increased over time.

7. CONCLUDING REMARKS

As mentioned in the starting section, the purpose of this study was to analyze what are the driving forces behind the changes in the distribution of labour market income across 14 EU countries over the period 1994-2001 using ECHP. Earnings inequality, as measured by the variance in log earnings was found to decrease in Germany, Denmark, Belgium, France, UK, Ireland, Spain, Austria and to increase in Netherlands, Luxembourg, Italy, Greece, Portugal and Finland. We examined the extent to which these changes in cross-sectional inequality were determined mainly by changes in the transitory or in the permanent component of individual earnings.

In line with the conclusions from Dew-Becker and Gordon (2008) and OECD (2004), the most notable change after 1995 in Europe has been increased country heterogeneity, which translated itself in the level and evolution of the cross-sectional earnings inequality components. However, some common trends can be identified. For all countries individual earnings inequality contains a highly permanent component for the oldest three cohorts and a highly transitory component for the youngest cohort. Regarding the structure of inequality, the permanent component appears to account for a higher share of the overall variance the older the cohort is, which is consistent with the evidence of lifecycle earnings divergence showing that older cohorts experience a lower earnings volatility compared with younger cohorts. Moreover, inequality in the temporary component of earnings accounts for the highest share for the youngest cohort, which reinforces the expectation that earnings volatility is higher at younger ages.

The highest permanent inequality is observed in Portugal, Spain, Greece, Germany, France, Luxembourg which are also the countries with strict EPL and a low trade union density. The lowest permanent inequality is observed in Finland and Denmark, which have higher trade union density and less strict EPL. So it appears that the higher the trade union density and the stricter the EPL are, the higher is the permanent earnings inequality.

The decrease in cross-sectional inequality was accompanied by an increase in mobility in, an therefore a decrease in the importance of the permanent component relative to the transitory component in Denmark, Belgium and Spain. In Denmark it was triggered by a decrease in both inequality components, whereas in Belgium and Spain by a decrease in the permanent variance and an increase in earnings volatility. Overall, income persistency appears to be higher in Spain, followed by Belgium and Denmark. For Denmark, this evolution might be the outcome of the "fexicurity approach" a assured by a low EPL), generous unemployment benefits and active labour market programmes. In Spain and Belgium, the overall trend can be linked to the increased incidence of temporary job contracts.

In Germany, France, UK, Ireland and Austria, the decrease in cross-sectional inequality was accompanied by a decrease in earnings mobility, meaning an increase in the importance of the permanent component relative to the transitory component. This was the result of mixed trends in Germany, of decreasing transitory and increasing permanent inequality in France and Ireland, a decrease in transitory inequality in UK and a decrease in both components in Austria. Germany is among the countries with the strictest regulation for temporary employment, which might affect new entrants in the labour market and older workers. This might favour the hiring of the younger workers with permanent contracts and also the crowding out of the older workers, with offsetting effects on the two components. In France, the level of strictness in the employment protection legislation is higher than in Germany and increased slightly over time. Other trend that might explain the evolution are the low level of labour market dynamics, the large increase collective bargaining coverage which placed France among the countries with the highest coverage rates, together with Austria, Belgium and Finland. In UK the strictness in the employment protection legislation appears to increase slightly over time, thus explaining the decrease in the transitory variance. The highly centralized nature of the wage bargaining in Ireland was the main driving force which kept inequality from rising in line with the remarkable economic growth, by reducing transitory inequality to a larger extent than the increase in return to skills. Moreover, what is surprising for Ireland is the high level of persistency in earnings for the youngest cohort, which might be explained by the moderate strictness of the EPL for permanent contracts which is a good incentive for firms to hire youngsters with permanent contracts and invest in their training. In Austria the increase in collective bargaining, which placed Austria the highest among all OECD countries, appears to have counteracted the decrease in trade union density, the decrease in the strictness EPL and trigger a larger decrease in the transitory component compared with the permanent component after 1998.

The increase in cross-sectional inequality was accompanied by a decrease in mobility, meaning an increase in the relative importance of the permanent component compared with the transitory component in Luxembourg, Italy, Greece, Portugal, and Finland, and by an increase in mobility in Netherlands This trend appears to be the result of an increase in the permanent component of earnings and a decrease in the transitory component. In Italy and Greece, these might have been triggered by a decrease in the EPL of permanent contracts compared with temporary contracts, a decrease in trade union density and in collective bargaining coverage and a high level of centralization/co-ordination. Similar conditions hold for Portugal, except for the EPL for temporary contract, which is less strict than the EPL for permanent contracts, and the large drop in union density. For Finland, the trend appears to be the result of a decrease in the EPL for permanent contracts, an increase in trade union density and collective bargaining coverage and a very high level of centralization. In Luxembourg, the activation policies appear to have been the triggering factor. In Netherlands, the increase in the incidence of temporary contracts appears to be the factor explaining the increase in the relative importance of the transitory inequality compared with the permanent one.

However, the links between the evolution of the two inequalities and the evolution of labour market is purely descriptive and should be interpreted with caution. I more thorough link could be realised using the two components as decomposed by our models in a similar analysis with the one conducted by the OECD (2004) report. Another point for further research could be a more thorough analysis of the link between earnings mobility and the two inequality components using different mobility measures.

8. ANNEX

8.1. The Specification of the covariance structure of earnings

The covariance structure for the first sample period takes the form:

$$\begin{aligned} & Var(Y_{ic0}) = E(r_{ic0} r_{ic0}) = \\ & = E[\gamma_{1c}^2 \lambda_{10}^2 (\mu_i + \varphi_i age_{i0} + u_{ia})^2] + E(\gamma_{2c}^2 \lambda_{20}^2 v_{i0} v_{i0}) = \\ & = \gamma_{1c}^2 \lambda_{1,0}^2 E(\mu_i^2 + \varphi_i^2 age_{i0}^2 + 2\mu_i \varphi_i age_{i0} + u_{ia}^2) + \gamma_{2c}^2 \lambda_{2,0}^2 Var(v_{i0}) = \\ & = \sigma_\mu^2 + \sigma_\varphi^2 E(age_{i0}^2) + 2\operatorname{cov}(\mu_i \varphi_i) E(age_{i0}) + (a-20)\sigma_\pi^2 + Var(v_{i0}) \;\; if\; t=0 \end{aligned} \tag{16}$$

The covariance structure implied by the model introduced in the previous section takes the following form. The variance of the process can be expressed as follows:

$$\begin{aligned} & Var(Y_{ict}) = E(r_{ict} r_{ict}) = \\ & = E[\gamma_{1c}^2 \lambda_{1t}^2 (\mu_i + \varphi_i age_{it} + u_{iat})^2] + E(\gamma_{2c}^2 \lambda_{2t}^2 v_{it} v_{it}) = \\ & = \gamma_{1c}^2 \lambda_{1t}^2 E(\mu_i^2 + \varphi_i^2 age_{it}^2 + 2\mu_i \varphi_i age_{it} + u_{iat}^2) + \gamma_{2c}^2 \lambda_{2t}^2 Var(v_{it}) = \\ & = \gamma_{1c}^2 \lambda_{1t}^2 [\sigma_\mu^2 + \sigma_\varphi^2 E(age_{it}^2) + 2\operatorname{cov}(\mu_i \varphi_i) E(age_{it}) + \sigma_\pi^2 (a-20)] + \gamma_{2c}^2 \lambda_{2t}^2 E[(\rho v_{it-1} + \varepsilon_{it} + \theta \varepsilon_{it-1})^2] = \\ & = \gamma_{1c}^2 \lambda_{1t}^2 [\sigma_\mu^2 + \sigma_\varphi^2 E(age_{it}^2) + 2\operatorname{cov}(\mu_i \varphi_i) E(age_{it}) + \sigma_\pi^2 (a-20)] + \\ & + \gamma_{2c}^2 \lambda_{2t}^2 [\rho^2 Var(v_{it-1}) + \sigma_\varepsilon^2 (1 + 2\rho\theta + \theta^2)] \;\; if\; t>0 \end{aligned} \tag{17}$$

where

$$\begin{aligned} & Var(\mu_{i,20,t-(a-20)}) = \sigma_{\mu_{20}}^2 \\ & Var(\mu_{iat}) = Var(\mu_{i,a-1,t-1}) + \sigma_\pi^2 = Var(\mu_{i,20,t-(a-20)}) + (a-20)\sigma_\pi^2 \end{aligned} \tag{18}$$

$\sigma_{\mu_{20}}^2$ is estimated as part of σ_μ^2.

$$\begin{aligned} & Cov(Y_{ict} Y_{ict-s}) = E(r_{ict} r_{ict-s}) = \\ & = E[\gamma_{1c}^2 \lambda_{1t} \lambda_{1t-s} (\mu_i + \varphi_i age_{it} + u_{iat})(\mu_i + \varphi_i age_{it-s} + u_{i,a-s,t-s})] + E(\gamma_{2c}^2 \lambda_{2t} \lambda_{2t-s} v_{it} v_{it-s}) = \\ & = \gamma_{1c}^2 \lambda_{1t} \lambda_{1t-s} E[\mu_i^2 + \varphi_i^2 age_{it} age_{it-s} + \mu_i \varphi_i (age_{it} + age_{it-s}) + u_{iat} u_{i,a-s,t-s}] + \gamma_{2c}^2 \lambda_{2t} \lambda_{2t-s} Cov(v_{it} v_{it-s}) = \\ & = \gamma_{1c}^2 \lambda_{1t} \lambda_{1t-s} \{\sigma_\mu^2 + \sigma_\varphi^2 E(age_{it}) E(age_{it-s}) + \operatorname{cov}(\mu_i \varphi_i)[E(age_{it}) + E(age_{it-s})] + \sigma_\pi^2 (a-s-20)\} + \\ & + \gamma_{2c}^2 \lambda_{2t} \lambda_{2t-s} E[(\rho v_{it-1} + \varepsilon_{it} + \theta \varepsilon_{it-1}) v_{it-s}] = \\ & = \gamma_{1c}^2 \lambda_{1t}^2 \{\sigma_\mu^2 + \sigma_\varphi^2 E(age_{it}) E(age_{it-s}) + \operatorname{cov}(\mu_i \varphi_i)[E(age_{it}) + E(age_{it-s})] + \sigma_\pi^2 (a-s-20)\} + \\ & + \gamma_{2c}^2 \lambda_{2t} \lambda_{2t-s} [\rho Cov(v_{it-1}, v_{it-s})] \;\; if\; t>0 \;\;\&\;\; s>1 \end{aligned} \tag{19}$$

Where

$$
\begin{aligned}
&Cov(\mu_{iat}, \mu_{i,a-s,t-s}) = Cov(\mu_{i,a-1,t-1}, \mu_{i,a-s-1,t-s-1}) + \sigma_\pi^2 = \\
&= Cov(\mu_{i,a-(a-s-20),t-(a-s-20)}, \mu_{i,20,t-(a-20)}) + (a-s-20)\sigma_\pi^2 = \\
&= \sigma_{\mu_{20}}^2 + (a-s-20)\sigma_\pi^2 \\
&Cov(\mu_{iat}, \mu_{i,20,t-(a-20)}) = \sigma_{\mu_{20}}^2
\end{aligned} \tag{20}
$$

$$
\begin{aligned}
&Cov(Y_{ict}Y_{ict-1}) = E(r_{ict}r_{ict-1}) = \\
&= E[\gamma_{1c}^2\lambda_{1t}\lambda_{1t-1}(\mu_i + \varphi_i age_{it} + u_{ia})(\mu_i + \varphi_i age_{it-1} + u_{ia-1})] + E(\gamma_{2c}^2\lambda_{2t}\lambda_{2t-1}v_{it}v_{it-1}) = \\
&= \gamma_{1c}^2\lambda_{1t}^2\{\sigma_\mu^2 + \sigma_\varphi^2 E(age_{it})E(age_{it-1}) + \mathrm{cov}(\mu_i\varphi_i)[E(age_{it}) + E(age_{it-1})] + \sigma_\pi^2(a-1-20)\} \\
&+\gamma_{2c}^2\lambda_{2t}\lambda_{2t-1}\{\rho Var(v_{it-1}) + \theta\sigma_\varepsilon^2)\} \;\; if\; t > 0 \;\;\&\;\; s = 1
\end{aligned} \tag{21}
$$

8.2.Estimation of Covariance Structures

For each cohort ***c*** and individual ***i,*** define a vector which identifies the presence for each individual in the respective cohort and year:

$$
\mathbf{d_{ic}} = \begin{pmatrix} d_{ict_1} \\ \cdot \\ \cdot \\ \cdot \\ d_{ict_c} \end{pmatrix}
$$

where d_{ict} is an indicator variable that is equal to 1 if the individual from cohort *c* is present in year *t* of the panel and t_c is the total length of the panel for each cohort. Similarly, the vector containing the cohort earnings residuals can be represented as follows:

$$
\mathbf{R_{ic}} = \begin{pmatrix} r_{ict_1} \\ \cdot \\ \cdot \\ \cdot \\ r_{ict_c} \end{pmatrix}
$$

where r_{ict} are the earnings residuals for individual *i* belonging to cohort *c,* in year *t* in mean deviation form for each cohort and year. The elements of the $\mathbf{R_{ic}}$ corresponding to missing years are set to 0. The variance-covariance matrix of the earnings is computed separately for each cohort, $\mathbf{C_c}$. The elements of the variance-covariance matrix for cohort c, $\mathbf{C_c}$**,** which is of dimension $(t_c \times t_c)$ are computed follows:

$$
m_c[k,l] = \frac{\sum_{i=1}^{n_c} r_{ick}r_{icl}}{\sum_{i=1}^{n_c} d_{ick}d_{icl}}
$$

where n_c is the total number of individuals in cohort c, $k,l=\{1,...,t_c\}$. Conformably with m_c, m_{ci} represent the distinct elements of the individual cross-product matrix $\mathbf{R_{ic}R'_{ic}}$. Then $m_c[k,l]=\frac{\sum_{i=1}^{n_c} m_{ci}[k,l]}{\sum_{i=1}^{n_c} d_{ick}d_{icl}}$.

The matrix C_c is symmetric with $(\frac{t_c(t_c+1)}{2}\times 1)$ distinct elements. Let $\mathbf{Vech(C_c)}$ be a column vector of dimension $(\frac{t_c(t_c+1)}{2}\times 1)$ which stacks all the elements of the variance covariance matrix $\mathbf{C_c}$ for cohort c. The aggregate vector of moments for all cohorts is denoted by: $\mathbf{m=(Vech(C_1)^T,...,Vech(C_4)^T)^T}$,

which is a column vector of dimension $(\sum_{c=1}^{4}\frac{t_c(t_c+1)}{2}\times 1)$. In this paper, each cohort is observed between 1994 and 2001, therefore $t_c=8$. Since the individuals were grouped in four cohorts, $\mathbf{m}$ is a column vector of dimension (144×1).

To estimate the error components of the structural model illustrated by equations (9), (10) and (11), the elements of $\mathbf{m}$ are fit to a parameter vector $\boldsymbol{\theta}$, so that $\mathbf{m}=f(\boldsymbol{\theta})$, $f(\boldsymbol{\theta})$ takes the form of equations (13), (14), (15) and (12). Minimum distance estimation requires minimising the weighted sum of the squared distance between the actual covariances ($\mathbf{m}$) and a function of the parameter vector ($f(\boldsymbol{\theta})$) which encapsulates the covariance structure implied by the error component model. Therefore, minimum distance estimation involves the following quadratic form: $D(\boldsymbol{\theta})=[\mathbf{m}-f(\boldsymbol{\theta})]\mathbf{W}[\mathbf{m}-f(\boldsymbol{\theta})]'$, where $\mathbf{W}$ is a positive definite weighting matrix. Minimum distance estimator chooses $\hat{\boldsymbol{\theta}}$ to minimise the distance function $D(\hat{\boldsymbol{\theta}})$.

Based on Chamberlain (1984), the asymptotic optimal choice of $\mathbf{W}$ is the inverse of a matrix that consistently estimates the covariance matrix of $\mathbf{m}$, which leads to the optimum minimum distance estimator (OMD). However, Clark (1996) and Altonji and Segal (1994) provided Monte Carlo evidence that OMD is biased in small samples because of the correlation between the measurement error in the second moments and forth moments. Instead, they proposed using the identity matrix as a weighting matrix. This approach, often called "equally weighted minimum distance estimation" (EWMD), involves using the standard nonlinear least squares to fit $f(\boldsymbol{\theta})$ to $\mathbf{m}$. The same procedure is followed in this paper.

For estimating the asymptotic standard errors of the parameter estimates, we apply the delta method. Following Chamberlain (1984), the asymptotic variance-covariance matrix of the estimated parameters is obtained from the following formula:

$$\mathbf{AsyVar(\boldsymbol{\theta})=(G'WG)^{-1}G'WVWG(G'WG)^{-1}} \tag{22}$$

where $\mathbf{G}$ is the Jacobian of the transformation $f(\boldsymbol{\theta})$ evaluated at $\boldsymbol{\theta}=\hat{\boldsymbol{\theta}}$. $\mathbf{G}$ has dimension $(t_m \times p)$ and rank p, where t_m is the sum across cohorts of $(\frac{t_c(t_c+1)}{2}\times 1)$ and p is the number of parameters. $\mathbf{W}$ is the identity matrix and $\mathbf{V}$ the matrix of fourth sample moments.

Chamberlain (1984) showed that under some fairly general regularity assumptions, the independence of $\mathbf{R_{ic}}$ implies that the sample mean of m_{ci} has an asymptotic normal distribution $m_c \sim N(m_c^*, \mathbf{V}_c^*)$, where m_c^* is the expectation of m_{ci}, meaning the true covariance matrix of earnings, and $\mathbf{V}_c^*$ is the variance-covariance matrix, which can be estimated consistently by computing the sample moment matrix of the $\mathbf{Vech(C_c)}$ vector, $\mathbf{V_c}$. The elements of the variance covariance $\mathbf{V_c}$ can be written as follows:

$$Cov(m_c[k,l], m_c[p,q]) = \frac{\sum_{i=1}^{n_c} d_{ick}d_{icl}d_{icp}d_{icq}}{\sum_{i=1}^{n_c} d_{ick}d_{icl}\sum_{i=1}^{n_c} d_{icp}d_{icq}}(m_c[k,l,p,q]-m_c[k,l]m_c[p,q]),$$

where $m_c[k,l,p,q] = \frac{\sum_{i=1}^{n_c} r_{ick}r_{icl}r_{icp}r_{icq}}{\sum_{i=1}^{n_c} d_{ick}d_{icl}d_{icp}d_{icq}}$

The variance-covariance matrix of $\mathbf{m}$ was denoted by $\mathbf{V}$, where $\mathbf{V}$ is the block diagonal matrix which is constructed from all the $\mathbf{V_c}$ matrices.

8.3. Strategy for model specification

The chi-squared goodness of fit statistic is computed following Newey(1985):

$$\chi = [\mathbf{m} - f(\hat{\boldsymbol{\theta}})]\mathbf{R}^{-1}[\mathbf{m} - f(\hat{\boldsymbol{\theta}})]'$$

where χ follows a chi-squared distribution with degrees of freedom equal to $\sum_{c=1}^{4}\frac{t_c(t_c+1)}{2} - p = 144 - p$, $\mathbf{R}^{-1} = \mathbf{(WVW')}^{-1}$ **and** $\mathbf{W = I - G(G'AG)^{-1}G'A}$. The majority of the existing studies estimating the covariance structure of earnings used this general form of specification test to assess the goodness of fit of the model. However, in most cases, all models have been rejected. Baker and Solon (2003), Baker (1997), Leamer (1983) criticized these type of tests for several reasons. First, Baker and Solon (2003) and Leamer (1983) underlined that "diagnostic tests such as goodness-of-fit tests, without explicit alternative hypothesis, are useless, since if the sample size is large enough, any maintained hypothesis will be rejected…. Such tests therefore degenerate into elaborate rituals for measuring the effective sample size." Second, as pointed by Baker and Solon (2003), an additional problem is that these specification tests have inflated size in small samples and the inflation is positively related with the number of overidentifying restrictions. For example, Baker (1997) revealed through a Monte Carlo study, that for a test with fewer than 150 overidentifying restrictions, the critical values are 40%-50% greater than the critical values based on the asymptotic theory. Therefore, we decided to report this statistic as a reference, but not to use it to assess the goodness of fit of our model.

To test between nested models, we could use Preposition 3' in Chamberlain (1984) or the LR test. Based on Preposition 3' in Chamberlain (1984), assuming that the general model has p parameters, to test between two nested models, one in which k_1 parameters are restricted to 0 (χ_{p-k_1}) and one in which k_2 [9] parameters are restricted to 0 (χ_{p-k_2}), Chamberlain (1984) showed that the incremental chi square statistic $\chi = \chi_{p-k_1} - \chi_{p-k_2}$ follows a chi-squared distribution with $k_1 - k_2$ degrees of freedom. The LR test takes the following form:

$$LR = N \log \frac{SSE_R}{SSE_U}$$

Under the null hypothesis, LR is follows a chi-square distribution with d.o.f equal to the number of restrictions $k_1 - k_2$.

To test between non-nested model, we use BIC and AIC criterion.

$$AIC = \frac{SSE \cdot e^{2k/144}}{144 - k} \quad or \quad BIC = \frac{SSE \cdot 144^{k/144}}{144 - k}$$

The smaller the value of BIC and AIC are the better the fit is. The difference between the two is that BIC incorporates a higher penalty for additional parameters than AIC and is recommended as the first choice.

[9] $k_1 > k_2$

8.4.Tables and Figures

Table 1. Inflows and Outflows of Individuals in the Sample – Germany

		1994	1995	1996	1997	1998	1999	2000	2001
Number of individuals with positive earnings		25018	26059	25806	24889	23290	22955	21909	20703
Absolute number and proportion of individuals who report positive earnings in current year conditional on being in the sample in previous year									
	Frequencies	23956	25224	24197	22814	22321	21290	20107	
	%	66.99	67.37	66.2	63.01	64.84	64.86	64.39	
Absolute number and proportion of individuals who report no earnings in current year conditional on being in the sample in the previous year									
Unemployed	Frequencies	3448	3461	4119	3932	3055	2787	2766	
Inactive	%	9.64	9.24	11.27	10.86	8.87	8.49	8.86	
Attrition	Frequencies	1885	2182	1892	3280	2951	2924	2830	
	%	5.27	5.83	5.18	9.06	8.57	8.91	9.06	
Missing Wage	Frequencies	6470	6576	6345	6180	6100	5826	5524	
	%	18.09	17.56	17.36	17.07	17.72	17.75	17.69	
Total	Frequencies	35759	37443	36553	36206	34427	32827	31227	
	%	100	100	100	100	100	100	100	

Table 2. Inflows and Outflows of Individuals in the Sample – Denmark

		1994	1995	1996	1997	1998	1999	2000	2001
Number of individuals with positive earnings		20899	20399	19190	19062	17321	16235	15678	15380
Absolute number and proportion of individuals who report positive earnings in current year conditional on being in the sample in previous year									
	Frequencies	19854	18527	18110	16442	15334	14865	14642	
	%	68.74	66.59	69.43	66.23	67.41	69.6	71.6	
Absolute number and proportion of individuals who report no earnings in current year conditional on being in the sample in the previous year									
Unemployed	Frequencies	1535	1744	951	899	732	658	958	
Inactive	%	5.31	6.27	3.65	3.62	3.22	3.08	4.68	
Attrition	Frequencies	2440	3096	2914	3603	2922	2133	1775	
	%	8.45	11.13	11.17	14.51	12.85	9.99	8.68	
Missing Wage	Frequencies	5054	4454	4110	3881	3759	3703	3074	
	%	17.5	16.01	15.76	15.63	16.53	17.34	15.03	
Total	Frequencies	28883	27821	26085	24825	22747	21359	20449	
	%	100	100	100	100	100	100	100	

Table 3. Inflows and Outflows of Individuals in the Sample – Belgium

		1994	1995	1996	1997	1998	1999	2000	2001
Number of individuals with positive earnings		33277	32384	31564	30575	28731	27460	25790	33277
Absolute number and proportion of individuals who report positive earnings in current year conditional on being in the sample in previous year									
	Frequencies	33277	32384	31564	30575	28731	27460	25790	
	%	63.43	63.65	64.38	63.88	64.28	65.15	64.38	
Absolute number and proportion of individuals who report no earnings in current year conditional on being in the sample in the previous year									
Unemployed	Frequencies	3810	5127	4378	3601	3040	3090	2540	
Inactive	%	7.26	10.08	8.93	7.52	6.8	7.33	6.34	
Attrition	Frequencies	4145	3798	3473	4803	4421	3851	4930	
	%	7.9	7.46	7.08	10.04	9.89	9.14	12.31	
Missing Wage	Frequencies	11228	9573	9614	8882	8504	7748	6798	
	%	21.4	18.81	19.61	18.56	19.03	18.38	16.97	
Total	Frequencies	52460	50882	49029	47861	44696	42149	40058	
	%	100	100	100	100	100	100	100	

Table 4. Inflows and Outflows of Individuals in the Sample – Netherlands

		1994	1995	1996	1997	1998	1999	2000	2001
Number of individuals with positive earnings		20221	22100	22892	22753	22863	23233	24065	24130
Absolute number and proportion of individuals who report positive earnings in current year conditional on being in the sample in previous year									
	Frequencies	20578	21328	21221	21055	20545	21026	21341	
	%	69.07	71.37	68.68	67.52	67.24	68.56	69.59	
Absolute number and proportion of individuals who report no earnings in current year conditional on being in the sample in the previous year									
Unemployed	Frequencies	2418	2356	2536	2120	1984	1840	1689	
Inactive	%	8.12	7.88	8.21	6.8	6.49	6	5.51	
Attrition	Frequencies	2941	1889	2591	3562	3984	4301	4891	
	%	9.87	6.32	8.39	11.42	13.04	14.02	15.95	
Missing Wage	Frequencies	3857	4310	4550	4448	4042	3502	2745	
	%	12.95	14.42	14.73	14.26	13.23	11.42	8.95	
Total	Frequencies	29794	29883	30898	31185	30555	30669	30666	
	%	100	100	100	100	100	100	100	

Table 5. Inflows and Outflows of Individuals in the Sample – Luxembourg

	1994	1995	1996	1997	1998	1999	2000	2001
Number of individuals with positive earnings		15829	13695	14489	13403	14075	12667	12992
Absolute number and proportion of individuals who report positive earnings in current year conditional on being in the sample in previous year								
	Frequencies		13417	12498	13190	12257	12402	11457
	%		64.75	69.48	69.33	69.81	68.71	70.39
Absolute number and proportion of individuals who report no earnings in current year conditional on being in the sample in the previous year								
Unemployed	Frequencies		1765	1559	1505	1408	1246	954
Inactive	%		8.52	8.67	7.91	8.02	6.9	5.86
Attrition	Frequencies		3423	1663	2109	1913	2346	1940
	%		16.52	9.25	11.09	10.9	13	11.92
Missing Wage	Frequencies		2116	2267	2220	1980	2057	1926
	%		10.21	12.6	11.67	11.28	11.4	11.83
Total	Frequencies		20721	17987	19024	17558	18051	16277
	%		100	100	100	100	100	100

Table 6. Inflows and Outflows of Individuals in the Sample – France

	1994	1995	1996	1997	1998	1999	2000	2001
Number of individuals with positive earnings	19143	18197	17243	14014	12209	12080	12468	19143
Absolute number and proportion of individuals who report positive earnings in current year conditional on being in the sample in previous year								
	Frequencies	19143	18197	17243	14014	12209	12080	12468
	%	62.47	64.76	62	52.08	54.24	55.54	60.8
Absolute number and proportion of individuals who report no earnings in current year conditional on being in the sample in the previous year								
Unemployed	Frequencies	3259	3042	3426	3006	2607	2072	1995
Inactive	%	10.64	10.83	12.32	11.17	11.58	9.53	9.73
Attrition	Frequencies	3371	2213	2785	5584	3531	3786	2658
	%	11	7.88	10.01	20.75	15.69	17.41	12.96
Missing Wage	Frequencies	4871	4646	4358	4304	4162	3811	3385
	%	15.9	16.53	15.67	16	18.49	17.52	16.51
Total	Frequencies	30644	28098	27812	26908	22509	21749	20506
	%	100	100	100	100	100	100	100

Table 7. Inflows and Outflows of Individuals in the Sample – UK

	1994	1995	1996	1997	1998	1999	2000	2001
Number of individuals with positive earnings	24511	24848	25303	25278	25006	24881	24467	24511
Absolute number and proportion of individuals who report positive earnings in current year conditional on being in the sample in previous year								
	Frequencies	24511	24848	25303	25278	25006	24881	24467
	%	64.59	66.31	67.06	67.04	67.36	68.33	68.58
Absolute number and proportion of individuals who report no earnings in current year conditional on being in the sample in the previous year								
Unemployed	Frequencies	4712	5053	4663	4140	3941	3607	3595
Inactive	%	12.42	13.48	12.36	10.98	10.62	9.91	10.08
Attrition	Frequencies	1836	966	1169	2073	1919	2153	2105
	%	4.84	2.58	3.1	5.5	5.17	5.91	5.9
Missing Wage	Frequencies	6888	6605	6597	6213	6257	5774	5510
	%	18.15	17.63	17.48	16.48	16.85	15.86	15.44
Total	Frequencies	37947	37472	37732	37704	37123	36415	35677
	%	100	100	100	100	100	100	100

Table 8. Inflows and Outflows of Individuals in the Sample – Ireland

	1994	1995	1996	1997	1998	1999	2000	2001
Number of individuals with positive earnings	13937	13221	12590	12515	12435	12091	10745	9727
Absolute number and proportion of individuals who report positive earnings in current year conditional on being in the sample in previous year								
	Frequencies	12750	12217	12212	12020	11668	10236	9507
	%	49.99	50.04	52.41	53.13	54.1	51.63	54.65
Absolute number and proportion of individuals who report no earnings in current year conditional on being in the sample in the previous year								
Unemployed	Frequencies	4930	4723	4254	3374	2905	2185	2307
Inactive	%	19.33	19.35	18.26	14.91	13.47	11.02	13.26
Attrition	Frequencies	2167	2115	1600	1936	2516	3288	2362
	%	8.5	8.66	6.87	8.56	11.66	16.59	13.58
Missing Wage	Frequencies	5656	5359	5235	5292	4480	4116	3220
	%	22.18	21.95	22.47	23.39	20.77	20.76	18.51
Total	Frequencies	25503	24414	23301	22622	21569	19825	17396
	%	100	100	100	100	100	100	100

Table 9. Inflows and Outflows of Individuals in the Sample – Italy

		1994	1995	1996	1997	1998	1999	2000	2001
Number of individuals with positive earnings		32633	32236	32111	29661	28865	26993	26912	25170
Absolute number and proportion of individuals who report positive earnings in current year conditional on being in the sample in previous year									
	Frequencies		30946	31028	28717	27188	25717	25348	24139
	%		51.58	51.19	47.18	47.34	46.87	48.73	48.86
Absolute number and proportion of individuals who report no earnings in current year conditional on being in the sample in the previous year									
Unemployed	Frequencies		7900	7799	7670	6627	6890	5662	5027
Inactive	%		13.17	12.87	12.6	11.54	12.56	10.88	10.18
Attrition	Frequencies		3175	2947	5922	6030	5941	5399	5920
	%		5.29	4.86	9.73	10.5	10.83	10.38	11.98
Missing Wage	Frequencies		17978	18836	18559	17585	16325	15610	14315
	%		29.96	31.08	30.49	30.62	29.75	30.01	28.98
Total	Frequencies		59999	60610	60868	57430	54873	52019	49401
	%		100	100	100	100	100	100	100

Table 10. Inflows and Outflows of Individuals in the Sample – Greece

		1994	1995	1996	1997	1998	1999	2000	2001
Number of individuals with positive earnings		27974	27654	26150	24865	22675	22001	21335	21929
Absolute number and proportion of individuals who report positive earnings in current year conditional on being in the sample in previous year									
	Frequencies		26868	25946	24385	21815	20357	20443	21342
	%		45.83	45.69	44.98	42.09	43.52	46.06	49.72
Absolute number and proportion of individuals who report no earnings in current year conditional on being in the sample in the previous year									
Unemployed	Frequencies		7537	6813	6419	4523	4489	4427	3858
Inactive	%		12.86	12	11.84	8.73	9.6	9.97	8.99
Attrition	Frequencies		4417	4392	4347	7892	6222	4159	2363
	%		7.53	7.73	8.02	15.23	13.3	9.37	5.5
Missing Wage	Frequencies		19802	19640	19068	17599	15707	15352	15365
	%		33.78	34.58	35.17	33.96	33.58	34.59	35.79
Total	Frequencies		58624	56791	54219	51829	46775	44381	42928
	%		100	100	100	100	100	100	100

Table 11. Inflows and Outflows of Individuals in the Sample – Spain

		1994	1995	1996	1997	1998	1999	2000	2001
Number of individuals with positive earnings		22559	21863	21296	20975	20371	20580	19898	20185
Absolute number and proportion of individuals who report positive earnings in current year conditional on being in the sample in previous year									
	Frequencies		21460	20521	20329	19456	19679	19167	19352
	%		47.6	48.29	48.49	48.63	52.13	52.12	56.06
Absolute number and proportion of individuals who report no earnings in current year conditional on being in the sample in the previous year									
Unemployed	Frequencies		8419	8230	7353	5970	5083	4512	4761
Inactive	%		18.67	19.37	17.54	14.92	13.46	12.27	13.79
Attrition	Frequencies		4467	3000	4120	4327	3188	3922	3052
	%		9.91	7.06	9.83	10.81	8.44	10.66	8.84
Missing Wage	Frequencies		10741	10742	10121	10259	9802	9176	7357
	%		23.82	25.28	24.14	25.64	25.96	24.95	21.31
Total	Frequencies		45087	42493	41923	40012	37752	36777	34522
	%		100	100	100	100	100	100	100

Table 12. Inflows and Outflows of Individuals in the Sample – Portugal

		1994	1995	1996	1997	1998	1999	2000	2001
Number of individuals with positive earnings		14653	15450	15379	15087	14837	14569	14604	14550
Absolute number and proportion of individuals who report positive earnings in current year conditional on being in the sample in previous year									
	Frequencies		13892	14538	14321	13977	13921	13952	13942
	%		57.84	57.5	57.32	56.98	59.12	60.83	62.16
Absolute number and proportion of individuals who report no earnings in current year conditional on being in the sample in the previous year									
Unemployed	Frequencies		2187	2264	2396	2019	2067	1843	1702
Inactive	%		9.11	8.95	9.59	8.23	8.78	8.04	7.59
Attrition	Frequencies		1701	1908	1918	2346	1956	1617	1575
	%		7.08	7.55	7.68	9.56	8.31	7.05	7.02
Missing Wage	Frequencies		6236	6573	6350	6189	5602	5525	5211
	%		25.97	26	25.42	25.23	23.79	24.09	23.23
Total	Frequencies		24016	25283	24985	24531	23546	22937	22430
	%		100	100	100	100	100	100	100

Table 13. Inflows and Outflows of Individuals in the Sample – Austria

		1994	1995	1996	1997	1998	1999	2000	2001
Number of individuals with positive earnings			17944	17789	17199	16209	15162	13816	13056
Absolute number and proportion of individuals who report positive earnings in current year conditional on being in the sample in previous year									
	Frequencies			16472	16384	15634	14551	13403	12601
	%			67.96	68.2	67.49	67.2	66.51	68.21
Absolute number and proportion of individuals who report no earnings in current year conditional on being in the sample in the previous year									
Unemployed	Frequencies			1209	1231	906	790	803	843
Inactive	%			4.99	5.12	3.91	3.65	3.98	4.56
Attrition	Frequencies			2195	2080	2435	2470	2409	1794
	%			9.06	8.66	10.51	11.41	11.95	9.71
Missing Wage	Frequencies			4361	4330	4189	3842	3538	3235
	%			17.99	18.02	18.08	17.74	17.56	17.51
Total	Frequencies			24237	24025	23164	21653	20153	18473
	%			100	100	100	100	100	100

Table 14. Inflows and Outflows of Individuals in the Sample – Finland

		1996	1997	1998	1999	2000	2001
Number of individuals with positive earnings		15811	15845	15895	15546	13329	13057
Absolute number and proportion of individuals who report positive earnings in current year conditional on being in the sample in previous year							
	Frequencies		15246	15345	14753	12756	12588
	%		55.95	57.2	59.29	53.83	64.16
Absolute number and proportion of individuals who report no earnings in current year conditional on being in the sample in the previous year							
Unemployed	Frequencies		3446	2327	1657	1326	1267
Inactive	%		12.65	8.67	6.66	5.6	6.46
Attrition	Frequencies		1933	3219	2658	5219	1708
	%		7.09	12	10.68	22.02	8.71
Missing Wage	Frequencies		6623	5937	5814	4398	4057
	%		24.31	22.13	23.37	18.56	20.68
Total	Frequencies		27248	26828	24882	23699	19620
	%		100	100	100	100	100

Table 15. Error-Components Models for Log Real Hourly Earnings

	Germany		Denmark		Netherlands		Belgium		France		Luxembourg		UK	
	Param.	SE	Param.	SE	Param.	SE	Param.	SE	Param.	SE	Param.	SE	Param.	SE
Permanent Component														
$\exp(estimate)=\sigma_{\mu}^{2}$	7.2609	0.0867	0.0097	0.5891	0.1913	0.0905	0.0698	0.0246			0.1071	0.0251	0.0467	0.2467
$\exp(estimate)=\sigma_{\varphi}^{2}$	0.0024	0.0968			0.0002	0.0797							0.0001	0.1032
$\mathrm{cov}(\mu,\varphi)$	-0.1313	0.0121			-0.0052	0.0005							-0.0022	0.0004
$\exp(estimate)=\sigma_{\pi}^{2}$			0.0014	0.1494					0.0056	0.0294				
Time loading factors														
$\lambda_{1,1994}$	1		1		1		1		1					
$\lambda_{1,1995}$	1.0734	0.0084	1.0185	0.0210	0.9735	0.0158	0.9421	0.0116	1.0338	0.0130	1		0.9915	0.0082
$\lambda_{1,1996}$	1.1503	0.0112	0.9910	0.0209	0.9748	0.0172	1.0041	0.0122	1.0899	0.0132	1.0215	0.0220	0.9070	0.0103
$\lambda_{1,1997}$	1.2028	0.0142	0.9011	0.0231	0.9334	0.0159	0.9225	0.0145	1.0980	0.0147	1.1810	0.0208	0.9228	0.0126
$\lambda_{1,1998}$	1.2720	0.0215	0.9022	0.0256	0.9876	0.0169	0.8915	0.0160	1.0738	0.0174	1.2493	0.0222	0.8936	0.0146
$\lambda_{1,1999}$	1.4078	0.0188	0.7953	0.0257	0.8963	0.0184	0.7853	0.0162	1.0470	0.0179	1.3205	0.0248	0.8571	0.0154
$\lambda_{1,2000}$	1.5155	0.0222	0.7431	0.0287	0.8749	0.0193	0.9245	0.0170	0.9524	0.0176	1.3425	0.0314	0.7802	0.0163
$\lambda_{1,2001}$	1.4744	0.0280	0.7643	0.0264	0.9096	0.0208	0.9207	0.0156	0.9466	0.0168	1.2977	0.0222	0.7982	0.0175
Cohort specific factors														
$\gamma_{1,40-50}$	1		1		1		1		1		1		1	
$\gamma_{1,51-60}$	0.4401	0.0145	1.0630	0.0306	1.2748	0.0424	1.0127	0.0138	1.0020	0.0166	0.9557	0.0189	1.4131	0.0301
$\gamma_{1,61-70}$	0.2031	0.0088	1.0950	0.0704	1.3168	0.1144	0.7776	0.0105	1.2248	0.0213	0.9396	0.0183	2.0459	0.0992
$\gamma_{1,71-80}$	0.0856	0.0046	0.9890	0.1467	0.7891	0.0704	0.1425	0.0387	1.3408	0.0503	0.5933	0.0183	2.4514	0.2435
Transitory Component														
$\exp(parameter)=\sigma_{\varepsilon}^{2}$	0.2578	0.5741	0.1315	0.2626	0.1262	0.3096	0.2439	0.1523	0.3420	0.2633	0.0186	0.1671	0.0702	0.1110
$\exp(estimate)=\sigma_{0}^{2}$														

$\exp(estimate) = \sigma^2_{0,40-50}$	0.0044	0.7316	0.0368	0.0732	0.0228	0.0913	0.0639	0.0437	0.1139	0.0451	0.0753	0.0638	0.0764	0.0437
$\exp(estimate) = \sigma^2_{0,51-60}$	0.0562	0.0887	0.0255	0.0810	0.0271	0.1208	0.0357	0.0663	0.1078	0.0727	0.1064	0.1109	0.0789	0.0605
$\exp(estimate) = \sigma^2_{0,61-70}$	0.0419	0.0940	0.0349	0.0725	0.0112	0.2073	0.0392	0.0535	0.0821	0.0575	0.0672	0.1136	0.0750	0.0681
$\exp(estimate) = \sigma^2_{0,71-80}$	0.0832	0.0679	0.0284	0.0705	0.0406	0.0962	0.0347	0.0596	0.1290	0.0855	0.0225	0.1220	0.0313	0.1179
ρ	0.3583	0.0223	0.5472	0.0732	0.3289	0.0118	0.6280	0.0104	0.4443	0.0205	0.2389	0.0161	0.4512	0.0125
θ														
Time loading factors														
$\lambda_{2,1994}$	1		1		1		1		1				1	
$\lambda_{2,1995}$	0.4531	0.1298	0.3697	0.0502	0.4936	0.0756	0.2941	0.0226	0.4464	0.0581	1		0.8214	0.0418
$\lambda_{2,1996}$	0.3801	0.1088	0.3548	0.0508	0.4839	0.0771	0.2396	0.0181	0.3165	0.0434	1.9774	0.1487	0.8135	0.0475
$\lambda_{2,1997}$	0.3480	0.1008	0.3531	0.0483	0.4839	0.0756	0.2677	0.0202	0.3479	0.0467	1.4402	0.1377	0.7179	0.0406
$\lambda_{2,1998}$	0.3511	0.1013	0.3077	0.0409	0.3287	0.0505	0.2784	0.0209	0.3893	0.0503	1.0818	0.0915	0.7025	0.0359
$\lambda_{2,1999}$	0.3886	0.1121	0.4086	0.0543	0.3875	0.0605	0.3371	0.0255	0.3770	0.0484	1.2422	0.1019	0.7140	0.0377
$\lambda_{2,2000}$	0.2918	0.0841	0.3980	0.0538	0.4541	0.0710	0.2704	0.0201	0.3954	0.0515	1.3644	0.1127	0.8482	0.0482
$\lambda_{2,2001}$	0.3957	0.1147	0.3595	0.0484	0.5629	0.0877	0.3255	0.0257	0.3910	0.0517	1.4003	0.1195	0.7977	0.0453
Cohort specific factors														
$\gamma_{2,40-50}$	1		1		1		1		1		1		1	
$\gamma_{2,51-60}$	0.9547	0.0299	1.1521	0.0265	1.0459	0.0294	1.0555	0.0189	0.9551	0.0236	0.8573	0.0355	0.8949	0.0171
$\gamma_{2,61-70}$	0.9643	0.0268	1.2128	0.0205	1.1180	0.0313	0.9996	0.0140	1.0459	0.0239	1.0445	0.0429	0.9938	0.0182
$\gamma_{2,71-80}$	1.3832	0.0411	1.8237	0.0325	1.7278	0.0464	1.3569	0.0233	1.3873	0.0345	1.4318	0.0595	1.1898	0.0224
SSR	0.0143		0.0068		0.0099		0.0047		0.0208		0.0222		0.0061	
χ^2	2473.7073		5872.5492		2492.7787		17769.4220		1996.7248		1632.2320		2597.3157	
LogL	459.2576		512.8864		486.0084		540.0406		432.2749		318.4753		520.5053	

Table 15. Error-Components Models for Log Real Hourly Earnings *(continued)*

	Ireland		Italy		Greece		Spain		Portugal		Austria		Finland	
	Param.	SE	Param.	Param.	Param.	SE	Param.	SE	Param.	SE	Param.	SE	Param.	SE
Permanent Component														
$\exp(estimate)=\sigma_{\mu}^{2}$	0.0483	0.4109	0.0325	0.0325	0.0779	0.0915	0.294	0.059			0.0811	0.0449	0.0616	0.2703
$\exp(estimate)=\sigma_{\varphi}^{2}$	0.00015	0.1547	0.00008	0.00008	0.0002	0.0582	0.000	0.000					0.0001	0.1399
$\mathrm{cov}(\mu,\varphi)$	-0.0026	0.0007	-0.0014	-0.0014	-0.0034	0.0003	-0.006	0.001					-0.0023	0.0005
$\exp(estimate)=\sigma_{\pi}^{2}$									0.0074	0.0388				
Time loading factors														
$\lambda_{1,1994}$	1		1		1		1		1					
$\lambda_{1,1995}$	0.9872	0.0108	0.9529	0.0112	1.0205	0.0145	1.010	0.012	0.9921	0.0144	1			
$\lambda_{1,1996}$	0.9342	0.0118	0.9548	0.0184	0.9970	0.0194	0.973	0.017	1.0646	0.0164	1.0112	0.0244	1	
$\lambda_{1,1997}$	0.9749	0.0161	0.9085	0.0212	1.0386	0.0229	0.972	0.022	1.0477	0.0189	1.0570	0.0287	1.1265	0.0193
$\lambda_{1,1998}$	0.9288	0.0175	0.9868	0.0267	1.0104	0.0239	0.976	0.027	1.0558	0.0207	0.9843	0.0291	1.0778	0.0232
$\lambda_{1,1999}$	0.8714	0.0184	0.9983	0.0292	1.0606	0.0238	0.959	0.032	1.0140	0.0232	0.9081	0.0379	1.0173	0.0274
$\lambda_{1,2000}$	0.8073	0.0208	0.9704	0.0307	0.9236	0.0227	0.898	0.036	1.1016	0.0270	0.9403	0.0391	0.9554	0.0266
$\lambda_{1,2001}$	0.7910	0.0241	0.9476	0.0335	0.9267	0.0207	0.867	0.040	1.0611	0.0260	0.9425	0.0384	1.0297	0.0309
Cohort specific factors														
$\gamma_{1,40-50}$	1		1		1		1		1		1		1	
$\gamma_{1,51-60}$	1.3479	0.0444	1.2272	0.0463	1.3261	0.0233	1.162	0.074	1.0664	0.0236	0.8921	0.0198	1.3819	0.0485
$\gamma_{1,61-70}$	1.9458	0.1552	1.3857	0.1189	1.9371	0.0811	0.988	0.120	1.1664	0.0288	0.8354	0.0262	2.4403	0.1705
$\gamma_{1,71-80}$	2.7833	0.4487	1.5606	0.2008	3.9268	0.4940	0.475	0.078	0.8031	0.0581	0.4591	0.0293	2.9792	0.7975
Transitory Component														
$\exp(parameter)=\sigma_{\varepsilon}^{2}$	0.0284	0.1707	0.0582	0.0758	0.1183	0.0750	0.099	0.006	0.0724	0.1082	0.4830	0.1811	0.0555	0.2197
$\exp(estimate)=\sigma_{0}^{2}$	0.0784	0.0569					0.052	0.004			0.0751	0.0652		

$\exp(estimate)=\sigma^2_{0,40-50}$			0.0314	0.0898	0.0791	0.0516			0.0903	0.0945			0.0550	0.0743
$\exp(estimate)=\sigma^2_{0,51-60}$			0.0422	0.0619	0.0574	0.0702			0.1247	0.1219			0.0588	0.0701
$\exp(estimate)=\sigma^2_{0,61-70}$			0.0521	0.0592	0.1011	0.0436			0.0880	0.0914			0.0707	0.0727
$\exp(estimate)=\sigma^2_{0,71-80}$			0.0283	0.0919	0.0695	0.1269			0.0492	0.0781			0.0464	0.1098
ρ	0.2912	0.0249	0.6438	0.0428	0.5995	0.0346	0.849	0.024	0.7353	0.0143	0.7009	0.0292	0.2904	0.0195
θ			-0.2506	0.0204	-0.1487	0.0242	-0.364	0.007						
Time loading factors														
$\lambda_{2,1994}$	1		1		1		1		1					
$\lambda_{2,1995}$	1.2064	0.0955	0.7692	0.0239	0.7991	0.0261	0.907	0.027	0.9301	0.0338	1			
$\lambda_{2,1996}$	1.2529	0.1063	0.8238	0.0294	0.6992	0.0277	0.815	0.024	0.7194	0.0366	0.2929	0.0291	1	
$\lambda_{2,1997}$	1.0088	0.0808	0.7296	0.0241	0.6171	0.0280	0.842	0.024	0.7369	0.0374	0.2089	0.0224	0.8849	0.0977
$\lambda_{2,1998}$	1.0628	0.0849	0.7536	0.0264	0.6269	0.0275	0.887	0.023	0.7464	0.0385	0.1724	0.0196	0.7069	0.0809
$\lambda_{2,1999}$	1.0255	0.0829	0.6516	0.0242	0.6106	0.0256	0.760	0.021	0.7197	0.0373	0.2270	0.0223	0.9301	0.0957
$\lambda_{2,2000}$	1.0557	0.0905	0.6656	0.0225	0.7195	0.0287	0.821	0.022	0.7070	0.0345	0.2203	0.0220	0.8191	0.0861
$\lambda_{2,2001}$	1.0910	0.1010	0.6998	0.0234	0.6657	0.0287	0.856	0.023	0.7791	0.0391	0.2248	0.0229	0.7937	0.0852
Cohort specific factors														
$\gamma_{2,40-50}$	1		1		1		1		1		1		1	
$\gamma_{2,51-60}$	0.9767	0.0360	0.9894	0.0204	0.9608	0.0179	1.004	0.025	0.8889	0.0337	0.8410	0.0254	0.8609	0.0253
$\gamma_{2,61-70}$	1.1651	0.0352	1.0324	0.0217	1.0187	0.0183	1.051	0.025	1.0122	0.0334	0.8986	0.0280	0.8714	0.0252
$\gamma_{2,71-80}$	1.1793	0.0385	1.3299	0.0278	0.9443	0.0256	1.330	0.030	1.1381	0.0349	1.1979	0.0416	1.2070	0.0349
SSR	0.0276		0.0017		0.0146		0.0094		0.0266		0.0052			
χ^2	2324.4346		1576.2281		3824.4496		1984.9587		3222.0626		2229.2852			
LogL	412.1300		611.7874		458.0054		489.8478		414.6123		399.6179			

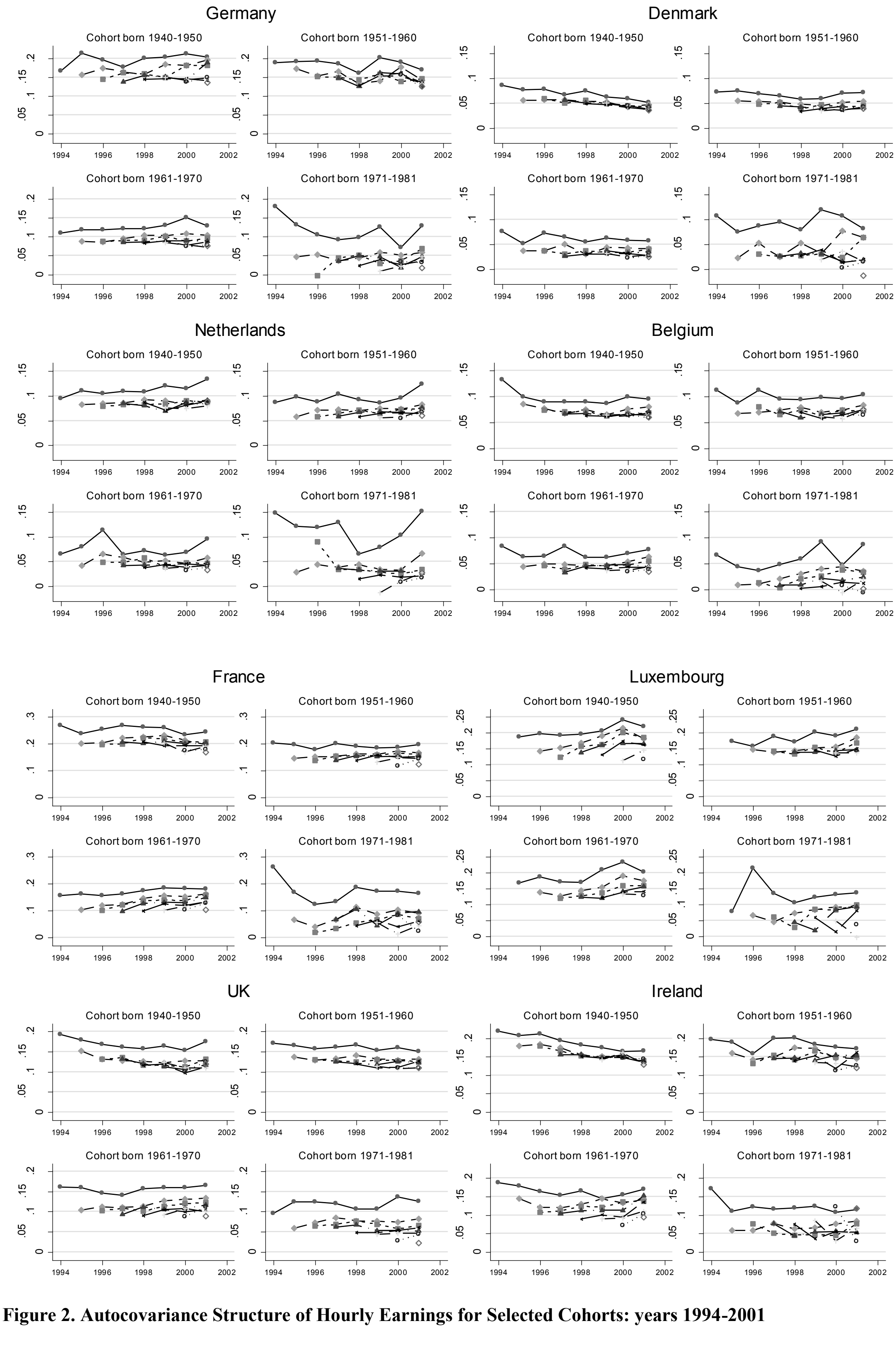

Figure 2. Autocovariance Structure of Hourly Earnings for Selected Cohorts: years 1994-2001

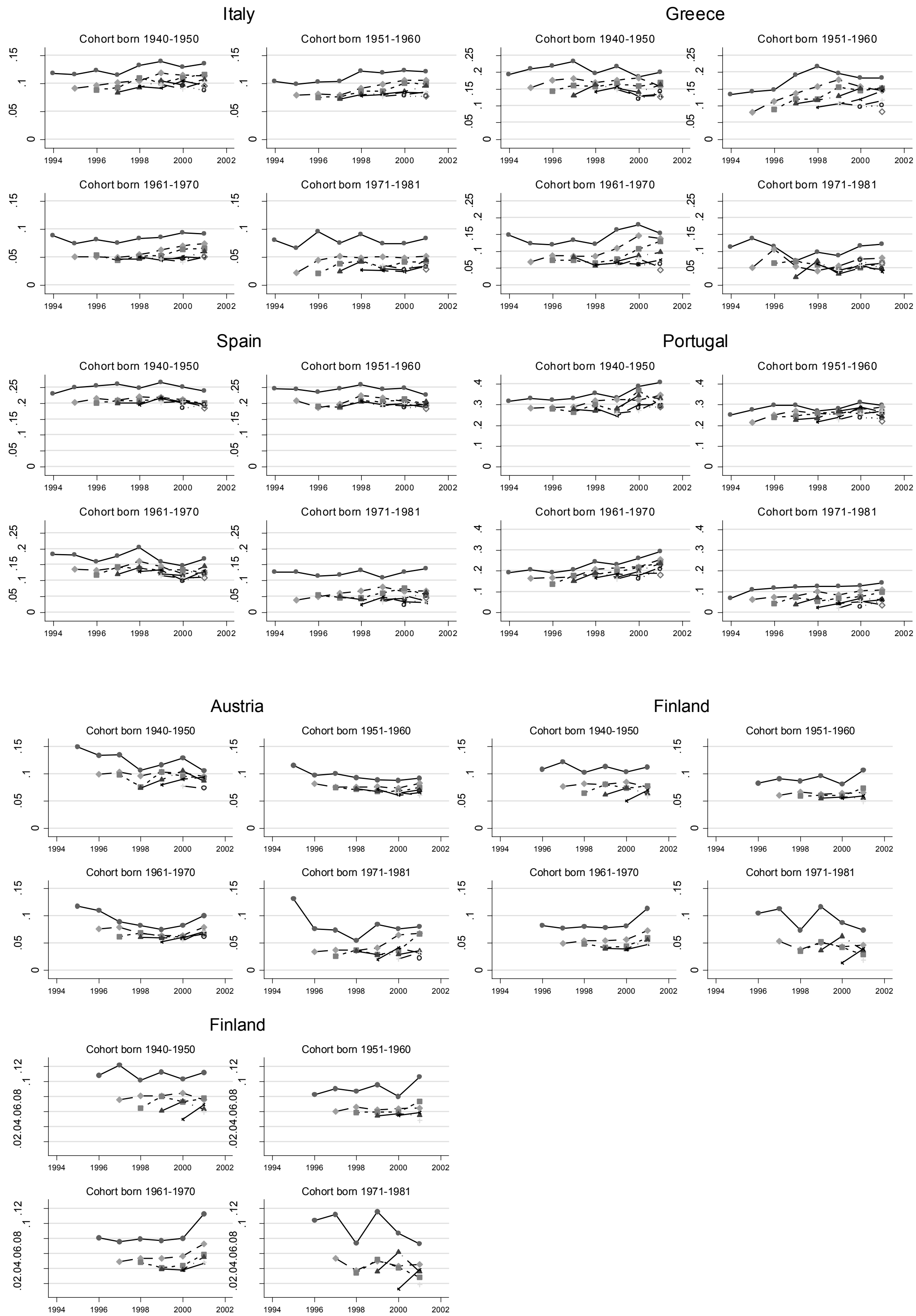

Figure 2. Autocovariance Structure of Hourly Earnings for Selected Cohorts: years 1994-2001 ***(continued)***

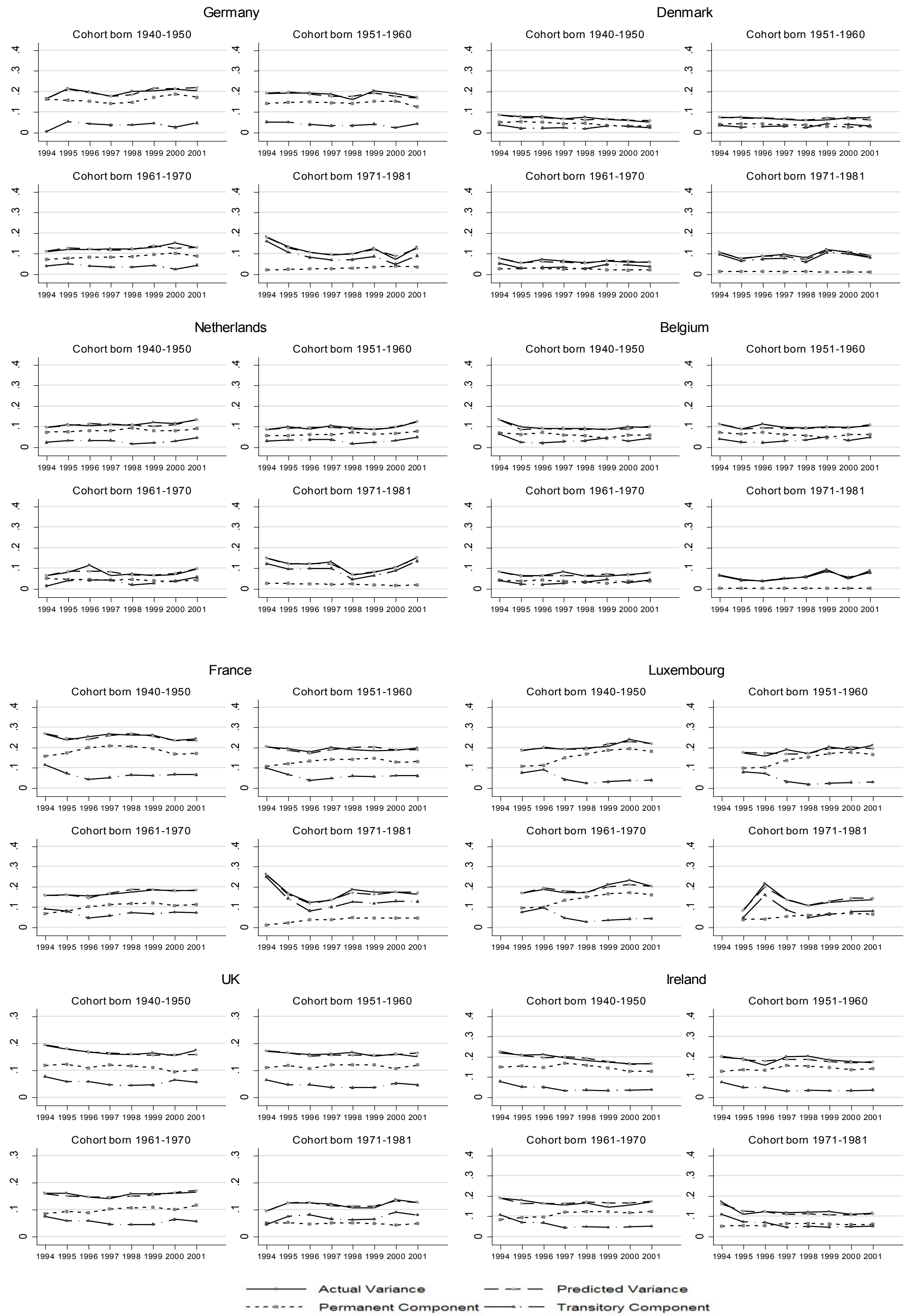

Figure 3. Actual and Predicted Variance of Earnings with Permanent and Transitory Predicted Components for Selected Cohorts: 1994-2001

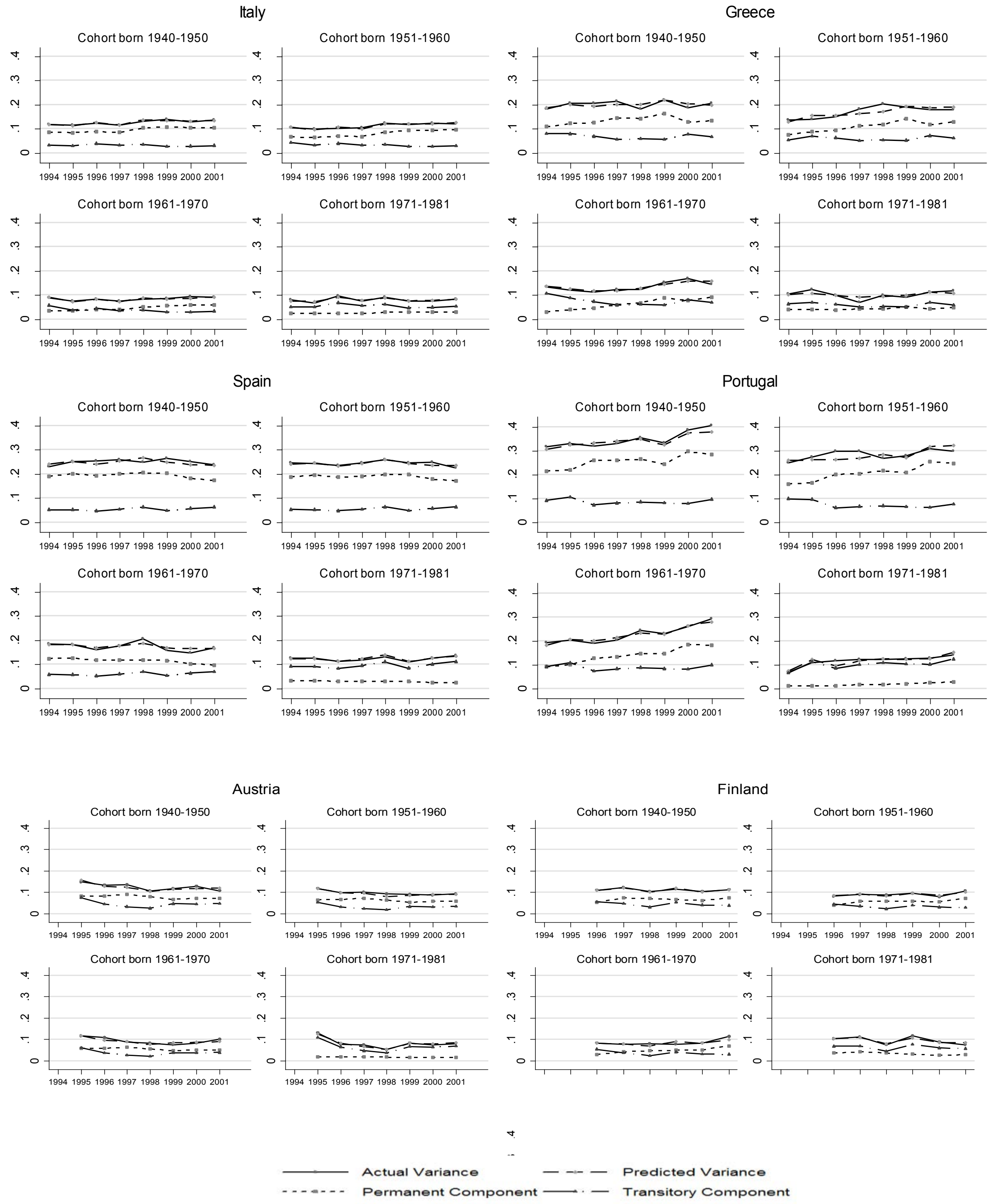

Figure 3. Actual and Predicted Variance of Earnings with Permanent and Transitory Predicted Components for Selected Cohorts: 1994-2001 *(continued)*

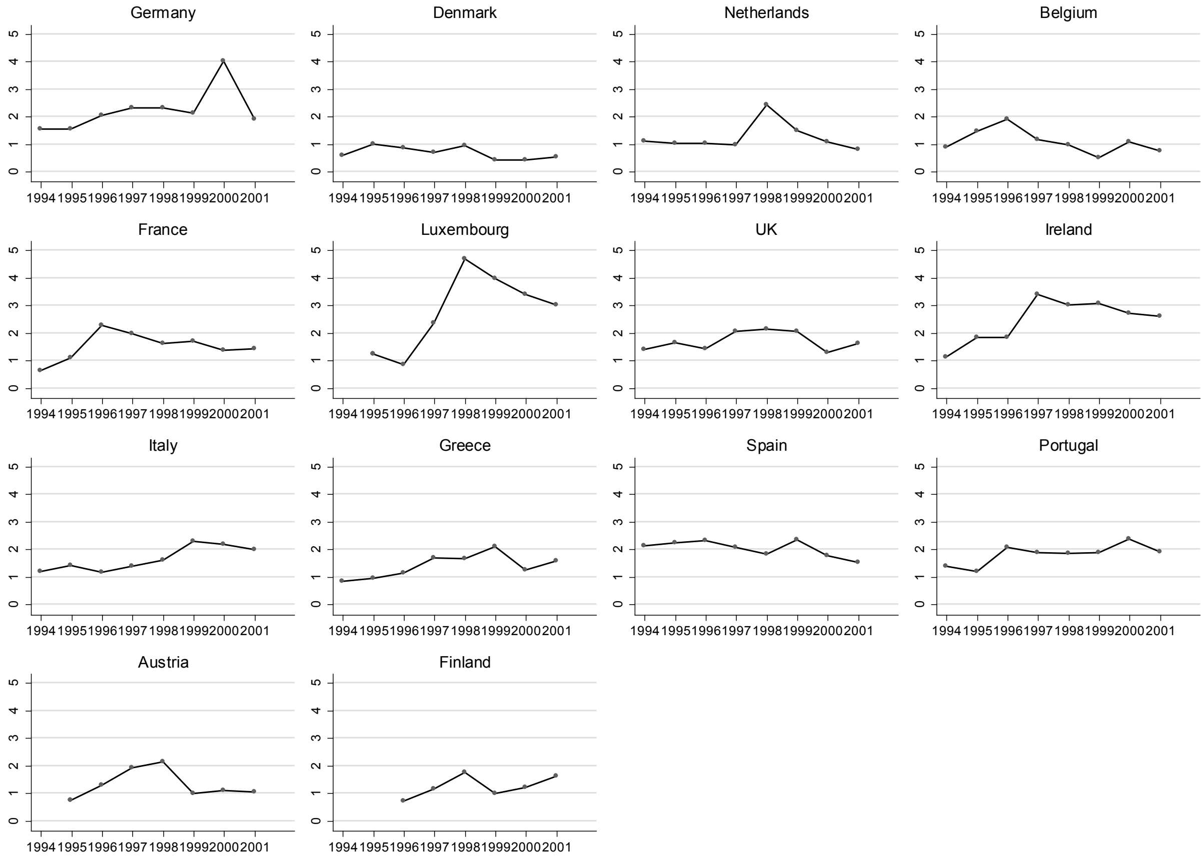

Figure 4. Ratio Between Permanent Variance and Transitory Variance Over Time For Selected Cohorts

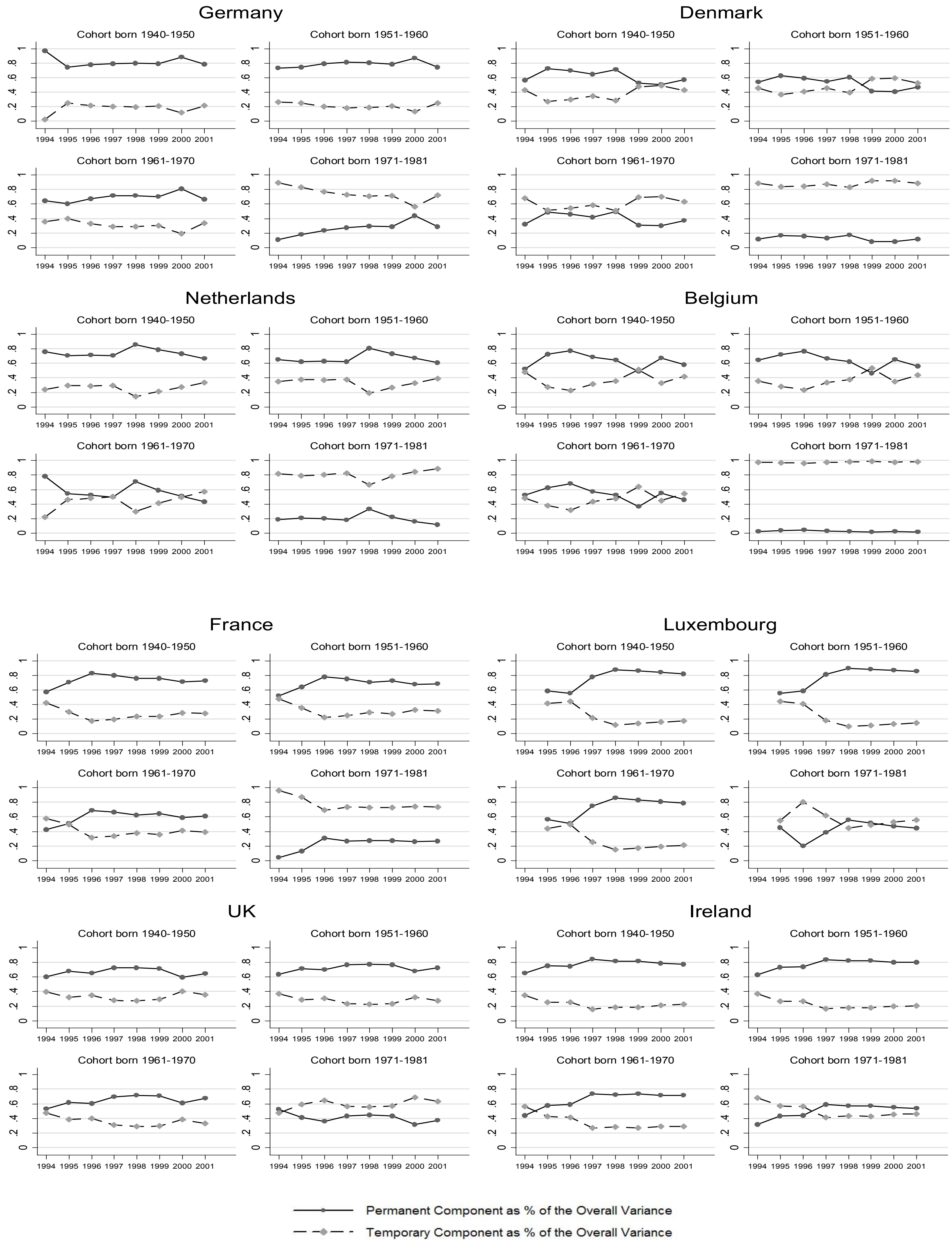

Figure 5. Predicted Permanent and Transitory Components of Earnings as % of Predicted Overall Variance for Selected Cohorts: 1994-2001

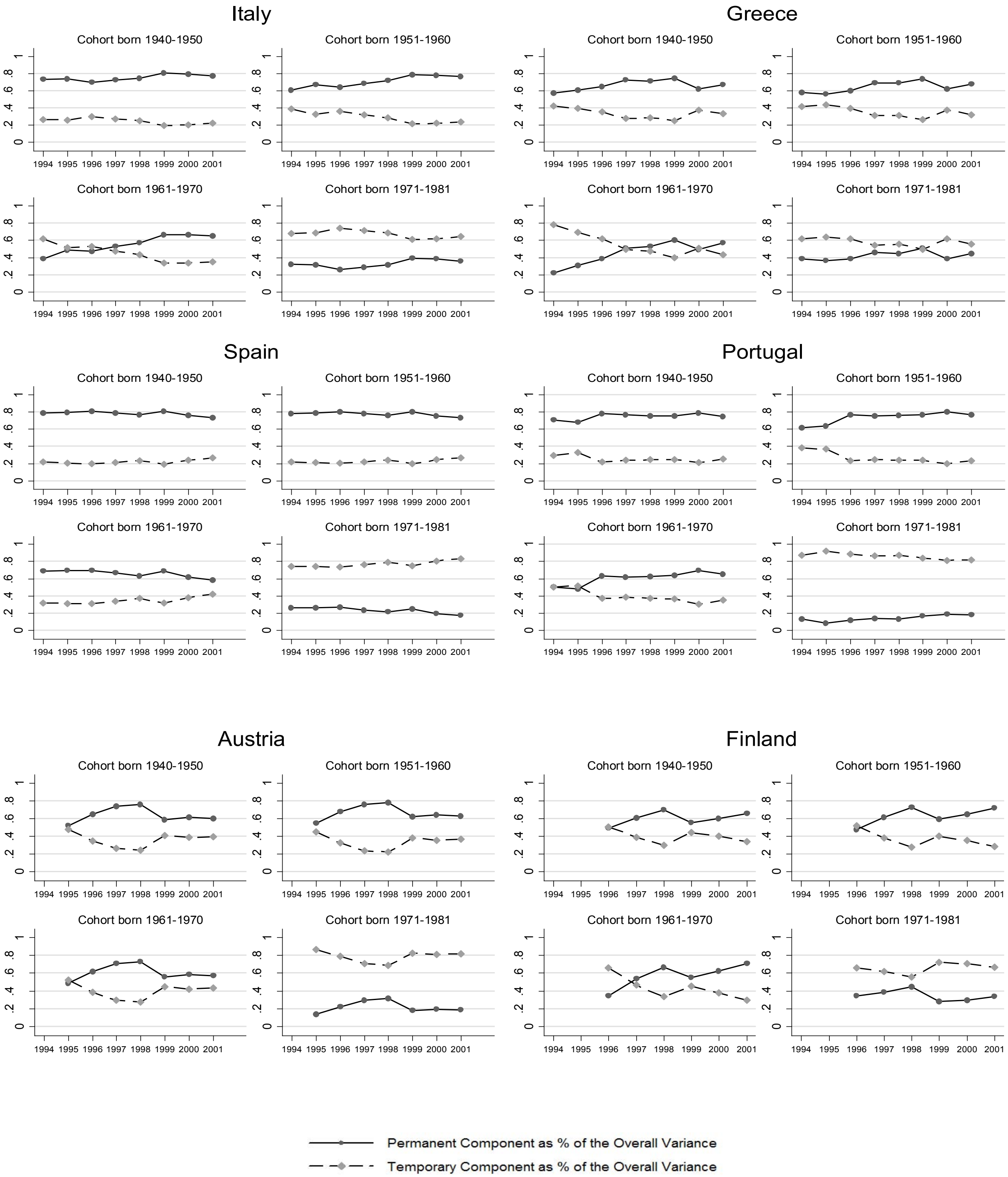

Figure 5. Predicted Permanent and Transitory Components of Earnings as % of Predicted Overall Variance for Selected Cohorts: 1994-2001 *(continued)*

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