

# **Shaping Earnings Volatility: Labour Market Policy and Institutional Factors**

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Paper Prepared for the IARIW-OECD Conference on Economic Insecurity

Paris, France, November 22-23, 2011

Session 5: Job and Earnings Insecurity

Wednesday, November 23, 2011, 11:10 - 12:40

# Shaping earnings instability: labour market policy and institutional factors\*

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October 2011

## **Abstract**

The concerns regarding the economic insecurity stemming from earnings instability have been gaining momentum in the contemporary political discourse. If earnings instability is as a proxy for risk, for risk-averse individuals, increasing earnings instability bears substantial welfare costs. Using the variance of transitory earnings estimated using the European Community Household Panel (ECHP) and the OECD labour market indicators, we explore by means of non-linear least squares the relationship between earnings instability and labour market policies/institutions across Europe in the 1990s. We find of a complex system of interactions within the institutional framework affecting earnings instability. For an average country with a low corporatism, we find a U-shape relationship between earnings instability and the strictness of labour market regulation. Corporatist systems have a lower earnings instability than decentralized economies, they are effective in reducing the adverse effects of macroeconomic shocks on earnings instability, and can counteract the increase in earnings instability associated with the development of ALMPs, with unionization, with product market regulation and with the tax wedge. The earnings instability associated with developed ALMPs is reduced by regulated labour markets, a high corporatism, low non-wage labour costs and high unemployment benefit replacement rates (UBRR). The decrease in earnings instability associated with an increase in the UBRR is the largest for developed ALMPs.

*Keywords:* economic insecurity, earnings instability, labour market institutions; labour market policies and institutions

*JEL classification codes:* C23, D31, J31, J60, J50, J08

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\*This paper represents an updated version of Sologon, Denisa M. and O'Donoghue, Cathal.2009. Policy, Institutional Factors and Earnings Mobility. IZA Discussion Series, No. 4151 (May). This research is part of the "Earnings Dynamics and Microsimulation" project supported by an AFR grant (PDR no. 893613) from the Luxembourg "Fonds National de la Recherche" cofunded under the Marie Curie Actions of the European Commission (FP7-COFUND).

## 1 Introduction

The concept of economic insecurity has been gaining an increasing attention over the past decades both in a national and cross-national context, fueled by the raising concerns regarding the impact of globalization on the security of well-paid jobs and of welfare safety nets in the world's advanced economies (Hacker, 2006, Mughan, 2007, Milberg and Winkler, 2009). According to the International Labour Organisation (ILO), economic security represents "basic social security, defined by access to basic needs infrastructure pertaining to health, education, dwelling, information, and social protection, as well as *work-related security*"<sup>1</sup>. Central to the "work-related security" is "income security" which "denotes adequate actual, perceived and expected income, either earned or in the form of social security and other benefits"<sup>2</sup>. Income security is a main determinant of household welfare and there are a number of factors that influence it: policy changes, employment shocks, capital market shocks, changes in the structure of labour market earnings. Since labour market earnings are the main source of household income, a large part of economic/income (in)security is determined by labour market earnings (in)security. The focus of this paper is on this driver of economic/income (in)security, namely labour market earnings (in)security. It is not about one-off shocks, but about systematic changes the earnings structure in terms of increased earnings instability or year-to-year fluctuations and risk.

The welfare implications of increasing earnings instability are not straightforward. Since existing evidence shows that consumption is well insulated from transitory shocks (Attanasio and Davis, 1996), increasing earnings instability is unlikely to reduce welfare through consumption. If we consider earnings instability as a proxy for risk and that individuals are averse to earnings variability and future income risk, then increasing earnings instability may carry substantial welfare costs (Blundell and Preston, 1998, Creedy and Wilhelm, 2002, Gottschalk and Spolaore, 2002). These findings have fueled the increasing concerns about the economic security of American families in the contemporary political discourse (Nichols and Zimmerman, 2008).

Our measure of earnings instability is derived from the transitory component of earnings which captures the volatility in the labour market, random events influencing earnings in a particular period, expected to average out over time, unlike the permanent component which reflects persistent individual characteristics such as ability, education, training (Friedman and Kuznets, 1954). Under the independence assumption, overall inequality at any point in time is composed of permanent inequality and transitory inequality. A growing persistent inequality

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<sup>1</sup>ILO (n.d.)

<sup>2</sup>ILO (n.d.)

indicates a growing inequality in lifetime or long-term resources. A growing transitory inequality indicates that individuals are facing an increase in the year-to-year earning fluctuations (instability) (Baker and Solon, 2003). Thus our measure of earnings instability is the variance in the transitory component of earnings or transitory earnings inequality. One must differentiate between the concept of earnings instability and earnings mobility, which is defined as the degree to which individual's rank changes within the wage distribution and which is determined by the ratio between the two components of inequality (Kalwij and Alessie, 2003): a large contribution of permanent inequality indicates that individual earnings are highly correlated over time and individuals experience low rates of earnings mobility.

The number of studies interested in exploring the trends in the two components of earnings inequality have been growing over the past decades. In the US and Canada, the most representative contributions are Lillard and Willis (1978), Lillard and Weiss (1979), MaCurdy (1982), Abowd and Card (1989), Moffitt and Gottschalk (1995, 1998, 2002, 2008), Baker (1997), Baker and Solon (2003). The increased availability of panel datasets has favored the growth of these studies also in Europe. The most representative national studies are Dickens (2000), Ramos (2003), Kalwij and Alessie (2003), Cappellari (2003), Gustavsson (2004), and most recent, Sologon and O'Donoghue (2010) (also in Sologon (2010)) - the first cross-national consistent comparative study in Europe. These studies, however, are limited to documenting the extent to which changes in cross-sectional earnings inequality reflect changes in the transitory or permanent inequality, without explaining the potential driving factors behind earnings instability and persistent inequality. Sologon and O'Donoghue (2011) take the first step and explore the role of labour market policies and institutions in understanding the cross-national differences in persistent earnings inequality across Europe. For earnings instability, as measured by the variance in the transitory component of earnings, however, to the best of our knowledge, a similar study does not exist.

We take the first step in this study and we explore the complex relationship between earnings instability and labour market policies and institutions using data for 14 European countries between 1994 and 2001. We consider the institutional factors associated with economic insecurity: the strictness of employment protection legislation (EPL), the degree of support in the labour market as public expenditure for active labour market programmes (ALMPs) (as % of GDP) and the average unemployment benefit replacement rate (UBRR), the degree of unionization and corporatism, and the product market regulation (PMR). Additionally we consider a set of macroeconomic shocks expected to affect economic insecurity and implicitly earnings instability. In Europe, this question has become increasingly relevant in the context of the economic reality

of the 1990s: the implementation of the single market (1992) and the preparation of the single currency (Maastricht criteria adopted in 1993) increased the pressure on the European labour markets to change. Since the early 1990s, influenced by the 1994 OECD Job Strategy, Europe has been moving towards more flexible labour markets (OECD, 2004). The pace of change was different across Europe (Palier, 2010) supporting the expectation of increased country heterogeneity with respect to the labour market structure and the distribution of labour market income across Europe. We investigate whether the heterogeneity in the main labour market policy and institutional factors can help us understand the cross-national differences in earnings instability across Europe. Is increased labour market flexibility likely to be associated with an increasing earnings instability? The evidence seems to point in this direction. Sologon and O'Donoghue (2010) (also in Sologon (2010)) find that eight EU countries reduced persistent differentials in 2001 compared to early 1990s, signaling an increase in labour market flexibility. In most countries, however, this trend is accompanied by an increase in earnings instability signaled by the increase in transitory inequality. This rises the question of a possible trade-off between labour market rigidity and earnings instability.

Using the OECD data on labour market policies and institutions for 14 EU countries and the predicted transitory inequality from Sologon and O'Donoghue (2010)(also in Sologon (2010)) as our measure of earnings instability, we apply a non-linear least squares method to explore the complex relationship between earnings instability and labour market policies and institutions.

## **2 Theoretical links between earnings instability and labour market policies and institutions**

Katz and Autor (1999) underlines that the rise of earnings instability is "a bit of a puzzle for hypotheses only emphasizing rising skills prices associated with increased growth in the demand for skills relative to the supply of skills". However, some explanations can be formulated. The increase in earnings instability may be attributed to an increased earnings exposure to macroeconomic shocks, a rise in the temporary workforce which increases earnings exposure to shocks, an increased labour market volatility, an increased competitiveness, globalization, an increased international capital mobility (Rodrik, 1997, Katz and Autor, 1999). 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 increase earnings instability, as firms face uncertainty with respect to the abilities of their workers (Katz and Autor, 1999).

The labour market institutional framework is expected to be a filtering mechanism aimed to minimize the adverse effects of macroeconomic shocks on earnings instability. The weakening of

the labour market institutions (e.g. unions, government wage regulation) in filtering the impact of macroeconomic shocks on earnings is expected to be among the factors increasing earnings instability (Rodrik, 1997; Katz and Autor, 1999).

Across age groups, as postulated by Freeman's (1975) "active labour market hypothesis", similarly with overall income, supply and demand factors together with the other macroeconomic shocks are expected to have the largest effect on the youngest generations of workers, as they have a weaker attachment to the labour market and a lower labour protection compared with senior workers.

Economic theory and previous empirical studies have identified a number of relevant policy and institutional factors expected to be associated with earnings instability. These include inter alia: (i) Employment protection legislation (EPL); (ii) Trade unions and the structure of collective bargaining; (iii) Product market regulation (PMR); (iv) The public spending on active labour market policies (ALMPs); (v) The average unemployment benefit replacement rate (UBRR); (vi) The tax wedge (the sum of the personal income tax and all social security contributions as a percentage of total labour cost). Based on the standard wage-setting/price-setting (WS/PS) model (Layard et al., 1991), any factor that affects the slope of the wage-setting curve (the degree of unionization and of corporatism, the PMR, the unemployment benefits) and the slope of the price-setting curve (the EPL, the PMR, the tax wedge) may be expected to interact with policies and institutions that affect the level of the wage-setting (the unemployment benefits) and the level of the price-setting curve (the PMR) (Bassanini and Duval, 2006*a,b*). All possible interactions across policies and institutions can affect earnings instability, and which policies complement/substitute each other should be established empirically.

To sum up, earnings instability may result from changes in labour market policies and institutions and the sensitivity of wages to shocks in market conditions. Compared with persistent inequality (Sologon and O'Donoghue, 2011), earnings instability is expected to be driven to a larger extent by macroeconomic shocks, but its final evolution depends on the ability of the labour market policy and institutions to minimize the adverse effects of these shocks.

### **3 Methodology**

#### **3.1 Measuring earnings instability**

The measure of earnings instability that we use emerges from the branch of literature which uses complex parametric models of earnings dynamics to decompose overall inequality into transitory inequality and permanent inequality (Baker, 1997, Dickens, 2000, Moffitt and Gottschalk, 2002,

1995, Haider, 2001, Baker and Solon, 2003, Ramos, 2003, Kalwij and Alessie, 2003, Cappellari, 2003). Our measure of earnings instability is the variance in the transitory component of individual earnings. Using the European Community Household Panel (ECHP), in Sologon and O'Donoghue (2010) (also in Sologon (2010)) we estimate the covariance structure of earnings by four birth cohorts for each country and decompose earnings inequality into a permanent and a transitory component using equally weighted minimum distance methods. Please refer to this study for a complete description of the estimation method. In the present study, we use the predicted transitory inequality as our measure of earnings instability to assess its link with the labour market policies and institutions.

The general specification of the transitory component of earnings is an ARMA(1,1) process with time and cohort specific shifters:

$$\gamma_c \lambda_t v_{it} = \gamma_c \lambda_t [\rho v_{i,t-1} + \epsilon_{it} + \theta \epsilon_{i,t-1}], \epsilon_{it} \sim iid(0, \sigma_\epsilon^2), v_{i0} \sim iid(0, \sigma_{c,0}^2) \quad (1)$$

The time and cohort shifters allow the structure of transitory earnings to vary over time and across cohorts.  $\epsilon_{it}$  is assumed to be white noise, the variance  $\sigma_{c,0}^2$  measures the volatility of shocks in the first period for each cohort and  $\sigma_\epsilon^2$  the volatility of shocks in subsequent years.  $\rho$  is the autoregressive parameter measuring the persistence of shocks.<sup>3</sup> Earnings instability measured as the transitory variance in year  $t$  is estimated as the  $Var(\gamma_c \lambda_t v_{it})$ .

The aggregation to obtain the overall inequality from the within-cohort inequalities for each country follows the Shorrocks sub-group inequality decomposition (Shorrocks, 1984, Chakravarty, 2001):

$$I = \sum_{c=1}^4 n_c PV_c + \sum_{c=1}^4 n_c TV_c \quad (2)$$

where  $n_c$ ,  $PV_c$ ,  $TV_c$  are the population share, the permanent variance, the transitory variance of cohort  $c$ . Our dependent variable, overall within-cohort transitory inequality, is:  $TV = \sum_{c=1}^4 n_c TV_c$

### 3.2 Estimation of the link between earnings instability and labour market policies and institutions

The relationship between earnings instability, measured by the transitory variance, and labour market policies and institutions is estimated using non-linear least squares, for all countries

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<sup>3</sup>The MA parameter  $\theta$ , which accommodates sharp drops in the lag-1 autocovariance compared with the other autocovariances, was found to differ significantly from 0 only in Italy, Greece and Spain.

pooled together. The unit of analysis is the country observed between 1994 and 2001.<sup>4</sup> Two steps are envisaged. First, we test whether policies interact with the overall institutional framework in shaping earnings instability. Second, we test whether institutions interact with the macroeconomic shocks in shaping earnings instability. Macroeconomic shocks are treated initially as unobservable but common to all countries - as time effects -, and lastly as observable and country-specific.

These regressions suffer from two problems which prevent the establishment of causality: first, the endogeneity between institutions and overall inequality is expected to affect also the relationship between institutions and transitory inequality, and second, the unobserved country-heterogeneity. These are long-standing and unsettled problems in the debate regarding the impact of labour market institutions, technological change, globalization, immigration on earnings inequality, expected to affect transitory inequality. The absence of good instruments prevents the establishment of causality. The estimated parameters should be interpreted as complex controlled associations between earnings instability and the institutional framework, and not causal relationships.

### 3.2.1 Systemic Interactions

The interactions between institutions are specified in a multiplicative form between the deviations of the respective institutions from their sample mean, as is usually done in macroeconomic equations. This specification enables the interpretation of the marginal effect of each institution when the others are kept constant at the sample mean. Undertaking a systematic analysis of policy interactions is not straightforward, as a model with seven policies/institutions implies including 21 cross-interactions, thereby inducing a substantial loss of degrees of freedom. To avoid this, we adopt an alternative strategy, similarly with Bassanini and Duval (2006a) for unemployment and Sologon and O'Donoghue (2011) for persistent inequality. We estimate systemic interactions, meaning interactions between each policy/institution and the overall institutional setting, defined as the sum of the direct effects of the policies/institutions. The model specification is displayed in equation (3):

$$TV_{it} = \sum_{k=1}^K v_k X_{kit} + \sum_{k=1}^K \varphi_k (X_{kit} - \bar{X}) \left( \sum_{k=1}^K v_k (X_{kit} - \bar{X}_k) \right) + u_{it} \quad (3)$$

$i$ ,  $t$  and  $k$  are the country, the period and the institution index.  $TV_{it}$  is the transitory variance of country  $i$  in year  $t$ . The parameters  $v_k$  and  $\varphi_k$  are estimated simultaneously using non-linear

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<sup>4</sup>Exceptions are Luxembourg and Austria observed between 1995 and 2001, and Finland between 1996 and 2001.

least squares.  $v_k$  is the direct effect of institution  $X_k$  on  $TV_t$  for a country with an average mix of policies and institutions.  $\varphi_k$  is the interaction effect between the institution/policy  $X_k$  and the overall institutional framework, expressed as the sum of the direct effects of policies/institutions (expressed in a deviation form in the interaction).

We evaluate the partial derivatives of (3) with respect to each policy/institution to indicate which of them has the potential to reduce earnings instability. The partial derivative of  $TV$  with respect to each policy/institution for a country with an average mix of policies is  $v_k$ . The partial derivative of  $TV$  with respect to policy/institution  $X_k$  for a country with an institutional mix which differs from the average is:

$$\frac{\partial TV}{\partial X_k} = v_k + 2\varphi_k v_k (X_k - \bar{X}_k) + \sum_{j \neq k}^J (\varphi_k v_j + \varphi_j v_k) (X_j - \bar{X}_j) \quad (4)$$

Setting all institutions, except  $X_k$  and  $X_j$ , equal to their averages we get:

$$\frac{\partial TV}{\partial X_k} = v_k + 2\varphi_k v_k (X_k - \bar{X}_k) + (\varphi_k v_j + \varphi_j v_k) (X_j - \bar{X}_j) \quad (5)$$

Evaluated at the average  $\bar{X}_k$ , expression (5) becomes:

$$\frac{\partial TV}{\partial X_k} = v_k + (\varphi_k v_j + \varphi_j v_k) (X_j - \bar{X}_j) \quad (6)$$

The sign of the partial derivative depends on the direct and the interaction effects of the interacting institution and its deviation from the average.

Next, in order to explore the possible cross-interactions between institutions, we compute the cross-derivatives of  $TV$  in (3) with respect to two policies/institutions  $X_j$  and  $X_k$ , when all the other policies/institutions are set equal to the average:

$$\frac{\partial^2 TV}{\partial X_k \partial X_j} = \varphi_k v_j + \varphi_j v_k \quad (7)$$

### 3.2.2 Interactions between institutions and shocks

Similar with Blanchard and Wolfers(1999) for unemployment and Sologon and O'Donoghue (2011) for persistent inequality, we explore the role of labour market policy and institutional factors in shaping the impact of macroeconomic shocks on earnings instability in two steps.

#### Common unobservable shocks and interactions with institutions

First we treat the macro shocks as unobservable but common to all countries. The macro shocks are incorporated as time effects, as shown:

$$TV_{it} = \tau_t \left( 1 + \sum_{k=1}^K \gamma_k (X_{kit} - \bar{X}_k) \right) + u_{it} \quad (8)$$

$\tau_t$  is the time effect for period  $t$ .  $\gamma_k$  is the interaction effect between the institution/policy  $X_k$  and the overall unobserved shock captured by  $\tau_t$ . This specification allows the effect of the common macro shocks on earnings instability to depend on the country-specific mix of labour market policies/institutions. This specification represents more a description of the data, rather than tightly specified theoretical interactions, but it captures the basic hypothesis that given the same shocks, countries with weaker institutions experience higher earnings instability.

### Country specific observable shocks and interactions with institutions

Second, we replace the unobservable common shocks by a set of country-specific observable shocks:

$$TV_{it} = \sum_{s=1}^S \zeta_s Z_{sit} (1 + \sum_{k=1}^K \gamma_k (X_{kit} - \bar{X}_k)) + u_{it} \quad (9)$$

$\sum_{s=1}^S \zeta_s Z_{sit}$  is a set of observed macroeconomic shocks, which are interacted with labour market policies and institutions.  $\zeta_s$  are the direct effects of shocks and  $\gamma_k$  the interaction effects between the institution/policy  $X_k$  and the aggregated macroeconomic shocks.

## 4 Data

Our measure of earnings instability, the transitory inequality, is estimated using the ECHP<sup>5</sup> over the period 1994-2001. Following the tradition of previous studies, we consider only men to avoid the selection bias attached to female earnings. The earnings measure is the real log hourly wage adjusted for CPI of workers aged 20 to 57, born between 1940 and 1981. Hourly earnings lower than 50 Euros and higher than 1 Euro are disregarded. The working sample for each country is an unbalanced panel, weighted using the "base weights" of the last wave observed for each individual, as recommended by Eurostat. The decomposition is performed by cohorts (1940-1950, 1951-1960, 1961-1970 and 1971-1981). For the data description and summary statistics see Sologon and O'Donoghue (2010)(also in Sologon (2010)). Luxembourg and Austria are observed between 1995 and 2001 and Finland between 1996 and 2001.

The link between the estimated transitory inequality (aggregated at the population level) and labour market policies and institutions is investigated using the Bassanini and Duval (2006a, 2006b) (OECD) dataset<sup>6</sup>. The institutional variables included are: employment protection legislation (EPL), trade union density, product market regulation (PMR), tax wedge, degree of corporatism, average unemployment benefit replacement rate (UBRR) and spending on active

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<sup>5</sup>The European Community Household Panel provided by Eurostat via the Department of Applied Economics at the Université Libre de Bruxelles.

<sup>6</sup>The data was provided by email from the authors.

labour market programmes (ALMPs). The macroeconomic shock variables are: labour demand shock, terms of trade shock, total factor productivity shock, and the real interest shock. These variables are observed for each country between 1994 and 2001. Their description is included in Table 1.<sup>7</sup> The summary statistics of the institutional and shock variables are in Table 2. Luxembourg and Greece have some missing institutional and shock variables and they are dropped from the final estimations. Portugal, Denmark and Ireland record some missing values for the labour demand shock.

## 5 Patterns in earnings instability and policy and institutional factors across the EU

The evidence obtained by Sologon and O'Donoghue (2010) and Sologon (2010) regarding the evolution of persistent inequality and earnings instability is summarized in Table 3. Most countries record opposite trends in the uncertainty concerned with unexpected transitory shifts in earnings from the inequality associated with permanent shifts in the earnings distribution, underlying that these two phenomena are indeed different. Increasing earnings instability exacerbates overall inequality in the Netherlands and Portugal, whereas increasing persistent differentials exacerbates overall inequality in Greece, Finland, Italy and Luxembourg. In 2001, the highest earnings instability is found in Portugal, Spain and the Netherlands and the lowest in the Scandinavian countries.

The evolution of the European labour market policies and institutions over time is shown in Figure 1. In most countries, except Austria, France, Ireland and Greece with constant regulatory level, and the UK with increasing regulation, labour markets are more deregulated (EPL decreased) in 2001 compared with early 1990s. Consistent across countries, a deregulation wave is identified in the product market (decreasing PMR). Union density decreases in all countries, except Belgium. Active labour market policies (ALMPs) develop in all countries (the most in the Netherlands, Denmark and Ireland), except Germany where the opposite holds. The tax wedge decreases over time across the EU: the Anglo-Saxon countries record the largest decline, followed by the Nordic and the Mediterranean countries. Exceptions are Austria, Belgium, Denmark and France where the opposite is observed. The unemployment benefits replacement rates (UBRR) increase in all countries, except in Denmark, Finland and the UK. These reforms are accompanied by a stable degree of corporatism across the EU. In 2001, Figure 2 reveals a substantial institutional heterogeneity across the 14 EU countries, which has the potential to explain the differences in earnings instability across Europe. Figure 2 shows the scatter plots of pair of labour

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<sup>7</sup>For a detailed description, please refer to Bassanini and Duval (2006a,b).

market indicators, re-scaled by setting the UK indicators as the base. The labour market support is summarized in one indicator computed as the arithmetic average of the ALMPs and the unemployment benefit RR, similar with Milberg and Winkler (2009). The scatter plot of labour market support against the labour market regulation (EPL) indicates the presence of similar country clusters as Boeri (2002). In the bottom left corner of the scatter plot we find the Anglo-Saxon countries (UK and Ireland) with the lowest levels of regulation and low levels of support in the labour market (only the UK, as Ireland offers a similar support as the Nordic countries); they also have the lowest low tax wedges and among the lowest union densities. In the upper left corner we find the Northern countries (the Scandinavian countries and the Netherlands) which adopted the "Flexicurity" model with relatively low levels of regulation and high labour market levels, high tax wedges, a high corporatism, a high union density and moderate levels of regulation in the product market (PMR). In the lower right corner we find the Mediterranean countries (Greece, Portugal and Spain) with the strictest regulation and a moderate support in the labour market, a low union density and an intermediate corporatism, a relatively high PMR and tax wedge. The other countries form the "Continental model" (Germany, France, Belgium, Austria, Italy) with a moderate labour market regulation and labour market support, a medium-high unionization, a high corporatism and high tax wedges.

The institutional factors are expected to interact with the macroeconomic shocks in shaping earnings instability. Figure 3 illustrates the evolution of selected macroeconomic shocks. Given that changes in labour demand factors, technology, terms of trade, real interest do not differ significantly across Europe, they cannot by themselves explain the changes in earnings instability. These trends are not surprising, as these countries operate in the same world markets, with similar technology, industry and occupation mixes. Ireland stands out with respect to its evolution in the total factors productivity shock: a sharp increase is recorded until 1997, followed by stabilization towards 2001; similarly, the real interest shock drops towards 1998 and stabilizes afterwards. These trends are most likely related to the Celtic Tiger. As these countries face similar macro shocks, the differences in institutions may explain the differences in earnings instability across countries.

## **6 Estimation results**

### **6.1 Direct effects and systemic interactions**

Table 4 reveals the estimates of the first model. Most direct and systemic interactions are significant. The model has a high explanatory power, suggesting that the complex institutional framework plays an active role in shaping earnings instability in Europe. In our discussion, unless

stated otherwise, we consider the results for a country with an average mix of policies/institutions and a low corporatism. In this particular institutional mix, we find that countries with a stricter labour market regulation (EPL) have on average a lower earnings instability. A similar association is found for the generosity of the unemployment benefit replacement rate (UBRR)(albeit insignificant). The institutions which are positively associated with earnings instability are the degree of unionization and corporatism, the tax wedge, the product market regulation (PMR) and the spending on ALMPs. In order to grasp the magnitude of these effects, we simulate the changes in policies/institutions evaluated at their sample averages, which implemented separately, imply a reduction in transitory inequality by 1% relative to the average country (Table 5). The most efficient reforms associated with a decrease of 1% in transitory inequality are decreasing the tax wedge (1%) or increasing labour market regulation (1.66%); the least efficient are decreasing the spending on ALMPs (3.85%) and decreasing the union density (4.75%). All systemic interactions are highly significant and reinforce the direct institutional effects. The transition from a decentralized economy to a corporatist economy is associated with a decrease in earnings in earnings instability of 37%<sup>8</sup> relative to the average country.

Evaluating the first derivative (evaluated at the min, mean, and max values of the respective institution) and the second derivative in Table 6, only union density displays a monotonic relationship: its effect is positive and stronger the higher the union density. For the other institutions, the partial derivative reverses its sign when evaluated at the min/max value of the respective institution. For example, an increase in EPL evaluated at the highest sample value has an increasing effect on earnings instability, opposite to the effects observed at lower values of EPL. Thus too much labour market regulation exacerbates earnings instability. A similar U-shape relationship with earnings instability is found for: the tax wedge, the PMR, the ALMPs and the UBRR.

To explore the extent to which the effect of each policy/institution varies depending on the mix of policies in place we evaluate the partial derivatives for institutional mixes that differ from the average country with a low corporatism. Table 6 shows the partial derivative of TV with respect to each institution at its average value, evaluated at different moments of the other institutions. Figures 5, 6 and 7 complement Table 6 by illustrating the partial derivative for each institution at its minimum and maximum value, evaluated at different moments of the other institutions. The effect of each policy/institution, both in sign and magnitude, depends to a large extent on the mix of policies in place, both in signs and magnitudes. For example,

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<sup>8</sup>37% =  $(0.017 - 2.285 * 0.017) / T\bar{V}$ , where  $T\bar{V} = .0573$  is the transitory variance for a country with an average mix of policies and a low corporatism

for an average country, the effect of each policy/institution has opposite signs in corporatist versus decentralized economies (Table 6); the effect UBRR maintains its sign but decreases its magnitude in corporatist economies. For an average EPL, the effect of EPL has opposite signs when evaluated at min/max values of the other institutions (Table 6). This holds for most institutions, with a some exceptions. For example, the higher the union density, the stronger the negative effect of EPL in countries with an average EPL, the stronger the positive effect of PMR in countries with an average PMR, and the stronger the positive effect of ALMPs in countries with an average spending on ALMPs (Table 6).

Next we turn to Figures 5-7. In Figure 5 (EPL) we find that for low values of EPL, the effect of EPL is negative irrespective of the policy mix. The magnitude of the effect, however, varies substantially across different policy mixes, and the strongest negative effect is found when the spending on ALMPs is high. The same holds for low unemployment benefit replacement rate (Figure 7 (UBRR)). Figure 5 (Union Density) shows that when union density is high, the effect of union density is positive for most institutional mixes. The same holds for PMR (Figure 6), for the tax wedge (Figure 6) and for ALMPs (Figure 7). The effects of the remaining institutions, evaluated both at low and high levels, differ substantially across different institutional mixes, both in magnitudes and signs (Figures 5- 7). In Table 6, the cross-derivatives of  $TV$  with respect to pairs of policies/institutions, when all the other policies/institutions are set equal to the average, summarize the extend to which the effect of each institution varies for different levels of the other institutions. A positive cross-derivative indicates that the effect of one institution, if positive, becomes stronger the higher the level of the second institution; if negative, it is counteracted the higher the level of the second institution. A negative cross-derivative indicates that the effect of one institution, if negative, becomes stronger the higher the level of the second institution; if positive, it is counteracted the higher the level of the second institution.

This model specification performs well in explaining between-country differences in earnings instability, as displayed in Figure 4 (Model 1, column 1). Our next question is how well does it explain the evolution of earnings instability over time across the 14 EU countries? The correlation between the change in the predicted outcome and the actual outcome is significant, positive and strong, indicating that the model does a good job at explaining the evolution over time (see also Figure 4 - Model 1, column 2). We find a stronger correlation for the change in earnings instability (0,903) than the one found by Sologon and O'Donoghue (2011) for persistent inequality (0.54), sign that the institutional reforms between 1994 and 2001 explain to a larger extent the change in earnings instability than the change in persistent inequality across Europe.

## 6.2 Macroeconomic shocks and interactions

Is the institutional explanation enough? As the labour market policies/institutions interact with the macroeconomic shocks, we are tempted to look for explanations of the differential evolution of earnings instability across Europe based on the interaction between shocks and institutions. This section explores the role of labour market policy and institutional factors in shaping the impact of the macroeconomic shocks earnings instability.

### Common unobservable shocks and interactions

First, we treat shocks as unobservables but common to all countries. Our basic hypothesis is that, given the same shocks, countries with weaker institutions experience higher earnings instability. This model has a high explanatory power, slightly lower compared with the initial model. The estimation results are displayed in Table 7. The estimated time effects indicate that for a country with an average mix of policies (and low corporatism), earnings instability increased by 18,65% (absolute increase of 0,0118) between 1994 and 2001. The significant interaction effects indicate that a high corporatism diminishes the adverse effects of shocks on earnings instability, whereas product market regulation and ALMPs augment them.

To get a sense of the magnitudes, column(2) gives the range of each institutional variable (in deviation from the sample mean). We take an adverse shock that would raise earnings instability by 1% for a country with an average mix of policies, and evaluate this effect (column(3)) when we consider, in turn min/max values of each institution. We find that the range of the effects of institutions on the impact of a given shock on earnings instability varies across institutions: the same shock will have the strongest negative impact on earnings instability in the country with a high corporatism, followed by the most deregulated product market, and the least developed ALMPs (*ceteris paribus* at the average). This ranks descendently the efficiency of each factor in reducing the adverse effects of shocks. Factors that augment the adverse effects of shocks are in a descendant order: the most developed ALMPs, the most regulated product market and low corporatism. This model performs well in explaining the cross-country heterogeneity in the evolution of earnings instability over the sample period, as illustrated by Figure 4 (Model 2, column 2), and the strong positive and highly significant correlation between the actual and the predicted change in earnings instability (0,89).

## Country specific observable shocks and interactions

Next, the unobservable common shocks are replaced by a set of country specific observable shocks. We consider four sources of shocks: the labour demand shift, the rate of total factor productivity growth, the terms of trade and the real rate of interest. Due to some missing data for some countries, the panel is slightly unbalanced. For Portugal, the information on shocks is missing in all years, restraining the estimation sample to 80 observations.

Replacing the unobservable shocks by a set of country-specific observable shocks (Table 8) leads to a slightly lower explanatory power compared with the previous models, suggesting that the heterogeneity in the magnitude of shocks explains part of the cross-country heterogeneity in the earnings instability. Whereas three out of four shocks are significant, only two institutions appear to significantly affect the impact of these shocks on earnings instability. Also in this specification, a high corporatism is an effective tool in reducing the adverse effects of these shocks on earnings instability and the generosity of the unemployment benefit acts as a filter against the adverse effects of these shocks. A positive labour demand shift and an increase in the real interest rate are associated with an increase in earnings instability. The opposite holds for the terms of trade shocks.

This specification, however, performs poorly in explaining the cross-country heterogeneity in the evolution of earnings instability over time, as indicated by Figure 4 (Model 3, column 2) and the insignificant correlation between the actual and the predicted change. Thus these shocks do not explain the evolution in earnings instability across Europe between 1994 and 2001.

### 6.3 Discussion of results

We end with a discussion of the results of the three models, taking each policy driver in turn.

#### *Employment protection legislation (EPL)*

For a country with an average mix of policies/institutions and a low corporatism, we bring evidence of a U-shape relationship between earnings instability and EPL. At low and average levels of EPL, a stricter labour market regulation is associated with a decrease in earnings instability. At high levels of regulation, the association turns positive, suggesting that extreme levels of EPL make the "cost" of EPL on earnings instability dominant. The literature points to the existence of both "costs" and "benefits" associated with a strict employment protection regulation. Cazes and Nesporova (2003) argue against a strict EPL because of its key role in generating labour market rigidity: EPL increases the cost of hiring and of layoffs, and consequently lowers labour turnover (Blanchard, 1999). A lower turnover is expected to affect mainly workers with

temporary contracts, as they have a weaker protection in the labour market. Thus, the potential "cost" of a strict EPL is widening differentials between workers with regular jobs covered by the EPL and workers with irregular jobs, unemployed job-seekers. A strict EPL "benefits" covered workers by lowering turnover and offering a better protection in the labour market, thus reducing earnings instability.

The relationship between EPL and earnings instability depends on the mix of policies in place, suggesting that certain policy mixes augment the "costs" of EPL, whereas other mixes augment its "benefits". For example, increasing EPL from the average increases earnings instability in the presence of a high corporatism/low tax wedge/deregulated product markets/low ALMPs/high UBR. These policy mixes augment the "cost" of EPL. Whereas the "benefit" of increasing EPL from low values dominates across all mixes, increasing EPL from high values decreases earnings instability only when coupled either by a high union density or a highly regulated product market or developed APLMs or a high tax wedge.

***Labour market support as spending for active labour market programs (ALMPs)***

For a country with an average mix of policies and a low corporatism, more developed ALMPs are associated with a higher earnings instability. The ALMPs are found to exacerbate the adverse effects of macro shocks on earnings instability. These findings are consistent with our expectations. ALMPs, which typically consist of job placement services and labour market programmes such as job-search, vocational training or hiring subsidies can improve the efficiency of job-matching, enhance the work experience and skills of the unemployed, facilitating their reintegration into the labour market (Bassanini and Duval, 2006*a,b*, Sologon and O'Donoghue, 2011). These reintegrated workers, however, are the least protected in the labour market and thus are expected to be the most affected by macroeconomic shocks. In the face of macroeconomic shocks, their presence in the labour market may amplify earnings instability.

For low levels of spending on ALMPs, increasing ALMPs is negatively associated with earnings instability. This effect, however, turns positive for countries with an average ALMPs, becoming stronger the higher the level of spending on ALMPs. This signals that complementary protection mechanisms should be put in place to protect the vulnerable groups re-integrated into the labour market by these policies. We identify a set of policy/institutional mixes which have the potential to reduce this increase in earnings instability or even reverse the sign. We find that the increase in earnings instability associated with increasing ALMPs when they are already high is considerably lower when accompanied by highly regulated labour markets, by a high corporatism, by low non-wage labour costs, and by high unemployment benefit replacement rates. Under the same conditions, increasing ALMPs from an average level is actually associated with

a decrease in earnings instability. Similarly, each of these conditions reinforce the negative effect of increasing ALMPs when they are low. This indicates that these institutional circumstances assure a smoother reintegration of workers into the labour market. Generous unemployment benefits favour a better job-matching, thus more stable employment profile for the reintegrated workers; low tax wedges (non-wage labour costs) favour less costly and faster reintegration into the labour market; and highly regulated labour markets and corporatist economies may provide a better labour market protection for the reintegrated workers.

### ***Labour market support as average unemployment benefit replacement rate (UBRR)***

For an average country with either low or average UBRRs, more generous unemployment benefits are associated with a lower earnings instability and are found to limit the adverse effect of shocks on earnings instability. These findings have two potential explanations. First, this negative effect may be spurious, if we consider the "cost" of generous unemployment benefits for unemployment: they are expected to weaken the job-search intensity, decrease the employability and human capital for the unemployed, and consequently exclude them from the labour market. As this group is more prone to earnings instability, their exclusion from the labour market hides part of the earnings instability. This explanation is supported by Blanchard and Wolfers (1999) who finds that generous unemployment benefits lead to a larger effect of adverse shocks on unemployment. Second, generous unemployment benefits, have also associated "benefits". Their "benefit" is that longer and more generous unemployment benefits represent incentives not to accept low-paid jobs, thereby improving job-matching. A better job-matching increases the likelihood of more stable employment and earnings profiles (Bassanini and Duval, 2006b, 2006a), which in turn imply a lower earnings instability.

The unemployment spells have an averse effect on the employability and the human capital accumulation of the unemployed, expected to increase their earnings vulnerability once they re-enter the labour market, unless protection mechanisms and developed ALMPs are in place to counteract this increase in earnings instability. We find that the decrease in earnings instability associated with an increase in the UBRR is the largest when the ALMPs are very developed. Thus developed ALMPs have the potential to counteract the adverse effect of increasing the generosity of the UBRR for earnings instability, similar with unemployment (Bassanini and Duval, 2006*a,b*). Evaluated at low levels, the generosity of the UBRR is negatively associated with earnings instability for most policy mixes. Evaluated at very high values, the effect of UBRR on earnings instability varies substantially depending on the institutional mix.

### ***Trade unions***

For an average institutional mix and a low corporatism, the higher the degree of unionization, the higher the earnings instability. This is a surprising result, given that the stated purpose of unions is to reduce earnings disparities (OECD, 2004). Our findings suggest that, for this institutional mix, the "cost" of unionization outweighs its "benefit". The "benefit" of unionization stems indirectly from its impact on training and minimum wage. By forcing employers to provide training to their employees, they increase the employees' human capital and adaptability to new technologies (Aghion and Williamson, 2001), thus reducing earnings instability for covered workers. However, even if unions decrease the within-group earnings instability, they may still increase the overall earnings instability by increasing the between-group differentials, between unionized and non-unionized workers.

The effect of unionization on earnings instability is found to depend on the mix of policies in place, a sign that the "cost" of increasing unionization from the average is mitigated when coupled with the right policies. We find that the effect of unionization depends on corporatism: a higher unionization is negatively associated with earnings instability in corporatist economies, opposite to what we find for decentralized economies. This is consistent with the evidence that unions in decentralized economies push towards claiming a larger share of the surplus, effect mitigated in corporatist economies which benefit from a higher coordination (Teulings and Hartog, 2008).

Evaluated at the average, the "cost" of unionization for earnings instability is mitigated also by a highly regulated labour market / a low tax wedge / a deregulated product market / low ALMPs / high unemployment benefits. Evaluated at its minimum, the "cost" is mitigated by a highly regulated labour market / a low tax wedge / a deregulated product market / low levels of spending on ALMPs / high UBRs. Evaluated at its maximum, the "cost" is mitigated only for the average country with a minimum tax wedge.

### *Corporatism*

We find that countries with an average institutional mix and a corporatist economy have a lower earnings instability than countries with an average institutional mix and a decentralized economy. Consistent across models, we find a strong negative significant interaction effect with the macroeconomic shocks, suggesting that corporatist systems are effective in reducing the adverse effects of macroeconomic shocks on earnings instability. Our finding runs counter to the traditional view that corporatism generates labour market rigidity, but it is consistent with the recent research on the impact of corporatism on wage structures. Teulings and Hartog (2008) argue that corporatist systems can be very flexible, even more so than decentralized ones, because they allow the contracts to be renegotiated to ensure a smooth adjustment to aggregate shocks. As corporatist systems deal with the adjustment to aggregate shocks, they can prevent

the exacerbation of earnings instability in the presence of adverse shocks.

From the cross-institutional interactions, the corporatist systems emerge as desired complements for counteracting the increase in earnings instability associated with the development of ALMPs, with the generosity of the unemployment benefits, with unionization, with the regulation in the product market and with the tax wedge. This suggests that a high degree of coordination has the potential of keeping earnings instability low.

### ***Product market regulation (PMR)***

The "benefit" of more regulated sectors is that they display more compressed and more stable earnings structures and are therefore expected to have a lower earnings instability than non-regulated sectors. Whereas the "benefit" emerges within the regulated sectors, the "cost" emerges when taking a larger perspective by including also non-regulated sectors: the potential "cost" of a stricter product market regulation is widening transitory differentials between workers in non-regulated sectors and those in regulated sectors. Deregulation in the product market is expected to increase competition, lower market rents and wages, thereby increasing earnings instability in the previously regulated sectors (Fortin and Lemieux, 1997).

We find that some policy mixes augment the "costs" of a strict regulation in the product market, whereas other mixes augment the "benefits". For a country with an average mix and a low corporatism, a stricter regulation in the product market is associated with a higher earnings instability. Regulated product markets also appear to exacerbate the adverse effects of macro shocks on earnings instability. For corporatist systems, however, a stricter PMR is associated with a lower earnings instability. The "cost" of increasing PMR from the average is also mitigated in the presence of a highly regulated labour market / a low tax wedge / a high UBR. The "cost" of increasing PMR from high values is mitigated only for an average country with a minimum tax wedge. In deregulated product markets, the effect of a stricter regulation varies substantially depending on the institutional mix.

## **7 Concluding remarks**

The concerns regarding the economic insecurity stemming from earnings instability have been gaining momentum in the contemporary political discourse given the recent findings which show increasing cross-sectional earnings differentials stemming from increasing earnings instability, both in the US and Europe. If we consider earnings instability as a proxy for risk and that individuals are averse to earnings variability, then increasing earnings instability bears substantial welfare costs. Whereas most studies focused on identifying earnings instability, little is known

regarding the potential driving factors. Our paper takes the first step towards understanding the complex relationship between earnings instability and labour market policies and institutions. We explore this relationship in a European context. The European institutions have been long regarded as a source of labour market rigidity, but the economic reality of the 1990s pressured Europe to move towards more flexible labour markets. A series of labour market reforms have implemented across Europe, increasing the country-heterogeneity in labour market policies and institutions (Palier, 2010). This heterogeneity has the potential to help us understand the cross-national differences in earnings instability across Europe.

One concern regarding the reforms aimed to boost labour market flexibility in Europe is whether a higher labour market flexibility is likely to increase earnings instability, and which are the potential labour market policies/institutions that can counteract this increase. Sologon and O'Donoghue (2010) bring supporting evidence that most European countries where labour market flexibility increased between the early 1990s and 2001, as measured by decreasing persistent differentials, record an increase in earnings instability as measured by the variance in the transitory component of earnings. Using the OECD labour market indicators and the predicted transitory variance from Sologon and O'Donoghue (2010), in this study we explore by means of non-linear least squares the relationship between earnings instability and labour market policies and institutions across 14 EU countries between 1994 and 2001.

We bring evidence of a complex system of interactions within the institutional framework affecting earnings instability, where the effects of most institutions/policies depend to a large extent on the institutional mix. For a country with an average mix of policies/institutions and a low corporatism, we find a U-shape relationship between earnings instability and the strictness of labour market regulation. This shows that low to moderate levels of EPL offer protection against earnings instability, but strict levels are associated with a higher earnings instability.

Corporatist systems have a lower earnings instability than decentralized economies, and are effective in reducing the adverse effects of macroeconomic shocks on earnings instability. Our findings bring supporting evidence that corporatist systems can be very flexible, even more so than decentralized ones, in line with Teulings and Hartog (2008)'s current findings regarding the impact of corporatism on wage structures. As corporatist systems deal with the adjustment to aggregate shocks, they limit the increase in earnings instability in the presence of adverse shocks.

The degree of corporatism affects significantly the relationship between earnings instability and the other policies/institutions. For a country with an average mix of policies and a decentralized economy, the spending on ALMPs, the union density, the product market regulation and the non-wage labour costs are positively associated with earnings instability. These associations

are reversed in corporatist economies, suggesting that corporatist systems can counteract the increase in earnings instability associated with the development of ALMPs, with unionization, with the regulation in the product market and with the tax wedge.

We find that the earnings instability associated with developed ALMPs is augmented in periods of adverse macroeconomic shocks. These policies are a crucial instrument for reintegrating the vulnerable groups into the labour market. To counteract the increase in earnings instability, these policies need to be accompanied by appropriate protection mechanisms. We identified a few institutional mixes, as deviations from the average country, which have the potential to achieve this goal when they accompany the development of ALMPs: regulated labour markets, a high corporatism, low non-wage labour costs and high unemployment benefit replacement rates. We also find that the decrease in earnings instability associated with an increase in the UBRR is the largest when the ALMPs are very developed, sign that developed ALMPs have the potential to counteract the potential the adverse effect of increasing the generosity of the unemployment benefit for earnings instability, similar with unemployment (Bassanini and Duval, 2006*a,b*).

Linking our findings with Sologon and O'Donoghue (2011)'s findings regarding the relationship between persistent inequality and the same labour market policy and institutional factors, we find evidence of an institutional mechanism that triggers a trade-off between labour market rigidity signaled by the increase in persistent inequality, and earnings instability signaled by the increase in transitory inequality. The only factors with consistent effects across the two outcomes are corporatism, (de)unionization, and product market (de)regulation.

Denmark and the Netherlands have among the most flexible labour markets in Europe, but their their earnings instability differs considerably. In Denmark, earnings instability increased slightly over time, with a negligible effect on the overall inequality. In the Netherlands, earnings instability is 2.6 times higher in 2001 compared with 1994 and contributes significantly to the increase in overall inequality. The difference between the two countries comes from their "Flexicurity" models. The Dutch "Flexicurity" model determined an impressive growth in employment in the 1990s, but this growth was entirely in part-time jobs which account for 70% of all low-wage workers (Salverda, 2008). The collective agreements in the Netherlands, however, provided an insufficient protection for this vulnerable segment of the economy (see Salverda (2008)). This may explain the staggering increase in earnings instability in the Netherlands. The lesson to be drawn is that the institutional framework in place needs to be adapted to re-integrate the vulnerable groups into the labour market, to offer adequate protection, and to favour their investment in human capital for future stable careers.

Table 1: Description of OECD Variables.

Source: Bassanini and Duval (2006)	
EPL= Employment Protection Legislation	OECD summary indicator of the stringency of Employment Protection Legislation. EPL ranges from 0 to 6.
Union Density	Trade union density rate, i.e. the share of workers affiliated to a trade union, in %.
Degree of Corporatism	Indicator of the degree of centralisation/coordination of the wage bargaining processes, which takes values 1 for decentralised and uncoordinated processes, and 2 and 3 for intermediate and high
Tax Wedge	The tax wedge expresses the sum of personal income tax and all social security contributions as a percentage of total labour cost.
PMR= Product Market Regulation	OECD summary indicator of regulatory impediments to product market competition in seven non-manufacturing industries. The data used in this paper cover regulations and market conditions in seven energy and service industries. PMR ranges from 0 to 6.
ALMPs = Public expenditures on active labour market policies	Public expenditures on active labour market programmes per unemployed worker as a share of GDP per capita, in %.
Average unemployment benefit replacement rate	Average unemployment benefit replacement rate across two income situations (100% and 67% of APW earnings), three family situations (single, with dependent spouse, with spouse in work)
Labour Demand Shock	Logarithm of the labour share in business sector GDP purged from the short-run influence of factor prices.
Terms of Trade Shock	Logarithm of the relative price of imports weighted by the share of imports in GDP
Total Factor Productivity Shock	Deviation of the logarithm of Total Factor Productivity (TFP) from its trend calculated by means of a Hodrick-Prescott (HP) filter (smoothing parameter $\lambda = 100$ )
Real Interest Shock	Difference between the 10-year nominal government bond yield (in %) and the annual change in the GDP deflator (in %).

Table 2: Institutional Variables - Summary Statistics.

Variable		Mean	Std. Dev.	Min	Max	Observations
EPL	overall	2.423	0.956	0.600	3.854	N = 101
	between		0.944	0.621	3.739	n = 13
	within		0.251	1.537	3.211	T = 7.769
Union Density	overall	0.371	0.191	0.096	0.794	N = 108
	between		0.201	0.098	0.779	n = 14
	within		0.017	0.302	0.429	T = 7.714
Degree of Corporatism	overall	2.570	0.649	1.000	3.000	N = 93
	between		0.669	1.000	3.000	n = 12
	within		0.000	2.570	2.570	T = 7.75
Tax Wedge	overall	0.326	0.068	0.128	0.449	N = 93
	between		0.067	0.219	0.404	n = 12
	within		0.022	0.234	0.390	T = 7.75
PMR	overall	3.394	1.015	1.133	5.236	N = 93
	between		0.871	1.454	4.415	n = 12
	within		0.563	2.155	4.459	T = 7.75
ALMPs	overall	0.301	0.209	0.048	1.261	N = 93
	between		0.188	0.094	0.750	n = 12
	within		0.101	-0.035	0.812	T = 7.75
Unemployment Benefit RR	overall	0.360	0.117	0.166	0.649	N = 93
	between		0.115	0.174	0.599	n = 12
	within		0.030	0.271	0.451	T = 7.75
Labour demand shock	overall	0.062	0.062	-0.075	0.167	N = 85
	between		0.063	-0.068	0.147	n = 11
	within		0.013	0.028	0.099	T=7.727
Terms of Trade Shocks	overall	-0.094	0.040	-0.178	-0.027	N = 93
	between		0.035	-0.146	-0.042	n = 12
	within		0.022	-0.142	-0.041	T=7.75
Total Factor Production Shock	overall	0.007	0.016	-0.058	0.047	N = 85
	between		0.007	-0.001	0.019	n = 11
	within		0.015	-0.056	0.049	T=7.727
Real Interest Shock	overall	0.039	0.018	-0.016	0.080	N = 93
	between		0.007	0.023	0.045	n = 12
	within		0.017	-0.001	0.088	T=7.75

Table 3: Evolution of overall within inequality and its components - permanent and transitory variance between the 1st and last wave, countries ranked descendently by actual inequality in 2001

Country	Overall Within Inequality		Permanent Inequality		Transitory Inequality	
	1st Wave	2001	1st Wave	2001	1st Wave	2001
PRT	0.221	0.249	0.181 (82%)	0.153 (61%)	0.04 (18%)	0.098 (39%)
LUX	0.169	0.193	0.096 (56%)	0.144 (76%)	0.074 (44%)	0.045 (24%)
FRA	0.208	0.191	0.123 (59%)	0.123 (65%)	0.085 (41%)	0.066 (35%)
ESP	0.210	0.181	0.155 (73%)	0.102 (56%)	0.056 (27%)	0.079 (44%)
GR	0.145	0.156	0.066 (46%)	0.097 (61%)	0.078 (54%)	0.063 (39%)
UK	0.168	0.152	0.099 (59%)	0.097 (62%)	0.069 (41%)	0.058 (38%)
DEU	0.154	0.153	0.116 (75%)	0.103 (67%)	0.039 (25%)	0.051 (33%)
IRL	0.194	0.149	0.105 (54%)	0.105 (70%)	0.091 (46%)	0.045 (30%)
NLD	0.085	0.122	0.058 (69%)	0.053 (43%)	0.027 (31%)	0.071 (57%)
ITA	0.101	0.104	0.059 (58%)	0.069 (66%)	0.044 (42%)	0.036 (34%)
FIN	0.092	0.102	0.04 (43%)	0.062 (63%)	0.052 (57%)	0.036 (37%)
AUT	0.125	0.093	0.06 (47%)	0.046 (50%)	0.067 (53%)	0.046 (50%)
BEL	0.104	0.089	0.057 (55%)	0.041 (45%)	0.047 (45%)	0.05 (55%)
DNK	0.080	0.064	0.041 (51%)	0.025 (38%)	0.039 (49%)	0.04 (62%)

Source: Based on the estimates in Sologon and O'Donoghue (2010)

Table 4: Transitory Variance - Systemic interactions across institutions.

Direct effect of institutions	Estimate	t
EPL	-0,014 ***	-3,370
Union density	0,032 **	2,420
High Corporatism	0,017 ***	3,990
Tax wedge	0,176 ***	5,810
PMR	0,006 ***	2,850
ALMPs	0,050 **	2,590
Average replacement rate	-0,040	-1,340
Systemic interactions		
EPL	-0,607 ***	-5,960
Union density	1,460 ***	3,470
High Corporatism	-2,285 ***	-16,340
Tax wedge	6,702 ***	4,840
PMR	0,378 ***	4,050
ALMPs	2,614 ***	5,460
Average replacement rate	-3,305 ***	-3,760
Adjusted $R^2$	0,949	
Observations	93	

Table 5: Transitory Variance - Simulated relative reforms resulting in 1% decrease in TV relative to the average country.

Change in institutions relative to their average	Change in TV relative to the average country
EPL	1,66%
Union density	-4,75%
Tax wedge	-1,00%
PMR	-2,61%
ALMPs	-3,85%
Average replacement rate	4,00%

Table 6: Partial and Cross-derivatives of TV with respect to the institutional factors

Institution $X_j$	Institution $X_k$														
	EPL <sup>1</sup>			Union density			Tax wedge			ALMPs			Average replacement rate		
$X_j^*$	$\frac{\partial TV}{\partial X_k}$	$\frac{\partial^2 TV}{\partial X_k \partial X_j}$	$\frac{\partial^2 TV}{\partial X_k \partial X_j}$	$\frac{\partial TV}{\partial X_k}$	$\frac{\partial^2 TV}{\partial X_k \partial X_j}$	$\frac{\partial^2 TV}{\partial X_k \partial X_j}$	$\frac{\partial TV}{\partial X_k}$	$\frac{\partial^2 TV}{\partial X_k \partial X_j}$	$\frac{\partial^2 TV}{\partial X_k \partial X_j}$	$\frac{\partial TV}{\partial X_k}$	$\frac{\partial^2 TV}{\partial X_k \partial X_j}$	$\frac{\partial^2 TV}{\partial X_k \partial X_j}$	$\frac{\partial TV}{\partial X_k}$	$\frac{\partial^2 TV}{\partial X_k \partial X_j}$	
EPL	min	-0,0459	0,0174	0,1064	0,0325	-0,0406	0,5457	0,1763	-0,2028	0,0065	-0,0093	0,1728	0,0497	-0,0676	0,0714
	mean	-0,0143	0,0174	0,0325	-0,0406	0,0948	0,1763	0,4750	0,0065	0,0217	0,1575	0,0497	-0,0399	0,0625	
	max	0,0106	-0,0257	-0,0257	0,0724	0,3763	-0,1142	0,3763	-0,0069	0,0156	0,1160	-0,0470	0,0625		
Union density	min	-0,0031	-0,0406	0,0063	0,0325	0,0948	0,0451	0,1763	0,4750	0,0065	0,0217	0,0062	0,0497	0,1575	-0,1655
	mean	-0,0143	-0,0406	0,0325	0,0325	0,0948	0,1763	0,4750	0,0065	0,0217	0,1575	0,0497	-0,0399	0,0625	
	max	-0,0314	0,0724	0,0724	0,3763	0,3763	0,3763	0,3763	0,0156	0,1160	0,1160	0,1160	-0,1096		
High corporatism	min	-0,0143	0,0226	0,0325	-0,0500	0,1763	0,1763	-0,2919	0,0065	-0,0086	0,0497	-0,0703	-0,0399	0,0364	
	max	0,0083	-0,0175	-0,0175	-0,1156	-0,1156	-0,1156	-0,1156	-0,0021	-0,0206	-0,0206	-0,0206	-0,0035		
Tax wedge	min	0,0258	-0,2028	-0,0615	-0,2909	-0,2909	-0,2909	-0,2909	-0,0153	-0,1073	-0,1073	-0,1073	0,1282		
	mean	-0,0143	-0,2028	0,0325	0,4750	0,1763	0,1763	2,3629	0,0065	0,1100	0,7941	0,0497	-0,0399	-0,8498	
	max	-0,0393	0,0910	0,0910	0,4675	0,4675	0,4675	0,4675	0,0200	0,1476	0,1476	0,1476	-0,1446		
PMR	min	0,0068	-0,0093	-0,0167	-0,0726	-0,0726	-0,0726	-0,0726	-0,0046	-0,0311	-0,0311	-0,0311	0,0427		
	mean	-0,0143	-0,0093	0,0325	0,0217	0,1763	0,1763	0,1100	0,0065	0,0049	0,0357	0,0497	-0,0399	-0,0365	
	max	-0,0315	0,0724	0,0724	0,3787	0,3787	0,3787	0,3787	0,0155	0,1154	0,1154	0,1154	-0,1070		
ALMPs	min	0,0027	-0,0676	-0,0072	-0,0238	-0,0238	-0,0238	-0,0238	-0,0025	-0,0158	-0,0158	-0,0158	0,0278		
	mean	-0,0143	-0,0676	0,0325	0,1575	0,1763	0,1763	0,7941	0,0065	0,0357	0,2600	0,0497	-0,0399	-0,2685	
	max	-0,0792	0,1838	0,1838	0,9394	0,9394	0,9394	0,9394	0,0408	0,2995	0,2995	0,2995	-0,2979		
Average replacement rate	min	-0,0282	0,0646	0,0646	0,3415	0,3415	0,3415	0,3415	0,0136	0,1019	0,1019	0,1019	-0,0911		
	mean	-0,0143	0,0714	0,0325	-0,1655	0,1763	0,1763	-0,8498	0,0065	-0,0365	0,0497	0,0497	-0,0399	0,2635	
	max	0,0064	-0,0154	-0,0154	-0,0694	-0,0694	-0,0694	-0,0694	-0,0041	-0,0279	-0,0279	-0,0279	0,0363		

<sup>1</sup>e.g.  $X_k = \text{EPL}$  in columns 1-2 (EPL) and  $X_j = \text{Union density}$  in row 2 (Union density): (i) the sign of the partial derivative of TV (for a country with an average mix of policies, except Union density and EPL) with respect to EPL (evaluated at average EPL) is evaluated at the minimum, mean and maximum value of Union density to check if it is changing; ii) the sign of the cross-derivative with respect to EPL and Union density is evaluated for an average mix of policies, except EPL and Union density.

<sup>2</sup>The partial derivative of TV with respect to  $X_k$  is evaluated at  $X_j = X_j^*$

Table 7: Transitory Variance - Time effects interacted with institutions.

	[1]	[2]		[3]		
	Estimates	Range of institutions/ policies		Implied relative change in TV due to an adverse shock which increases TV by 1% for the average country (TV for mean institutions and shocks = 0,0636 )		
		t	Min	Max	Min	Max
Time effects*	0,0118					
EPL	0,0109	0,29	-1,82167	1,4325	-1,01%	2,58%
Union density	0,1089	0,65	-0,27631	0,4212	-2,04%	5,63%
High corporatism	-0,3681***	-6,74	0	1	1,00%	-36,18%
Tax wedge	-0,2774	-0,68	-0,19774	0,1232	6,54%	-2,45%
PMR	0,0572*	1,82	-2,26252	1,8403	-12,07%	11,63%
ALMPs	0,2904*	1,77	-0,25193	0,9610	-6,39%	29,18%
Average replacement rate	-0,4354	-1,43	-0,19437	0,2892	9,55%	-11,72%
Adj. $R^2$	0,9366					
Obs.	93					

Table 8: Transitory Variance - Observed shocks interacted with institutions.

	Estimates	t
EPL	-0,0576	-0,62
Union density	-0,1306	-0,39
High corporatism	-0,2104*	-1,98
Tax wedge	1,1377	1,07
PMR	0,0051	0,11
ALMPs	0,2680	0,99
Average replacement rate	-1,0866***	-2,75
LD shift	0,1094***	3,3
Terms of trade	-0,3146***	-6,94
TFP growth	-0,1789	-1,37
Real interest rate	0,4597***	4,86
Adj. $R^2$	0,9206	
Obs.	80	

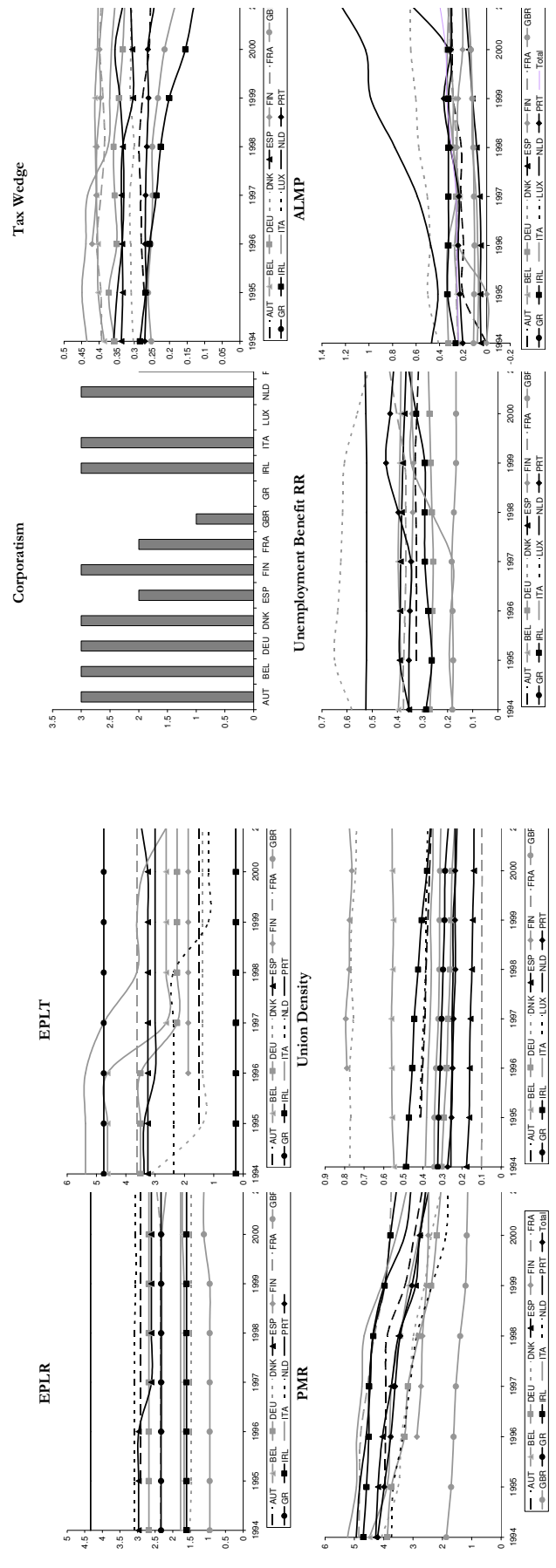


Figure 1: Evolution of labour market institutions

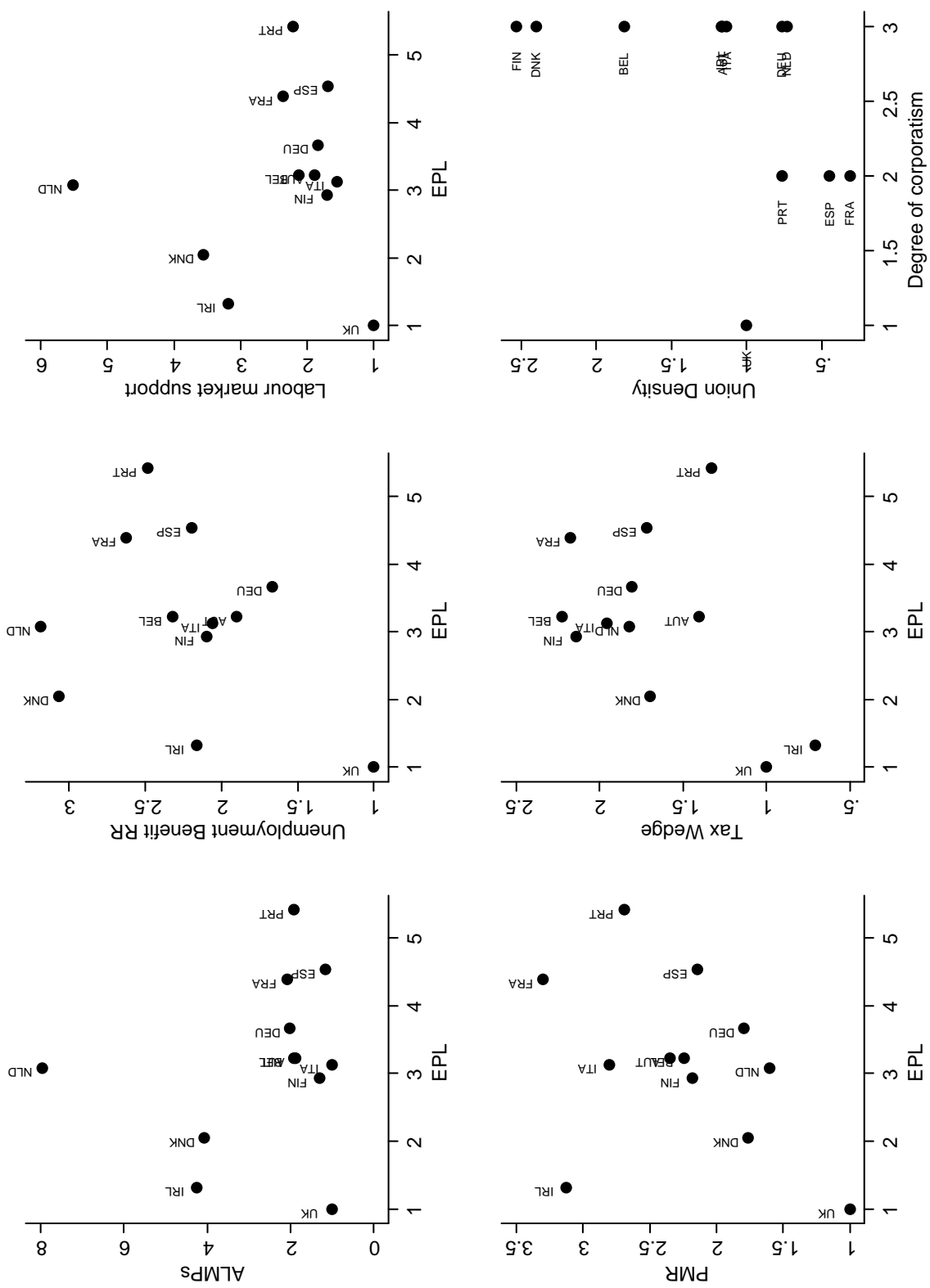


Figure 2: Labour Market Institutions in 2001  
 Notes: (i) The labour market indicators are re-scaled to set the UK as the base; (ii) The labour market support is the arithmetic average of ALMPs and the Unemployment benefit RR.

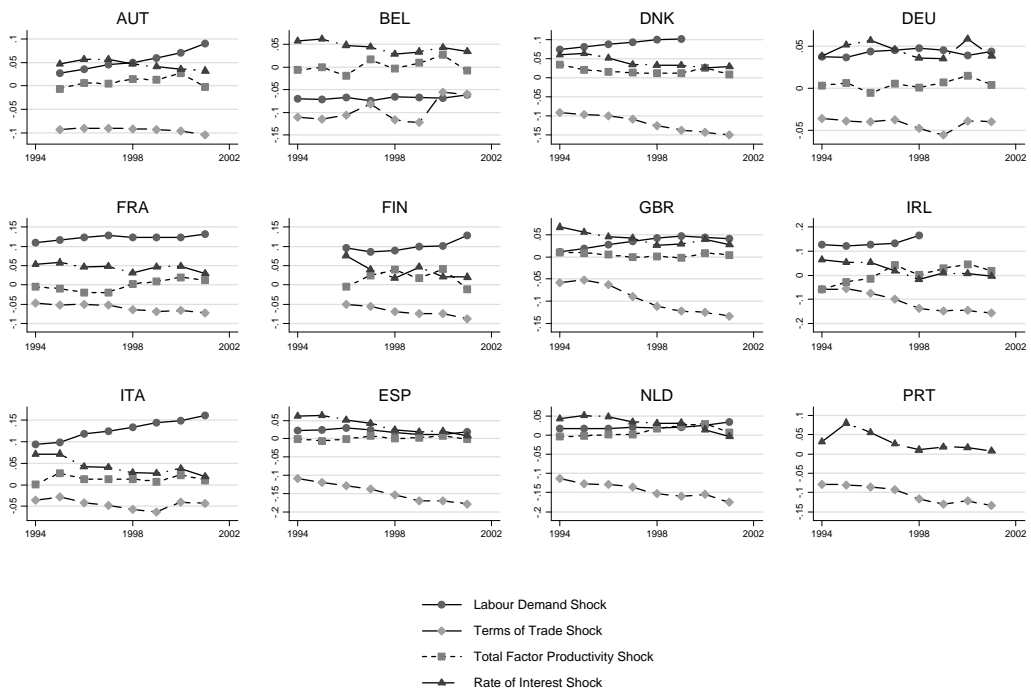


Figure 3: Evolution of macroeconomic shocks

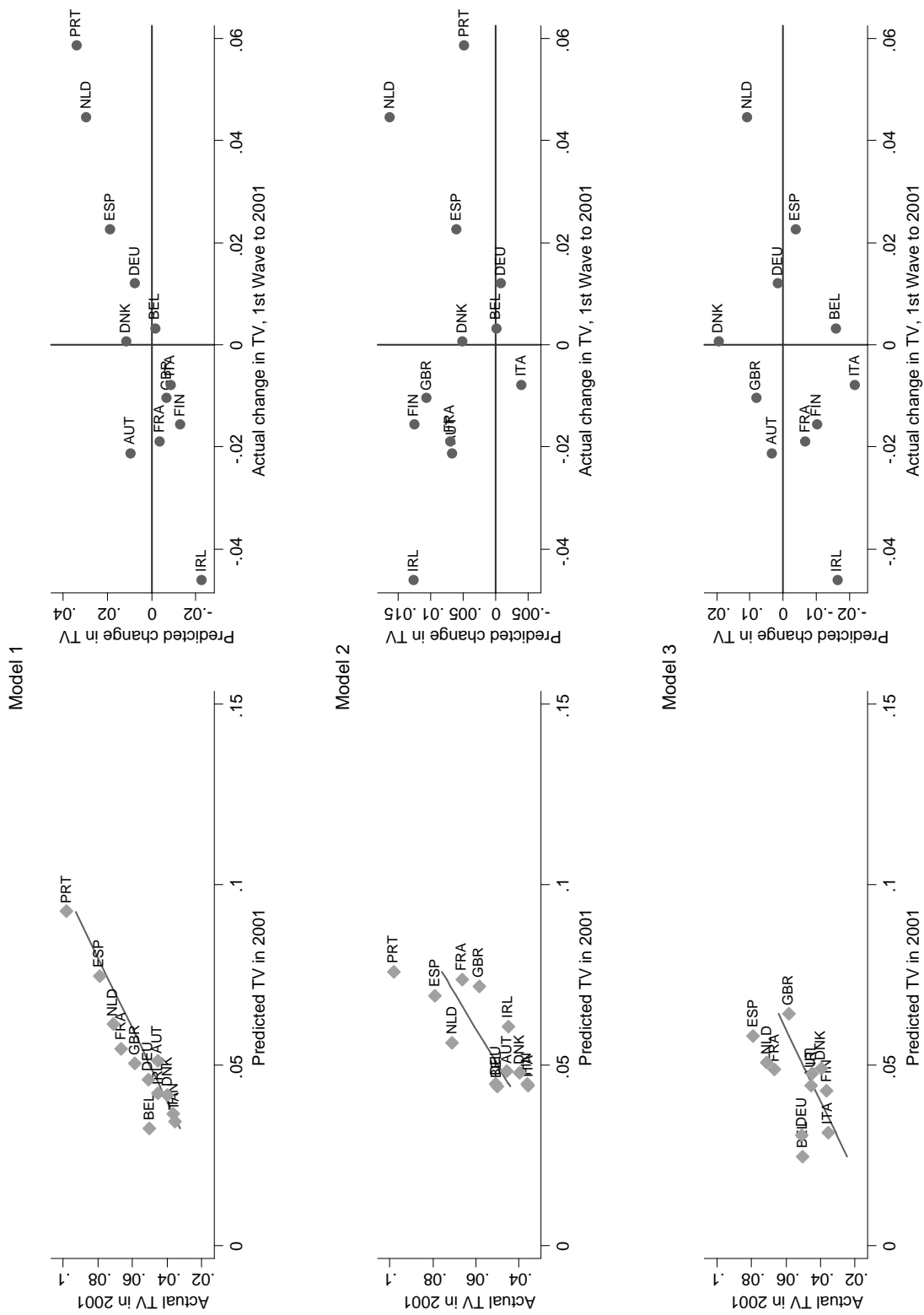


Figure 4: Actual vs Predicted Transitory Inequality - Models 1, 2, 3

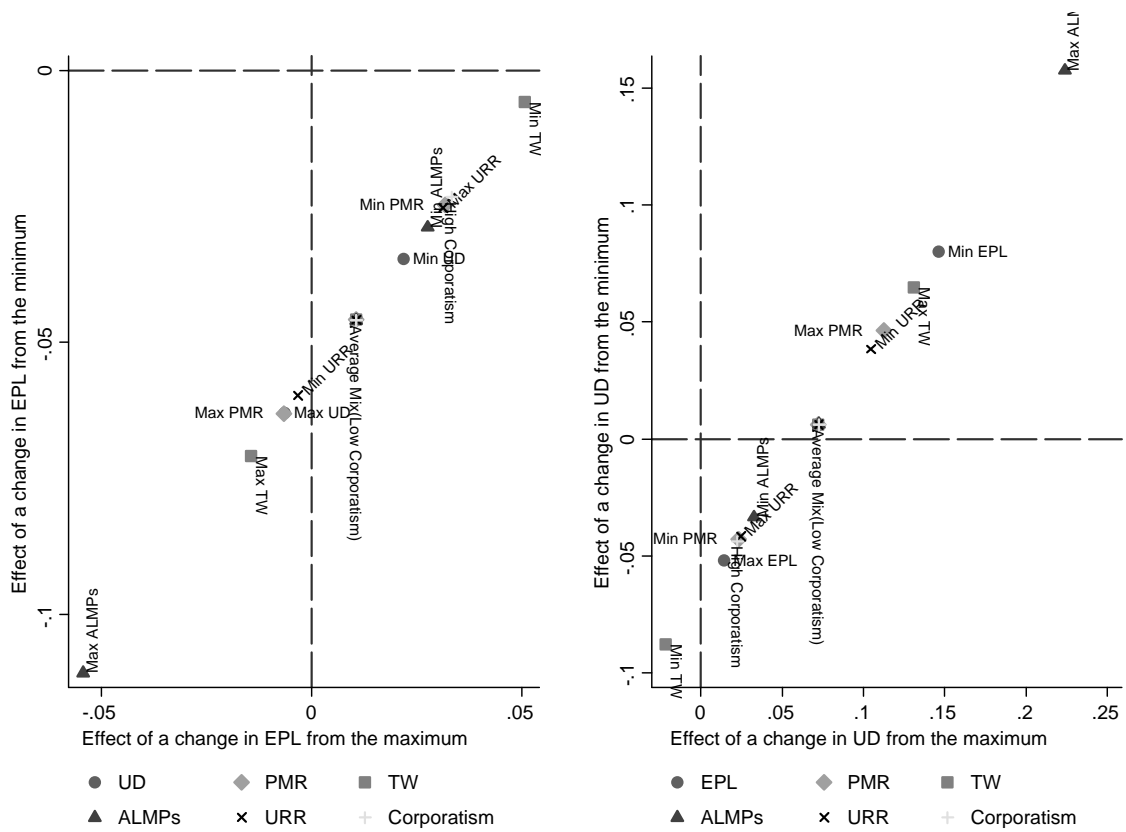


Figure 5: Effect of EPL (left) / Union Density(UD) (right) at its maximum/minimum value evaluated for min/mean/max values of other factors, ceteris paribus at the average

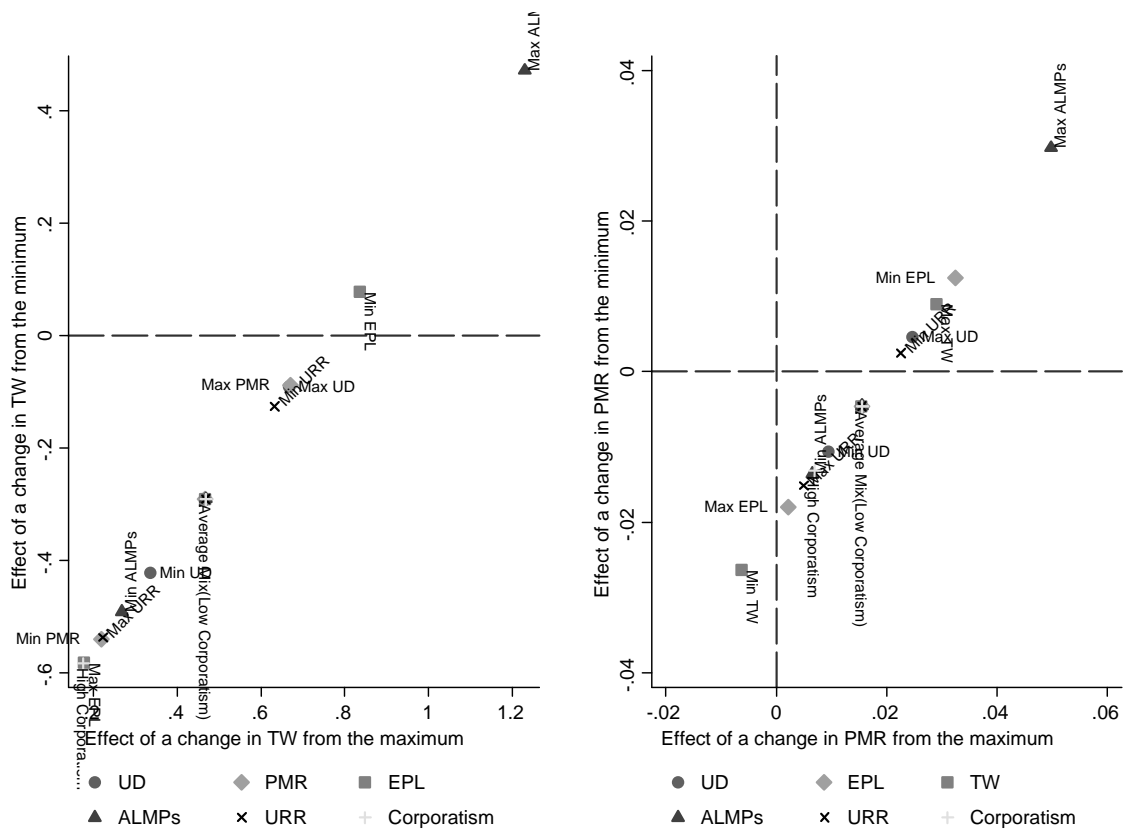


Figure 6: Effect of the Tax Wedge(TW) (left) / PMR (right) at its maximum/minimum value evaluated for min/mean/max values of other factors, ceteris paribus at the average

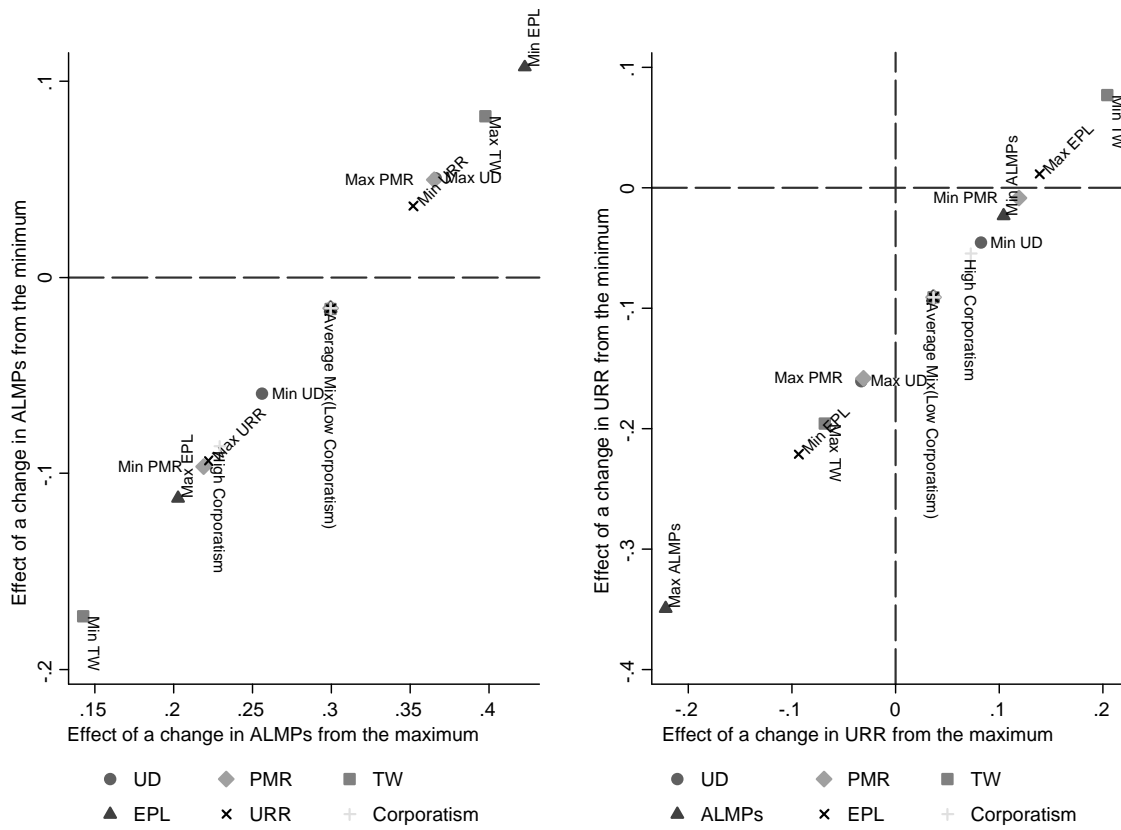


Figure 7: Effect of ALMPs (left) / Unemployment benefit replacement rate(UBRR) (right) at its maximum/minimum value evaluated for min/mean/max values of other factors, ceteris paribus at the average

## References

- Abowd, J. M. and Card, D. (1989), ‘On the covariance structure of earnings and hours changes’, *Econometrica* **57**(2), 411–445.
- Aghion, P. and Williamson, J. G. (2001), *Growth, Inequality, and Globalization*, Cambridge University Press.
- Attanasio, O. and Davis, S. J. (1996), ‘Relative wage movements and the distribution of consumption’, *Journal of Political Economy* **104**(6), 1227–62.
- Baker, M. (1997), ‘Growth-rate heterogeneity and the covariance structure of life-cycle earnings’, *Journal of Labor Economics* **15**(2), 338–375.
- Baker, M. and Solon, G. (2003), ‘Earnings dynamics and inequality among Canadian men, 1976–1992: evidence from longitudinal income tax records’, *Journal of Labor Economics* **21**(2), 289–321.
- Bassanini, A. and Duval, R. (2006a), ‘The determinants of unemployment across OECD countries: Reassessing the role of policies and institutions’, *OECD Economics Studies* **42**.
- Bassanini, A. and Duval, R. (2006b), ‘Employment patterns in OECD countries: Reassessing the role of policies and institutions’, *OECD Economics Department Working Papers* **486**.
- Blanchard, O. and Wolfers, J. (1999), The role of shocks and institutions in the rise of European unemployment: The aggregate evidence, NBER Working Papers 7282, National Bureau of Economic Research, Inc.
- Blundell, R. and Preston, I. (1998), Consumption inequality and income uncertainty, Open Access publications from University College London <http://eprints.ucl.ac.uk/>, University College London.
- Cappellari, L. (2003), ‘The dynamics and inequality of Italian men’s earnings’, *The Journal of Human Resources* **XXXIX**.
- Chakravarty, S. R. (2001), ‘The variance as a subgroup decomposable measure of inequality’, *Social Indicators Research* **53**, 79–95. 10.1023/A:1007100330501.
- Creedy, J. and Wilhelm, M. (2002), ‘Income mobility, inequality and social welfare’, *Australian Economic Papers* **41**(2), 140–150.

- Dickens, R. (2000), 'The evolution of individual male earnings in Great Britain: 1975-95', *The Economic Journal* **110**(460), 27–49.
- Fortin, N. M. and Lemieux, T. (1997), 'Institutional changes and rising wage inequality: Is there a linkage?', *Journal of Economic Perspectives* **11**(2), 75–96.
- Friedman, M. and Kuznets, S. (1954), 'Income from independent professional practice', *New York, NBER* .
- Gottschalk, P. and Spolaore, E. (2002), 'On the evaluation of economic mobility', *Review of Economic Studies* **68**, 191–208.
- Gustavsson, M. (2004), Changes in permanent and transitory earnings inequality in Sweden: 1991-1999", in "Empirical Essays on Earnings Inequality", Ph.D. Dissertation, Uppsala University.
- Hacker, J. S. (2006), *The Great Risk Shift: The Assault on American Jobs, Families, Health Care, and Retirement—And How You Can Fight Back*, Oxford University Press.
- Haider, S. (2001), 'Earnings instability and earnings inequality of males in the United States: 1967-1991', *Journal of Labor Economics* **19**(4, October), 799–836.
- ILO (n.d.), '<http://www.ilo.org/public/english/protection/ses/download/docs/denition.pdf>'.
- Kalwij, A. and Alessie, R. (2003), 'Permanent and transitory wage inequality of British men, 1975-2001: year, age and cohort effect', *Journal of Applied Econometrics* **22**, 1063–1093.
- Katz, L. F. and Autor, D. H. (1999), Changes in the wage structure and earnings inequality, in O. Ashenfelter and D. Card, eds, 'Handbook of Labor Economics', Vol. 3 of *Handbook of Labor Economics*, Elsevier, chapter 26, pp. 1463–1555.
- Layard, R., Nickell, S. and Jackman, R. (1991), *Unemployment: macroeconomic performance and the labour market*, Oxford University Press, Oxford.
- Lillard, L. A. and Weiss, Y. (1979), 'Components of variation in panel earnings data: American scientists 1960-70', *Econometrica* **47**(2), 437–54.
- Lillard, L. A. and Willis, R. (1978), 'Dynamic aspects of earnings mobility', *Econometrica* **46**(5), 985–1012.
- MaCurdy, T. E. (1982), 'The use of time series processes to model the error structure of earnings in a longitudinal data analysis', *Journal of Econometrics* **18**(1), 83–114.

- Milberg, W. and Winkler, D. (2009), ‘Globalization, offshoring and economic insecurity in industrialized countries’, *DESA Working Paper* **87**.
- Moffitt, R. and Gottschalk, P. (1995), Trends in the covariance structure of earnings in the United States: 1969-1987, Institute for Research on Poverty Discussion Papers 1001-93, University of Wisconsin Institute for Research on Poverty.
- Moffitt, R. and Gottschalk, P. (1998), ‘Trends in the variances of permanent and transitory earnings in the U.S. and their relation to earnings mobility’, *Boston College Working Papers* **No. 444**.
- Moffitt, R. and Gottschalk, P. (2002), ‘Trends in the transitory variance of earnings in the United States’, *The Economic Journal* **112**(478), C68–C73.
- Moffitt, R. and Gottschalk, P. (2008), Trends in the transitory variance of male earnings in the U.S., 1970-2004, Boston College Working Papers in Economics 697, Boston College Department of Economics.
- Mughan, A. (2007), ‘Economic insecurity and welfare preferences: A micro-level analysis’, *Comparative Politics* **39**(3), pp. 293–310.  
**URL:** <http://www.jstor.org/stable/20434042>
- Nichols, A. and Zimmerman, S. (2008), Measuring trends in income variability, Technical report, Urban Institute.
- OECD (2004), Chapter 2. Employment protection regulation and labour market performance, *in* ‘Employment Outlook’, OECD, Paris.
- Palier, B., ed. (2010), *A Long Goodbye to Bismark? The Politics of Welfare Reform in Continental Europe*, Amsterdam University Press, Amsterdam.
- Ramos, X. (2003), ‘The covariance structure of earnings in Great Britain, 1991-1999’, *Economica* **vol. 70**(278), 353–374.
- Rodrik, D. (1997), *Has international integration gone too far?*, Institute for International Economics, Washington, DC.
- Salverda, W. (2008), The bite and effects of wage bargaining in the netherlands, *in* M. Keune and B. Galgoczi, eds, ‘Wages and wage bargaining in Europe’.
- Shorrocks, A. F. (1984), ‘Inequality decomposition by population subgroups’, *Econometrica* **52**(6), 1369–1385.

Sologon, D. M. (2010), Earnings Dynamics in Europe, PhD thesis, Boekenplan, Maastricht University.

Sologon, D. M. and O'Donoghue, C. (2010), Earnings dynamics and inequality in the EU, 1994-2001, CEPS/INSTEAD Working Paper Series 2010-34, CEPS/INSTEAD.

Sologon, D. M. and O'Donoghue, C. (2011), Shaping persistent inequality: labour market policy and institutional factors, CEPS/INSTEAD Working Paper Series 2011-22, CEPS/INSTEAD.

Teulings, C. and Hartog, J. (2008), *Corporatism or competition? Labour contracts, institutions and wage structures in international comparison*, Cambridge University Press.