Temporary jobs wage differential in Europe.

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Abstract

The aim of this paper is to analyse the wage gap between temporary and permanent jobs in 14 European countries. We use semi-parametric (quantile regression) approach and evaluate the wage gap across the entire wage distribution. We show that the fixed-term wage gap decreases as we consider higher quantiles and that having a fixed-term contract penalizes more low skilled workers (at the bottom of the earnings distribution) than high skilled. Finally, we decomposed the wage differential along the entire wage distribution, using the procedure developed by Machado and Mata (2005) to account for the relative importance of observed characteristics versus different returns to skills. We find that workers with the same characteristics of temporary workers would have received higher wages if they had worked with a permanent contract in almost all the countries considered and that this *discrimination* is higher at the bottom of the wage distribution.

Keywords: Temporary jobs, fixed-term contracts, wage differentials, quantile regression, decomposition.

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1. Introduction

During the last two decades European countries with a high level of employment protection for permanent workers have implemented policies to enhance the use of temporary contracts in order to increase the flexibility of the labour market and ameliorate the overall economic performance. In these countries, firms are be able to adjust their workforces to economic cycle fluctuations increasing or reducing the number of temporary workers. Since 1999 the increase of atypical employment (part-time, fixed-term contract and temporary agency workers) has become a central issue for labour market policy in the European Union (EU). In June 1999[1] a first European directive was adopted to improve the quality of fixed-term contract work and to reduce any form of discrimination against temporary workers[2].

In the economic literature, the study of the wage differential between temporary and permanent workers is a highly debated issue. According to the theory of compensating wage differentials, we could in principle expect that a competitive labour market should reward any "adverse conditions" the workers face. It is well documented that workers with a fixed –term contracts have many disadvantages which could be rewarded: higher probability of unemployment , lower welfare provision, more instability and thus lower fertility rate and higher risk of on the job injuries (Oecd, 2004; Guadalupe, 2003). But so far all the empirical researches carried out find no evidence of a wage premium for these workers; on the contrary, temporary workers seem to earn systematically less than permanent employees (OECD, 2003, Brown and Session, 2005, Booth and Francesconi. 2002, Picchio, 2006).

There are many reasons why temporary workers may experience a wage penalty. First of all, they tend to invest in a lower amount of firm specific training, and the consequence is a lower wage and a flatter wage profile (Booth et al , 2002).

The observed negative wage differential can also be explained on the grounds of either efficiency wage or insider-outsider arguments. In the former case, Rebitzer and Taylor (1991) show that it could be optimal for a profit maximising firms to hire both temporary and permanent workers and pay a lower wage to temporary worker even if workers are homogenous and perfect substitutes when the monitoring of workers is costly and the product demand is uncertain. According to Guell (2000) the possibility of a renewal could be used as an effort incentive device instead of wages. Fixed-term workers accept to be pay less and earn less as the firms related their performance to the

[1] The European Commission recommend each Country to adopt the Directive by July 2001, but the implementation process took longer time in some coutries (i.e. was adopted in 2003 in Greece,

[2] Iin 2008 **Temporary and Agency Workers Directive** (2008/104/EC) guaranteed people who get jobs through employment agencies equal pay and conditions with those in the business who do the same work.

promise of a contract renewal or conversion in a permanent one. In both contributions, the introduction of fixed term contract end up in a segmentation of the labour market.

According to the insider-outsider models, if a firing cost exists, it could be more efficient for firms to have a buffer stock of workers (outsiders) with a fixed term contract with low employment rights that can easily (and less expansively than permanent insiders workers) be fired in case of adverse shocks. (Lindbeck and Snower, 1988). Whenever firms use temporary labour as a buffer, risk of job loss for permanent workers is reduced and a higher bargained wages for the permanent "insiders" is observed (Bentolila and Dolado, 1994). Koutentakis (2008) show that if temporary workers are present, an additional upper limit on the wage that the permanent workers could bargain exists and that in case they exceed this limit, firms facing a negative shock will fire permanent workers. Thus, the wage of permanent workers is proportional to the wage of temporary workers. If permanent workers wish to increase their wage without risking job security they have to increase the temporary wage as well.

Firms can also use fixed-term contracts ad a screening device, a sort of extension of probationary period Loh (1994). Low paid temporary contracts can be attractive also to high ability workers, who accept lower wage for a short period and then experience a steeper wage growth.

Most of the previous empirical studies focus on the mean wage differentials observed (OECD 2003), and study the wage penalty associated with temporary contracts in one country (Jimeno and Toharia (1993) for Spain, Booth and Francesconi (2002) for the UK, Blanchard and Landier (2002) for France, Segal and Sullivan (1998) for the US, Hagen (2002) for Germany and Picchio (2008) for Italy).Two exceptions must be acknowledged. First, Brown and Session (2005), using data from the British 1997 Social Attitude Survey and 1997 wave of ISSP, study the wage gap associated to a temporary job in nine European countries (UK,Germany, France, Italy, Switzerland, Denmark, Norway, Sweden and Portugal) and some OECD countries (USA, Canda, japan, New Zealand). They find evidence that "individuals employed under fixed-term contracts in a number of countries receive lower wages than their permanent contract counterpart.". On the basis of these results they state that "Such a finding could be indicative of wage discrimination against fixed-term employees" and suggest increasing legal protection for fixed-term workers, as was done starting in 1999 from the European Commission. Secondly, Mertens et al (2007) compare the wage gap associated with a fixed-term contract in Spain and Germany but move a step forward from previous study and evaluate the gap along the wage distribution using quantile regressions technique.

The aim of this paper is to analyse the wage gap between temporary and permanent jobs in 14 European countries in 2006. Our findings contribute to the existing literature in several ways. First, by focussing on different European countries with differences in the wage setting institutions allow us to better understand the effect of labour market national specific institutions on fixed-term contract pay gap. In this sense, we update and extend Brown and Session (2005) results.

Second, differently from the conventional empirical approach that estimates a Mincerian wage equation by least square method and following Mertens et al., we evaluate the wage gap across the entire wage distribution of temporary and permanent workers. Therefore, in this paper we use both non parametric and semi parametric (quantile regression) approach. We expect the wage gap to be greater at the bottom of the wage distribution in those countries where the insider mechanism described above is stronger (for example because there is a higher employment protection towards permanent workers). In fact, whenever temporary work is used as a buffer by firms, we would observe young workers with a low level of specific human capital accumulated (i.e. with a probationary contracts) or low skilled workers holding a temporary contracts[3]. And those types of workers are typically found at the bottom of the wage distribution "competing" with low skilled permanent workers. A high level of employment protection towards permanent (low skilled) workers will increase their bargaining power, and a higher wage penalty will be observed at the bottom of the wage distribution. We show that the fixed-term wage gap decreases as we consider higher quantiles and that having a fixed-term contract penalizes more low skilled workers than high skilled.

Finally, we move a step forward and analyse to what extent temporary contracts workers are discriminated by the labour market and we decomposed the wage differential along the entire wage distribution, using the procedure developed by Machado and Mata (2005), to account for the relative importance of observed characteristics versus different returns to skills. When comparing results across countries we find that workers with the same characteristics of permanent workers would have received lower wages if they had worked with a temporary contract and that the "discrimination" decline from lower to upper decile.

We realize that self-selection into different type of contract may be an issue and that, without controlling for it, the estimated coefficients may be biased. But limitations of the dataset prevent us to address and control self-selection. However, we restrict attention not on the level wage differentials but on the way it changes along the entire wage distribution

[3] Unfortunately in Eu-silc we can't divide temporary contracts into more detailed categories.

2. Data and descriptive statistics

EU_SILC is a large household survey that covers most members countries in the Enlarged European Union and replaced the former European Community Household Panel (ECHP). As it was for ECHP, rather than trying to harmonise output from national surveys, the European statistical agency (Eurostat) adopts an input oriented approach and uses the same community questionnaire as the base for the national versions of the survey. A desirable feature of EU-SILC is that the definitions of and questions on earnings, the reference period and the survey methods are common across countries. This format increases comparability, but does not eliminate all problems, as the interpretation of common questions can vary across countries because of country – specific institutions and history (OECD, 1991). We focus our analysis on[4] 2006 wave.

In EU-SILC, people who define themselves as "Working full time" or "working part-time"[5] are asked about their type of contract. We follow the EU_SILC classification and define temporary workers those who are not working under a permanent contract[6]. Our analysis focuses on fourteen countries: Austria, Belgium, Czech Republic, Germany, Spain, France, Greece, Hungary, Ireland, Italy, Poland, Portugal, Slovak Republic and the UK. We group countries according to their geographical position and welfare regime into four main groups:, Continental (Germany, France, Belgium, and Austria), Liberal (The UK and Ireland), Mediterranean (Italy, Greece, Spain and Portugal) Eastern countries (Czech republic, Hungary, Slovack Republic and Poland).

We exclude from our analysis individuals with an age lower than 22 in order to avoid conflating issues related to early education enrolments. We also exclude workers aged 55 and over to overcome problems related to different national retirement schemes. After excluding self-employment, workers in agriculture and fishery and all those observations with missing value on relevant variables we end up with a sample of more than 80000 observations, distributed by country and type of contract as shown in table 1. Table 1 reports the descriptive statistics of the samples. As expected, temporary jobs are more frequent in Spain and Poland, which have a percentage of temporary workers respectively of 25.9 and 25.1. UK and Austria have the lower percentage of temporary jobs, 6.1%. On average individuals with a permanent contract are older, more educated

[4] The questions on the 2006 wave refers to wage and working condition of the previous year, 2005.
[5] pl030=1 or pl030=2
[6] Variable pl140. Classified among temporary workers are:
- persons with a seasonal job
- persons engaged by an employment agency or business and hired out to a third party for the carrying out of a "work mission" (unless there is a work contract of unlimited duration with the employment agency or business)
- persons with specific training contracts. If there exists no objective criterion for the termination of a job or work contract these should be regarded as permanent or of unlimited duration.

(with the exception of Austria, Italy, Portugal, Ireland and the UK) more likely to be male (with the exception of Poland, Hungary and Slovak republic) and earn an higher hourly wage (with the exception of the UK).

Furthermore, temporary contracts are almost everywhere concentrated in the lower deciles of the wage distribution, as shown in figure 1. In particular, in Poland, the majority of workers in the first decile of the (hourly) wage distribution has a temporary job., while in Spain and Greece the percentage of temporary and permanent job in the first decile is almost the same.

The wage variable we use is the gross hourly wage, with the exception of Greece, Italy and Portugal, where we use the net hourly wage[7]. As it can be seen in Table 1, the average hourly wage is always lower for temporary jobs workers. Indeed, in order to analyse the role of temporary and permanent contracts in explaining the wage differentials, we believe that it is more interesting to focus on the entire distribution of the dependent variable rather than just on the conditional mean.

As a first step, we estimate a standard Micerian wage equation which include educational dummies, age and age squared, a gender dummy and a part-time dummies. In order to control for unobserved heterogeneity, we add control for occupation and Industry. We do not provide results with these additional controls, but the tendencies outlined using the Mincerian equation are confirmed.

To formally test for differences in all moments of the wage distribution a non-parametric test, the Kolmogorov-Smirnov test, has been used based on the concept of stochastic dominance. [8]

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[7] We compute hourly wage by dividing the monthly Gross employee cash or near cash income by the number of months worked in the references period and then divide by 4.5 four times the number of hours worked in a week (main + secondary jobs)..

[8] The concept of first order stochastic dominance allows one to establish a ranking for compared distributions. Let F and G denote the cumulative distribution functions of wages for two groups, e.g. permanent and temporary contracts. First order stochastic dominance of F relative to G is defined as: $F(z) - G(z) \leq 0$ uniformly in $z \in \Re$, with strict inequality for some z. To test whether there are statistically robust differences between the distributions we adopt the non-parametric one-sided and two-sided Kolmogorov-Smirnov tests

The two-sided test can be formulated as:

H_0: $F(z) - G(z) = 0 \ \forall \ z \in \Re$ vs. H_1: $F(z) - G(z) \neq 0$ some $z \in \Re$

The one-sided test can be expressed as:

H_0: $F(z) - G(z) \leq 0 \ \forall \ z \in \Re$ vs. H_1: $F(z) - G(z) > 0$ some $z \in \Re$

Hence, the two-sided test permits one to determine whether both distributions are identical or not. While, the one-sided test determines whether a distribution dominates the other.

Therefore, to conclude that F stochastically dominates G, a rejection of the null hypothesis for the two-sided test is required and the null for the one-sided test cannot be rejected. This indicates that, graphically, F is to the right of G.

The Kolmogorov-Smirnov test statistics for the two-sided, KS_2, and the one-sided test, KS_1, are:

$$KS_s = \sqrt{nm/N} \max_{1 \leq i \leq N} \{F_n(z_i) - G_m(z_i)\}$$

At this point, to further illustrate the comparison between the types of contracts and examine the differences of the entire wage distributions, Figure 1A in Appendix A reports the graphs of the cumulative functions of log wage for temporary and permanent contracts in each country. As shown, for each country, except for UK, the cumulative distribution function of wages for permanent jobs is to the right of the cumulative distribution function of wages for temporary jobs. In addition, the results of the Kolmogorov-Smirnov test for first order stochastic dominance confirm that the hourly wages of workers with permanent contracts stochastically dominate those of workers with temporary contracts. We do not find the same pattern focusing on the Kolmogorov-Smirnov test for UK, in fact, for this country the test provides evidence that there is no differences between the wage distribution of temporary and permanent jobs. In addition, the graph suggests that the dominance change along the distribution. Further analysis is necessary and this interesting pattern reinforces the adoption of the quantile regression approach.

3. Estimation and Decomposition

Most previous studies employ standard OLS technique which concentrates on the conditional mean of the log wage distribution (for a review see Picchio, 2005). However, this method may not be adequate if the dependent variable violates the assumption of normality. This is exactly what occurs with our dataset. In fact, the assumption of normality is formally rejected for our dependent variable[9].

Hence, a semi parametric approach could be more appropriate than the standard OLS estimator which relies on normal distribution. In addition, as mentioned in the introduction, we are specifically interested to study whether the impact of different kinds of contract changes across the wage conditional distribution. To address these issues we apply a quantile regression (QR) approach which seems more interesting as well as more appropriate, because we are able to give a more precise picture of the dynamics of the dependent variable at different points of the distribution rather than at the conditional mean. In our analysis we use both OLS and QR methods to provide a comparison.

Let $y_t\{t=1...T\}$ be a random sample of a random variable Y having distribution F. Then, $Q_\theta(y \mid x)$ for $\theta \in (0,1)$ denote the θth quantile of the distribution of *y*, given a vector *x* of covariates.

$$KS_1 = \sqrt{nm/N}\max_{1\le i\le N}\left|F_n(z_i) - G_m(z_i)\right|$$

Where n and m are the sample sizes of the two groups of contracts, N is given by n+m, F_n and G_m represent the empirical distribution of functions for F and G, respectively.

[9] Both the Shapiro-Francia test and Skweness and Kurtosis test reject the null hypothesis of normal distribution

We model the conditional quantile by: $Q_\theta(y \mid x) \equiv \inf\{y \mid F(y \mid x) \geq \theta\} = x'\beta(\theta)$, where $\beta(\theta)$ is a vector of quantile regression coefficients.

Koenker and Basset (1978), introducing this technique, show that $\beta(\theta)$ can be estimated by:

$$\underset{\beta(\theta)}{Min}\left\{\sum_{t:y_t \geq x_t'\beta(\theta)} \theta\left|y_t - x_t'\beta(\theta)\right| + \sum_{t:y_t < x_t'\beta(\theta)} (1-\theta)\left|y_t - x_t'\beta(\theta)\right|\right\}$$

In this way the estimation of quantiles is conducted giving different weights to positive and negative residuals. The median case, $\theta = 1/2$, is equivalent to minimising the sum of absolute value of the residual.[10]

One of the advantages of the QR approach is that it enables us not to concentrate only on a single central tendency measure, but to estimate different slope coefficients at different quantiles of the conditional distribution of the dependent variable. Therefore, these coefficients may be interpreted as differences in the response of the dependent variable to changes in the regressors at several points of the conditional distribution of *y*. Also, the QR approach is more robust than OLS to modest deviations of the residuals from normality, such as outliers or long tail situations. In addition, the QR approach is equivalent to monotonic linear and non linear transformations of the dependent variable and finally, even if the residuals are i.i.d. and the estimates of the conditional mean give the same information, the QR estimates of the intercepts give a picture of the asymmetry of the conditional distribution.[11]

With QR approach we estimate for each country a standard Mincerian equation (education, age, age squared and gender). Thus the coefficient of the dummy of interest (permanent=1) could be interpreted as the percentage wage gain anything else equal (gender, educational level, experience and occupation) associated with a permanent job.

The equality of the coefficient estimated is tested using the variance-covariance matrix of the coefficients of the system of quantile regressions. The null hypothesis is that the *j*th coefficient at the $\theta_a{}^{th}$ quantile is the statistically the same as the one in the $\theta_b{}^{th}$quantile (H_0: $\theta_a{}^{th}=\theta_b{}^{th}$). This test allows us to analyse whether the coefficients of the permanent dummy vary significantly across the conditional distribution.

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[10] The estimation of the linear conditional mean function $E|y \mid x| = x'\beta$ is solved by $\underset{\beta}{Min} \sum_t \left(y_t - x_t'\beta \right)^2$

[11] For more details on the advantages of QR estimation see, among others, Mata and Machado (1996).

3.1 Quantile Regression results

We initially investigate how the wage inequality, between temporary and permanent jobs, varies across the wage distribution introducing in our estimation model a dummy variable that takes value 1 if workers have a permanent job. We estimate the model separately for each country. The wage gap reported in table 3 has been estimated using a standarda Mincerian wage equation (age, age squared, education and a part-time dummy)[12]. Quantile regression is applied to ten percentiles, in addition, for comparison purpose, we provide the results obtained from OLS model. Overall, the values of the coefficients estimated differ widely across quantiles, and compared to the benchmark results from the OLS regression, reinforcing the adoption of QR technique. The estimated coefficients for each group of countries are graphically presented in Figures 2A in Appendix A.

For Mediterranean countries (Italy, Spain, Greece and Portugal) the coefficients associated with the permanent dummy clearly decrease as we move up along the wage distribution providing important evidence of wage gain in favour of temporary jobs in the upper quantiles. In this set of countries the wage gain for permanent workers at the top of the distribution is almost 50% lower than that at the bottom of the distribution. In Greece, for example, the permanent dummy coefficient varies significantly from 0,242 at 10^{th} percentile to 0,112 at the 90^{th} percentile with a particular acceleration after the 50^{th} percentile. In Italy the wage gap ranges significantly between 0.246 and 0.107[13]. These differentials are confirmed using the F-test of equality as reported in Table 1A in Appendix A. We find evidence of differences in the magnitude of the permanent dummy coefficients along the distributions especially for Italy, but also for Greece, and Spain, while for Portugal the null hypothesis of equality is not rejected for all the pairwise comparisons except one. In other words, we find evidence that, for Mediterranean countries, the temporary workers earn less than permanent counterparts but this differential is considerably greater in lower percentiles and it widely decreases with higher percentiles. This pattern is confirmed for all countries with the exception of Portugal, for which there is no tendency for the wage gap to decrease along the wage distribution.

Focusing on Continental countries (Austria, Belgium, Germany and France) we find an interesting pattern, especially for Germany and France where the wage differentials between permanent and temporary jobs decrease more than in Mediterranean countries. The value of the dummy coefficient for Germany ranges between 0.491 and 0.181 as we move from the lower tail to the upper tail of the wage distribution, while for France it ranges between 0.396 and 0.093. Both

[12] , the estimation results including more controls can be obtained from the authors on request

[13] The value of 0.107 refers to the 80^{th} percentile as at the 90^{th} percentile the coefficient is not significant.

countries exhibit a higher wage gap at the bottom at the distribution in favour of permanent jobs, but in Germany the wage gain is always higher than in France and constantly decrease by percentile[14]. On the whole, for these two countries, the strong evidence of wage loss among low-earning temporary workers and the deep reduction of the penalty for the high-earning temporary workers are pointed out by the F-tests of equality between quantiles. The null hypothesis is rejected for many of the pairwise comparisons. A similar pattern is found for Austria, but focusing on the value of the dummy coefficients the country seems like Mediterranean countries. In addition, looking at the F-tests, the wage differentials seem similar along the wage distribution. Finally, for Belgium there is a strong tendency for the permanent dummy to decrease as we move up along the wage distribution. At the upper quantiles (80^{th} and 90^{th}) the temporary workers earn more than permanent counterparts, but unfortunately the coefficients are not significant.

Regarding Eastern countries (Hungary, Poland, Czech Republic and Slovak Republic) we find that the pattern of Poland and Hungary is rather the same, even if the wage gap in Poland is always higher than in Hungary. In both countries, the coefficient of the permanent dummy increases in the left tail of the wage distribution, with a particular acceleration for Hungary. These results do not support our a priori expectation with respect to the wage gap between temporary and permanent jobs, suggesting that the wage differentials favour permanent jobs as we move up with the wage distribution. However, this rise in the value of the coefficients finishes close to the median and then there is no tendency for wage differentials to change. These results are confirmed also by the F-tests of equality as shown in Table 1A in Appendix A. In fact the null hypothesis is rejected if we compare the coefficients at the lower percentiles to the median, but we cannot reject the null hypothesis comparing the upper percentiles to the median. For Czech Republic, the results show that the dummy coefficient associated with the permanent dummy varies significantly from 0.106 to 0.052 as we move from the lowest percentiles to the highest percentiles, but on the whole, the hypothesis of equality cannot be rejected, providing evidence that the pattern remains constant, without wage gain for temporary jobs along the wage distribution. Focusing on Slovak Republic, we find a stable pattern in the left tail of the wage distribution, confirmed also by the F-tests of equality; while, from the median to the upper percentiles the value of the permanent dummy coefficient decreases suggesting a reduction of the wage loss per temporary jobs. Overall, the magnitude of the wage gap in these countries, expect for Poland, is rather low compared to Mediterranean and Continental countries.

[14] The quantile regression results for Germany are in line with other evidence on this country (Mertens et al. 2007).

Finally, focusing on Liberal countries (UK and Ireland) we find an interesting pattern especially for UK. The wage gap decreases along the distribution and the value of the coefficient is negative and statistically significant at the top of the distribution (90^{th} percentiles). In other words, we find that the wage gain for permanent jobs tends to be higher at the lower quantiles and in the middle of the wage distribution, but the result is reversed at the upper quantiles, where temporary workers earn more than their permanent counterparts. The permanent dummy coefficient is statistically significant only in five cases out of ten, and it varies from 0.125, at the 10^{th} percentile, to -0.201, at the 90^{th} percentile. These results provide some evidence of existing "compensating wage differentials" in this country. Regarding Ireland, we find, as for UK, that the value of the dummy coefficient is very low compared with the other European countries, and it decreases as we move up to the upper tail of the wage distribution. However, in Ireland the null hypothesis that the coefficients are equal between pairs of quaintiles is not rejected indicating that there are not statistically significant differences in the wage gap along the entire distribution.

To sum up, although it is not possible to draw identical remarks for all the European countries analysed, the quantile regression results reveal that we may find similar pattern among groups of country with different labour market institutions. In addition, the empirical estimation performed support the belief that just concentrating at the average wage gap (using OLS) is inadequate.

The above results have been obtained running a pooled regression. Pooled regressions impose that the returns to observed characteristics are the same across type of contracts, and that differences in the wages are due only to a shift factor (the type of contract dummy). Hence the estimated temporary dummy captures the extent to which the gap remains unexplained – at various quantile - after controlling for individual characteristics. In the next section, we allow the returns to vary across type of contract and estimate a "raw" wage differential.

3.2 Decomposition

The standard methodology for analysing permanent-temporary wage gap, with OLS, applies the traditional Oaxaca decomposition. In practice, the wage gap is decomposed into two parts, the first one reflects differences in human capital endowments of both groups, the second one explains differences in prices that are the remuneration of these endowments (i.e. wage discrimination). This approach is helpful if the object of interest is the mean, but it is not very helpful if we are interested in the wage gap distribution. Therefore, we explain the wage differences, quantile by quantile,

between permanent and temporary workers using a version of the methodology developed by Machado and Mata (2005)[15] as suggested in Albrecht at al. (2003).

In practical, the approach that we used is the following:

Step 1: estimate the quantile regression coefficients at particular percentile θ_i of interests[16] using permanent and temporary data set, $\beta^p(\theta_i)$ and $\beta^t(\theta_i)$

Step 2: make 100 draws at random (with replacement) using permanent dataset for each θ_i . Use the characteristics of permanent to predict the wages using the estimated coefficients, $\beta^p(\theta_i)$ and $\beta^t(\theta_i)$, from step (1). This allows us to generate i) the counterfactual distribution of temporary's wages that would arise if their characteristics were distributed as permanent's are; ii) the counterfactual distribution of permanent's wages.

Step 3: Using the counterfactual distributions calculated in step (2), estimate the wage gap between permanent and temporary due to differences in returns at each percentile θ_i . Note that the decomposition of the differences between the two groups of workers is the following:

$$x^p\beta^p(\theta_i) - x^t\beta^t(\theta_i) = x^p(\beta^p(\theta_i) - \beta^t(\theta_i)) + \beta^t(\theta_i)(x^p - x^t) \qquad (1)$$

In this case, we allow both characteristics and returns to vary between temporary and permanent workers, and calculate the raw differentials as in the left hand side of equation (1) for 10 different points (deciles) of the wage distributions.

As our main goal is to analyse the gap at the (θ_i) percentile due to differing return between permanent and temporary workers, we are interested in the term: $x^p(\beta^p(\theta_i) - \beta^t(\theta_i))$ in equation (1) which gives the differences in pay that temporary would face at percentile (θ_i) if they had the characteristics of permanent. A positive value indicates that the returns to temporary characteristics are lower than those of permanent and this obviously points out at "discrimination". A negative value of the estimated wage gap implies the reverse.

We compute also the percentage of the raw differentials (the left side of equation 1) explained by our estimated wage gap. This gives us a more detailed picture of the proportion of the raw gap that is explained by the differences in returns with respect to characteristics. The higher the percentage the higher the "discrimination" of temporary workers, in addition, a percentage greater than 100 means that the characteristics of temporary compensate them for any "discrimination".

[15] An alternative method is to implement nonparametric density estimation, developed by Di Nardo et.al (1996). The idea of this procedure is to estimate a counterfactual density using a kernel density estimation that yields a visually clear representation of what the distribution of wages would be if everyone were paid permanent wages.

[16] We estimate 100 percentile, from the first to the ninety-ninth.

3.3 Decomposition Results

The results of the decomposition are reported in table 4. For each country- percentile we report the raw differential log earnings calculate as in the left hand side of equation (1), the observed differences in returns (first term of right hand side of equation (1)) and the percentage of the raw gap explained by differences in returns. In computing the raw gap, we allow returns to vary by type of contracts. As it can be seen in table 4, in each country the raw gap is greater than the dummy permanent reported in table 3 and commented in the previous section, but share the same tendency along the wage distribution.

We then estimate the part of the wage gap due to different returns to permanent and temporary workers, when permanent's characteristics are used in the counterfactual calculations. This raw gap component indicates the differences in pay[17] which temporary would face at quantile θ if they had the characteristics of permanent. A positive wage gap indicates that the returns to temporary characteristics are lower than those of permanent, and a negative differential implies the reverse. In the majority of countries the gap is decreasing along the wage distribution. In fact, we find a positive gap in lower half of the wage distribution in almost all countries (with the exception of Italy, where the differences in returns are almost always zero) and a negative gap in the upper part of the earnings distribution in Austria, Belgium, Greece and at the 90 decile in France, Ireland and the UK. In these country-deciles, temporary workers would have received lower wages if they would have been paid permanent returns. To sum up, we find evidence of *discrimination* against temporary workers at the bottom of the wage distribution.

The proportion of the raw wage differential explained by differences in returns is shown in the last row of each country. A value greater than 100% implies that temporary workers have characteristics that compensated them for any discrimination faced in the labour market. For examples, in Spain, Ireland, and UK (and workers placed at the bottom of the distribution in Austria and Hungary) temporary have better characteristics than permanent workers.

4. Explaining the differences.

Our estimations point out that even if temporary workers would have had the same characteristics of permanent ones, would have received a lower wage in almost all countries at the bottom of the wage distribution. We now try to explain the documented cross-country differences in the tendency of wage differentials along the wage distribution. In doing so, we try to relate our

[17] Log wage of permanent workers characteristics evaluated with permanent returns minus the log wage of permanent characteristics evaluated with temporary returns.

result with the main labour market institutions that can shape the wage distribution. We present some pair-wise correlations that of course could not be interpreted as causal relationship. We use three different indicators to exploit cross-country differences in the patterns describe in section 3.2. Two are similar in fashion to the sticky floor and glass ceiling indicator used in the gender discrimination literature. The first one is the difference of the conditional wage gap estimated at the bottom of the wage distribution and that observed at the median (d10-d50). The higher it is, the worse is the pay penalty suffered by workers at the very bottom of the distribution. The second one (d50-d90) is exactly the same indicator, applied to the upper part of the distribution: we compute the difference between the conditional median wage gap and the conditional wage gap observed at the ninth decile. In order to explain cross-country differences in discrimination, we use the proportion of the gap explained by differences in returns at the first decile of the wage distribution.

Stricter employment protection towards temporary workers has been introduced in many European Countries during the last decades (OECD, 2004). In figure 3 we cross tabulate the OECD index of employment protection towards fixed-term contract against the three indicators described above. In Figure 3a we can see that countries with a higher fixed-term contract employment protection tend to have a greater value of the d10-d50 index. It seems that the more fixed-term workers are protected the more pay penalty for those workers declines along the first part of the wage distribution. In other words, when fixed-term contract workers are highly protected, the wage differentials suffered at the bottom of the wage distribution is higher with respect to the median workers. Indeed, more protection imply higher firing costs, which are relatively higher at the bottom of the wage distribution and are discounted by firms in terms of lower wage paid. No relationship emerges when we consider the upper part of the wage distribution (Figure3b). A negative relationship is found when the index of discrimination is used. In countries with lower employment protection towards fixed-term contract workers the “discrimination” at the bottom of the distribution is higher.

Employment protection towards permanent workers increases the firing costs faced by firms and thus can influence also the temporary-permanent wage gap. Figure 4 plots the OECD index of regular employment protection against our three indexes. No clear patterns emerge when d1-d5 and d5-d9 indexes are used. The proportion of the gap explained by differences in returns is negatively correlated with the protection of regular employment: in countries where regular employment is more protected, the discrimination is lower.

5. Conclusion

In this paper we evaluate the wage gap across the entire wage distribution of temporary and permanent workers not only at the mean. Therefore, we use both non parametric and semi parametric (quantile regression) approach. We show that the fixed-term wage gap decreases as we consider higher quantiles and that having a fixed-term contract penalizes more low skilled workers than high skilled. Finally, we decomposed the wage differential along the entire wage distribution, using the procedure developed by Machado and Mata (2005) to account for the relative importance of observed characteristics versus different returns to skills. When comparing results across countries we find that workers with the same characteristics of temporary workers would have received higher wages if they had worked with a temporary contract in all the countries considered and that this *discrimination* is higher at the bottom of the wage distribution.

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Table 1: descriptive statistics

		Personal characteristics							
Country		Age	Tertiary education	Secondary educ.	Primary education	Females	Hourly wages	**Nobs**	% of the sample
Austria	***Temp***	38.1	.22	.61	.17	.52	11.73	259	6.0
	Perm.	39.5	.19	.69	.11	.45	13.54	4045	
Belgium	***Temp***	33.3	.45	.33	.16	.61	13.87	317	7.9
	Perm.	39.4	.46	.38	.14	.46	15.88	3698	
Germany	***Temp***	34.8	.35	.56	.08	.57	10.45	846	9.9
	Perm.	42.1	.41	.54	.04	.51	16.00	4300	
France	***Temp***	34.5	.26	.49	.10	.58	9.20	802	11.5
	Perm.	40.3	.31	.49	.10	.47	12.65	6149	
Greece	***Temp***	35.6	.24	.38	.37	.48	4.92	638	21.9
	Perm.	38.6	.33	.45	.21	.42	7.05	2273	
Italy	***Temp***	35.5	.17	.46	.36	.55	7.34	1376	11.4
	Perm.	39.7	.13	.53	.33	.43	8.91	10638	
Portugal	***Temp***	32.8	.20	.19	.58	.51	3.67	492	16.9
	Perm.	39.4	.15	.18	.65	.48	4.82	2405	
Spain	***Temp***	34.6	.31	.23	.44	.49	6.94	2185	25.9
	Perm.	39.4	.38	.27	.35	.42	9.28	6241	
Czech Republic	***Temp***	36.2	.12	.78	.09	.51	2.69	616	12.5
	Perm.	38.9	.15	.79	.04	.47	3.11	4293	
Hungary	***Temp***	36.9	.20	.61	.17	.47	2.28	360	7.2
	Perm.	38.8	.23	.66	.11	.50	2.75	4574	
Slovak Republic	***Temp***	35.6	.16	.79	.03	.50	1.81	621	13.1
	Perm.	39.4	.20	.77	.02	.51	2.05	4107	
Poland	***Temp***	34.1	.14	.77	.08	.43	1.96	2407	25.1
	Perm.	39.6	.26	.69	.04	.49	3.00	7158	
Ireland	***Temp***	35.5	.46	.29	.21	.67	14.7	192	6.1
	Perm.	39.7	.39	.36	.22	.49	18.5	2909	
The UK	***Temp***	35.2	.56	.36	.07	.58	16.6	212	3.6
	Perm.	39.2	.42	.46	.12	.52	16.5	5670	

Table 2: Kolmogorov – Smirnov test for comparison between temporary and permanent wages

Country	Equality of distributions	Difference favourable to:	
		Temporary	Permanent
Austria	0.1755 (0.000)	-0.1755 (0.000)	0.0057 (0.984)
Belgium	0.2355 (0.000)	-0.2355 (0.000)	0.0081 (0.962)
Germany	0.3620 (0.000)	-0.3620 (0.000)	0.0000 (1.000)
France	0.3771 (0.000)	-0.3771 (0.000)	0.0049 (0.967)
Greece	0.3385 (0.000)	-0.3385 (0.000)	0.0000 (1.000)
Italy	0.2743 (0.000)	-0.2743 (0.000)	0.0012 (0.996)
Portugal	0.2016 (0.000)	-0.2016 (0.000)	0.0017 (0.998)
Spain	0.2610 (0.000)	-0.2610 (0.000)	0.0008 (0.998)
Czech Republic	0.1915 (0.000)	-0.1915 (0.000)	0.0016 (0.997)
Hungary	0.1894 (0.000)	-0.1894 (0.000)	0.0000 (1.000)
Slovack Republic	0.1818 (0.000)	-0.1818 (0.000)	0.0026 (0.993)
Poland	0.3258 (0.000)	-0.3258 (0.000)	0.0001 (1.000)
Ireland	0.2650 (0.000)	-0.2650 (0.000)	0.0101 (0.964)
The UK	0.0807 (0.140)	-0.0807 (0.070)	0.0558 (0.280)

P-values are in parenthesis.

Table 3: Estimated coefficients of permanent contract dummy by decile and OLS.

		QUANTILE REGRESSION									OLS
Country		**10**	**20**	**30**	**40**	**50**	**60**	**70**	**80**	**90**	**(mean)**
Austria	***Perm***	0.206	0.152	0.133	0.151	0.155	0.148	0.117	0.096	0.167	0.145
		(0.078)	(0.039)	(0.028)	(0.021)	(0.029)	(0.031)	(0.042)	(0.036)	(0.037)	(0.033)
	Obs.										4299
Belgium	***Perm***	0.154	0.115	0.105	0.11	0.083	0.042	0.025	-0.033	-0.077	0.049
		(0.043)	(0.028)	(0.023)	(0.026)	(0.024)	(0.029)	(0.025)	(0.047)	(0.073)	(0.023)
	Obs.										4008
Germany	***Perm***	0.491	0.487	0.446	0.402	0.331	0.273	0.26	0.202	0.181	0.325
		(0.044)	(0.034)	(0.034)	(0.029)	(0.030)	(0.022)	(0.027)	(0.027)	(0.035)	(0.014)
	Obs.										8522
France	***Perm***	0.396	0.24	0.239	0.218	0.215	0.19	0.167	0.134	0.093	0.225
		(0.045)	(0.024)	(0.020)	(0.014)	(0.017)	(0.020)	(0.019)	(0.020)	(0.036)	(0.018)
	Obs.										6951
Greece	***Perm***	0.242	0.239	0.228	0.233	0.211	0.176	0.163	0.172	0.112	0.200
		(0.039)	(0.025)	(0.023)	(0.025)	(0.027)	(0.025)	(0.025)	(0.030)	(0.037)	(0.020)
	Obs.										2911
Italy	***Perm***	0.246	0.182	0.164	0.158	0.155	0.135	0.119	0.107	0.026	0.140
		(0.022)	(0.016)	(0.011)	(0.009)	(0.012)	(0.014)	(0.014)	(0.019)	(0.023)	(0.011)
	Obs.										12014
Portugal	***Perm***	0.185	0.185	0.165	0.153	0.141	0.151	0.138	0.144	0.111	0.172
		(0.035)	(0.027)	(0.027)	(0.024)	(0.017)	(0.027)	(0.024)	(0.028)	(0.046)	(0.020)
	Obs.										2897
Spain	***Perm***	0.205	0.186	0.178	0.179	0.165	0.155	0.145	0.140	0.136	0.161
		(0.019)	(0.018)	(0.015)	(0.011)	(0.012)	(0.012)	(0.015)	(0.017)	(0.024)	(0.011)
	Obs.										8426
Czech Republic	***Perm***	0.106	0.117	0.128	0.125	0.113	0.092	0.109	0.071	0.052	0.102
		(0.025)	(0.023)	(0.020)	(0.021)	(0.024)	(0.020)	(0.024)	(0.027)	(0.030)	(0.016)
	Obs.										4909
Hungary	***Perm***	0.071	0.094	0.13	0.167	0.154	0.163	0.153	0.17	0.172	0.146
		(0.041)	(0.021)	(0.028)	(0.028)	(0.032)	(0.031)	(0.027)	(0.033)	(0.042)	(0.023)
	Obs.										4934
Slovack Republic	***Perm***	0.146	0.147	0.151	0.148	0.124	0.092	0.07	0.066	0.056	0.110
		(0.037)	(0.023)	(0.020)	(0.020)	(0.031)	(0.024)	(0.022)	(0.027)	(0.037)	(0.049)
	Obs.										4824
Poland	***Perm***	0.233	0.238	0.25	0.265	0.271	0.278	0.273	0.274	0.24	0.256
		(0.018)	(0.015)	(0.015)	(0.014)	(0.014)	(0.016)	(0.019)	(0.020)	(0.026)	(0.012)
	Obs.										9565
Ireland	***Perm***	0.163	0.153	0.133	0.146	0.081	0.116	0.125	0.088	0.024	0.111
		(0.060)	(0.049)	(0.035)	(0.051)	(0.045)	(0.038)	(0.040)	(0.055)	(0.062)	(0.036)
	Obs.										3101
UK	***Perm***	0.125	0.061	0.064	0.093	0.081	0.073	0.011	-0.116	-0.201	0.017
		(0.059)	(0.056)	(0.030)	(0.031)	(0.041)	(0.054)	(0.070)	(0.071)	(0.102)	(0.039)
	Obs.										5882

Standard errors are in parenthesis. A standard Mincerian wage equation (educational dummies, age, age squared, gender dummy and part-time dummy) is estimated by country.

Table 4
The estimated wage gap by decile and countries (percentage of the raw gap explained by different returns)*.

Country		10	20	30	40	50	60	70	80	90
Austria	*Raw differential*	0,17	0,21	0,19	0,20	0,17	0,16	0,17	0,17	0,17
	Differences in returns	0,34	0,07	0,13	0,07	0,04	-0,04	-0,05	-0,04	-0,27
	Proportion explained	*202*	*31*	*66*	*33*	*22*	*-24*	*-28*	*-23*	*-159*
Belgium	*Raw differential*	0,20	0,21	0,20	0,21	0,20	0,18	0,17	0,12	0,11
	Differences in returns	0,17	0,21	0,27	0,27	0,01	-0,08	-0,09	-0,06	-0,04
	Proportion explained	*82*	*97*	*135*	*132*	*4*	*-47*	*-50*	*-51*	*-37*
Gernany	*Raw differential*	0,69	0,67	0,65	0,63	0,57	0,50	0,48	0,45	0,41
	Differences in returns	0,35	0,35	0,33	0,29	0,26	0,17	0,21	0,19	0,16
	Proportion explained	*50*	*52*	*51*	*46*	*45*	*34*	*44*	*43*	*40*
France	*Raw differential*	0,49	0,39	0,34	0,33	0,33	0,35	0,35	0,33	0,32
	Differences in returns	0,26	0,21	0,15	0,13	0,11	0,06	0,03	0,02	-0,03
	Proportion explained	*53*	*54*	*45*	*38*	*34*	*17*	*8*	*5*	*-9*
Greece	*Raw differential*	0,40	0,40	0,39	0,39	0,39	0,38	0,35	0,35	0,36
	Differences in returns	0,12	0,13	0,07	0,02	0,00	-0,04	-0,13	-0,19	-0,19
	Proportion explained	*29*	*33*	*19*	*6*	*-1*	*-11*	*-37*	*-54*	*-53*
Italy	*Raw differential*	0,35	0,27	0,25	0,24	0,22	0,22	0,21	0,20	0,19
	Differences in returns	-0,02	-0,02	0,00	-0,02	-0,04	-0,03	-0,01	-0,04	-0,01
	Proportion explained	*-7*	*-7*	*-1*	*-10*	*-16*	*-14*	*-3*	*-19*	*-7*
Portugal	*Raw differential*	0,32	0,30	0,31	0,31	0,32	0,30	0,30	0,30	0,29
	Differences in returns	0,14	0,25	0,25	0,22	0,16	0,15	0,15	0,13	0,09
	Proportion explained	*45*	*84*	*80*	*72*	*51*	*49*	*51*	*44*	*30*
Spain	*Raw differential*	0,22	0,24	0,25	0,24	0,25	0,24	0,22	0,24	0,25
	Differences in returns	0,29	0,28	0,26	0,30	0,28	0,26	0,22	0,21	0,28
	Proportion explained	*132*	*115*	*105*	*121*	*110*	*109*	*96*	*86*	*113*
Hungary	*Raw differential*	0,11	0,15	0,16	0,18	0,21	0,20	0,19	0,20	0,20
	Differences in returns	0,22	0,15	0,14	0,09	0,06	0,00	-0,05	0,08	-0,09
	Proportion explained	*195*	*101*	*84*	*48*	*27*	*-1*	*-24*	*42*	*-45*
Czech Republic	*Raw differential*	0,16	0,19	0,18	0,18	0,19	0,18	0,18	0,16	0,15
	Differences in returns	0,13	0,16	0,17	0,01	0,06	0,06	0,07	0,08	0,03
	Proportion explained	*82*	*81*	*97*	*6*	*33*	*34*	*40*	*46*	*20*
Slovack Republic	*Raw differential*	0,19	0,17	0,19	0,20	0,19	0,16	0,14	0,10	0,09
	Differences in returns	0,16	0,15	0,19	0,18	0,12	0,11	0,09	0,07	0,07
	Proportion explained	*82*	*86*	*100*	*93*	*66*	*69*	*67*	*73*	*73*
Poland	*Raw differential*	0,36	0,38	0,40	0,41	0,44	0,45	0,45	0,45	0,45
	Differences in returns	0,04	0,14	0,19	0,18	0,17	0,21	0,23	0,21	0,27
	Proportion explained	*11*	*36*	*48*	*43*	*39*	*47*	*50*	*47*	*59*
Ireland	*Raw differential*	0,23	0,30	0,28	0,28	0,30	0,31	0,29	0,26	0,26
	Differences in returns	0,56	0,73	0,77	0,74	0,66	0,03	0,00	0,05	-0,01
	Proportion explained	*239*	*244*	*274*	*264*	*224*	*10*	*1*	*20*	*-4*
UK	*Raw differential*	0,18	0,11	0,08	0,10	0,10	0,10	0,09	0,06	0,02
	Differences in returns	0,51	0,38	0,29	0,22	0,17	0,11	0,09	0,07	-0,01
	Proportion explained	*278*	*350*	*372*	*220*	*166*	*114*	*97*	*103*	*-46*

Figure 1a: percentage of temporary and permanent workers by quantile of the (hourly) wage distribution in the Continental countries. By country (2006)

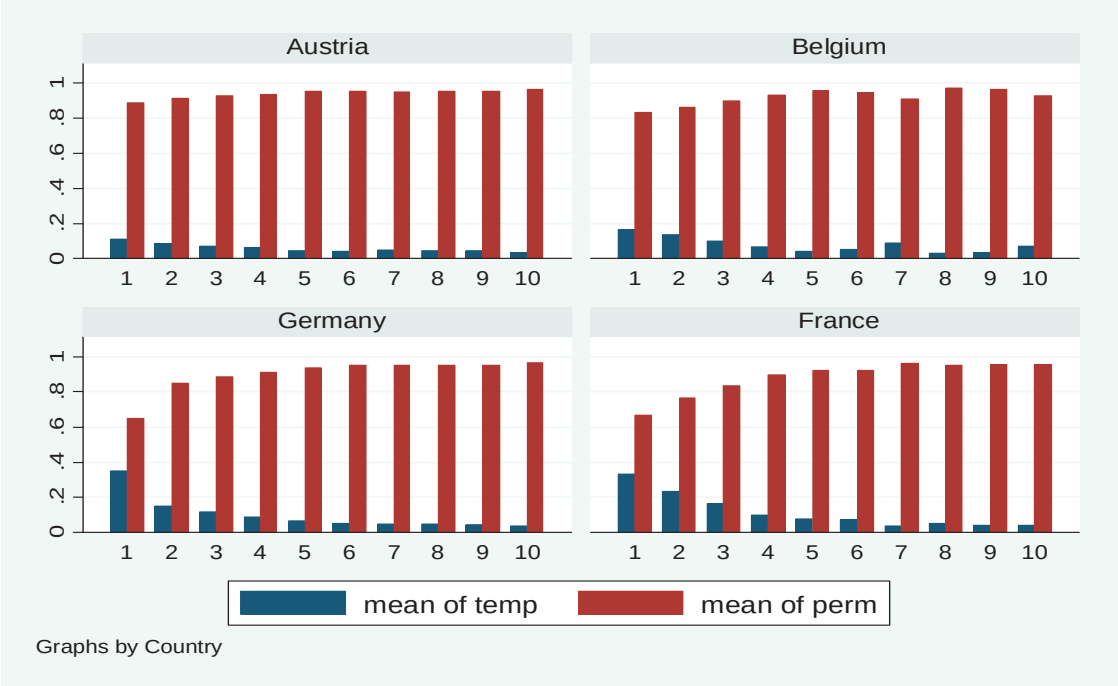


Figure 1b: percentage of temporary and permanent workers by quantile of the (hourly) wage distribution in Mediterranean countries. By country (2006)

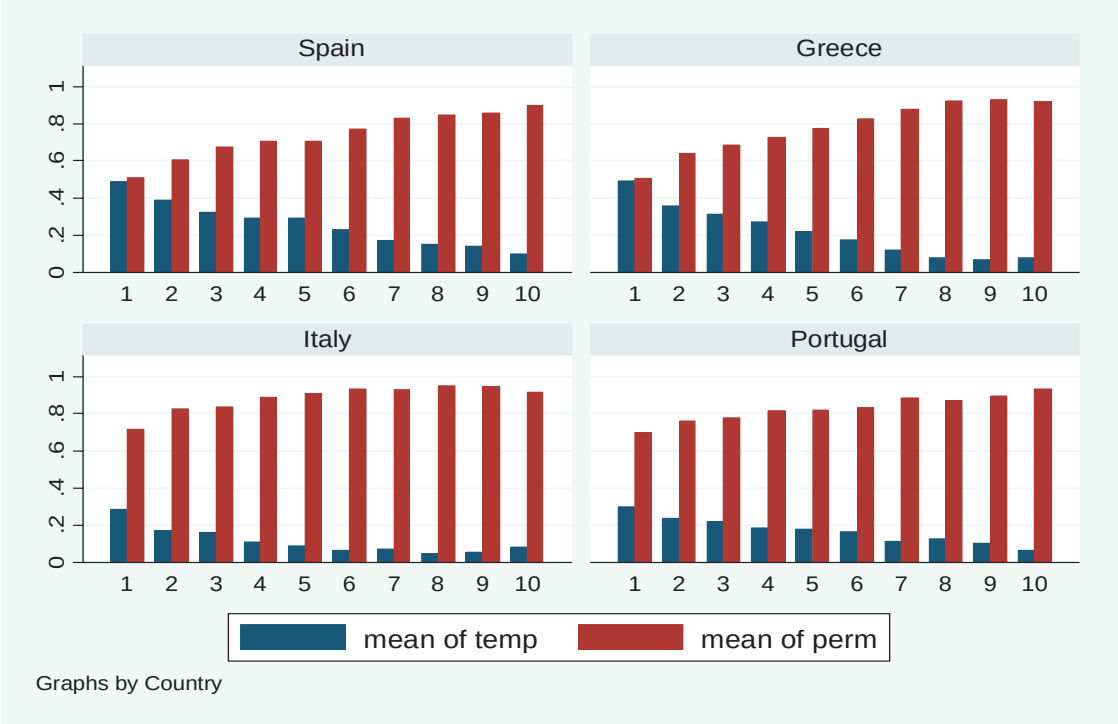


Figure 1c: percentage of temporary and permanent workers by quantile of the (hourly) wage distribution in Eastern countries. By country (2006)

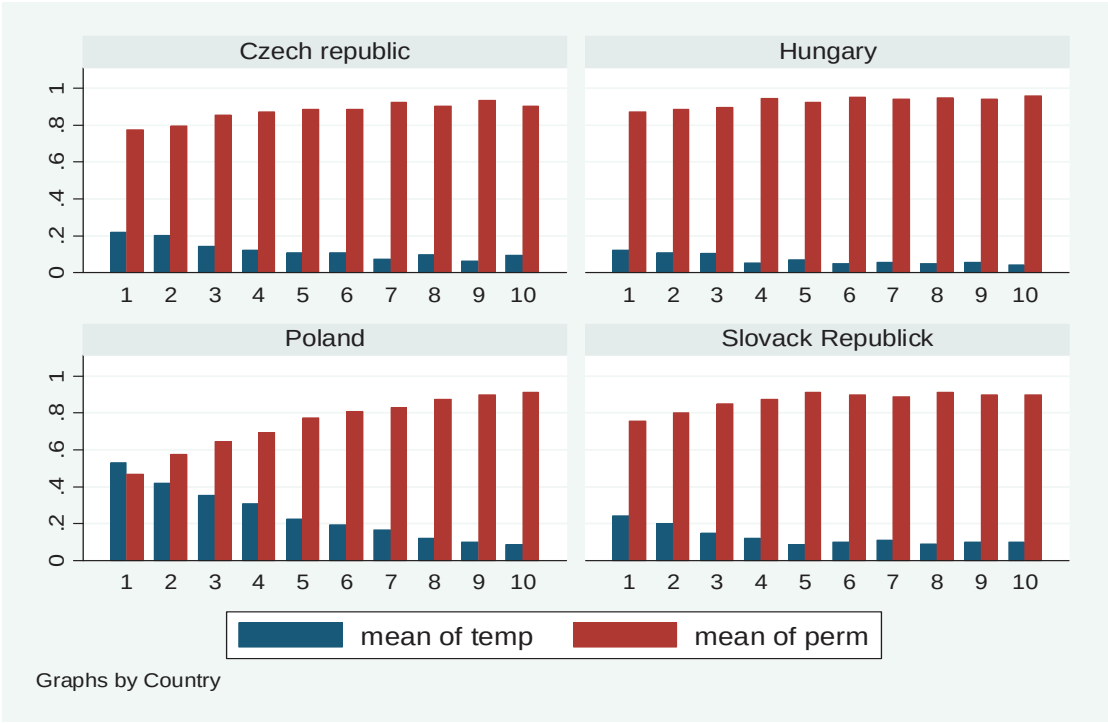


Figure 1d: percentage of temporary and permanent workers by quantile of the (hourly) wage distribution in Liberal countries. By country (2006)

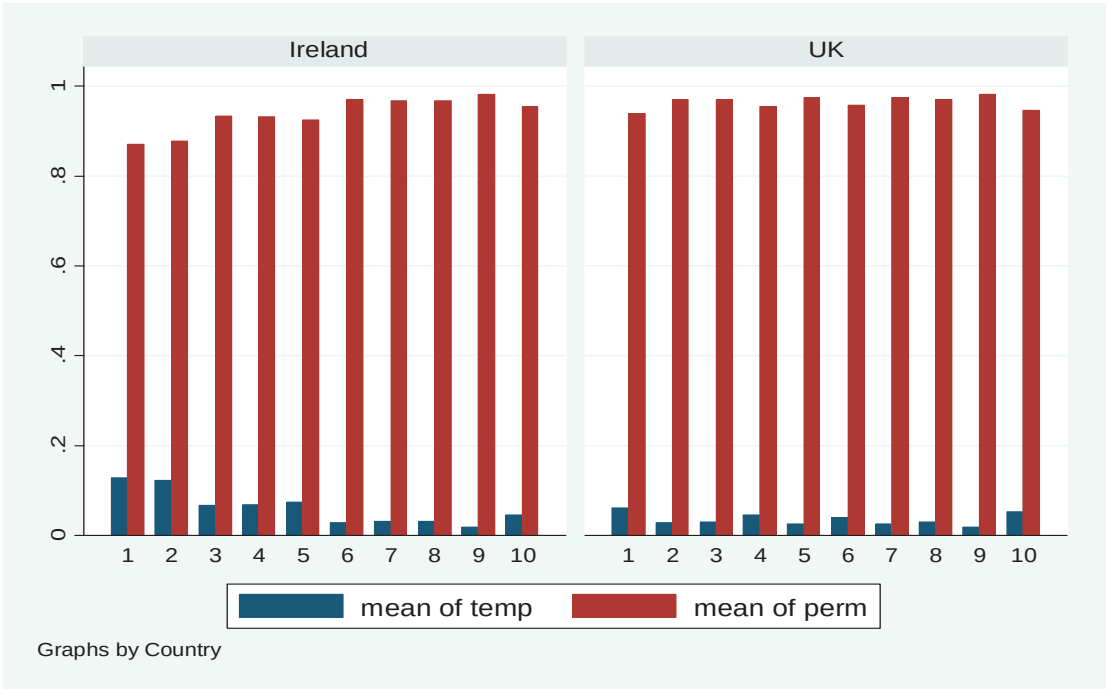
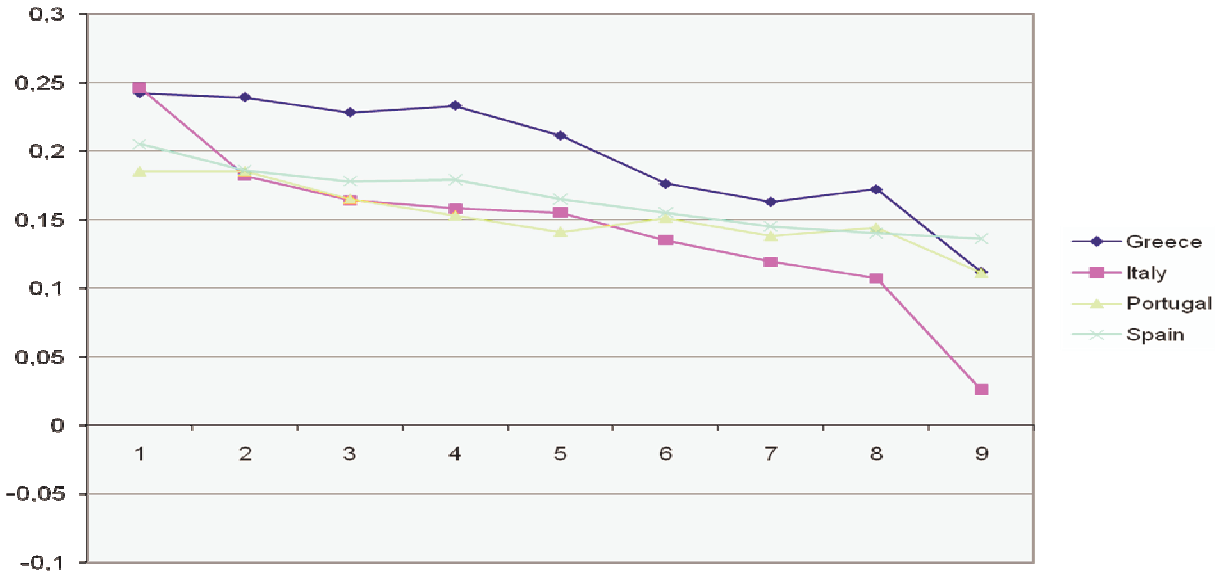
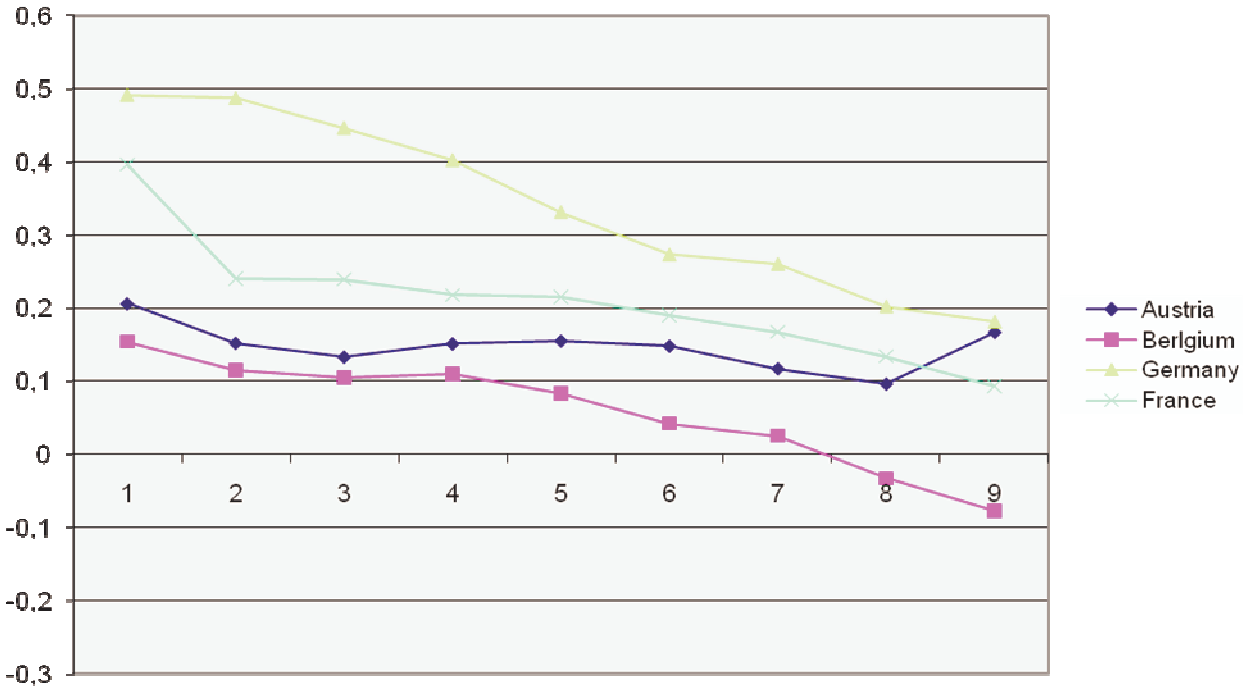


Figure 2: Estimated coefficients of permanent job by decile

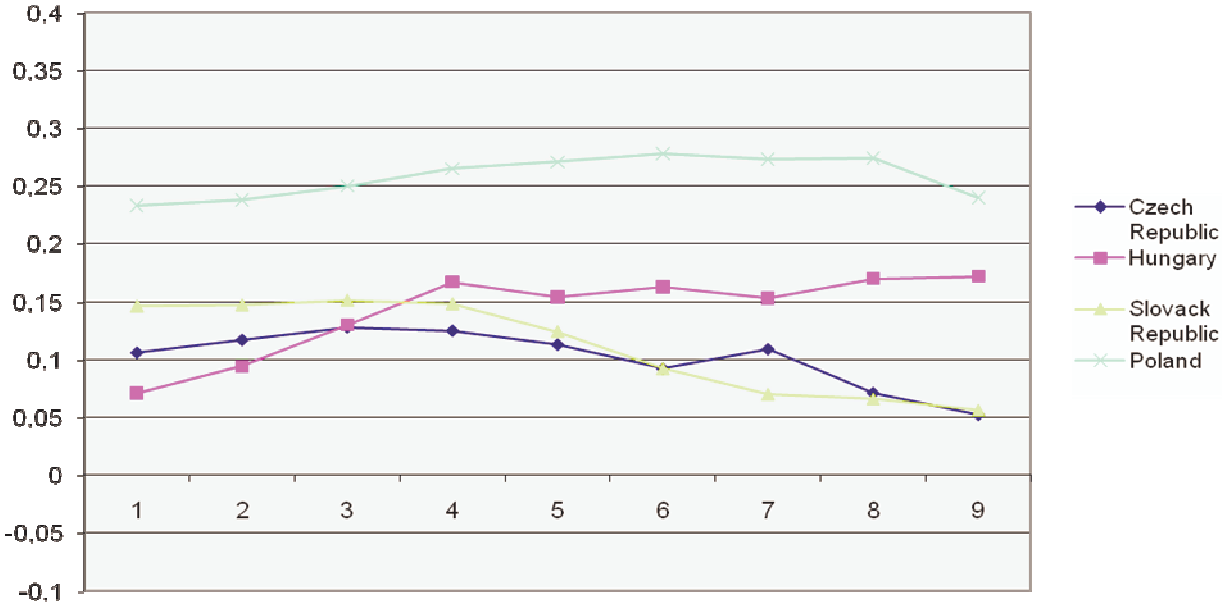
Mediterranean Countries



Continental Countries



Eastern Countries



Liberal Countries

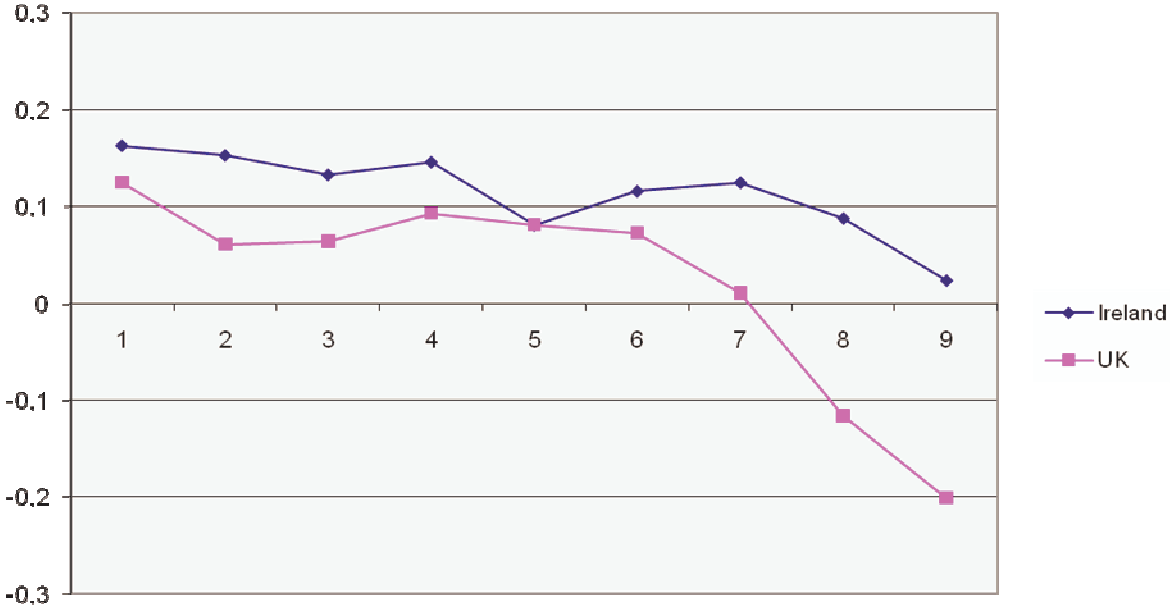


Figure 3a:Simple correlation between d10-d50 and Employment Protection of fixed-term workers

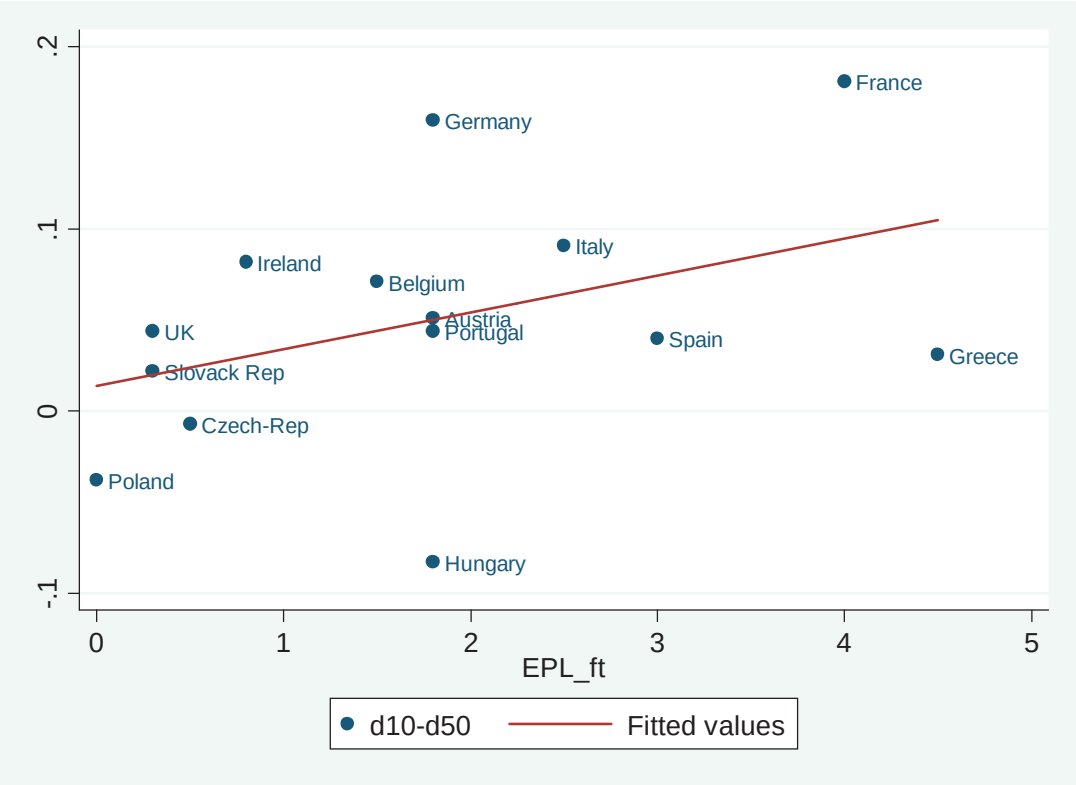


Figure 3b:Simple correlation between d50-d90 and Employment Protection of fixed-term workers

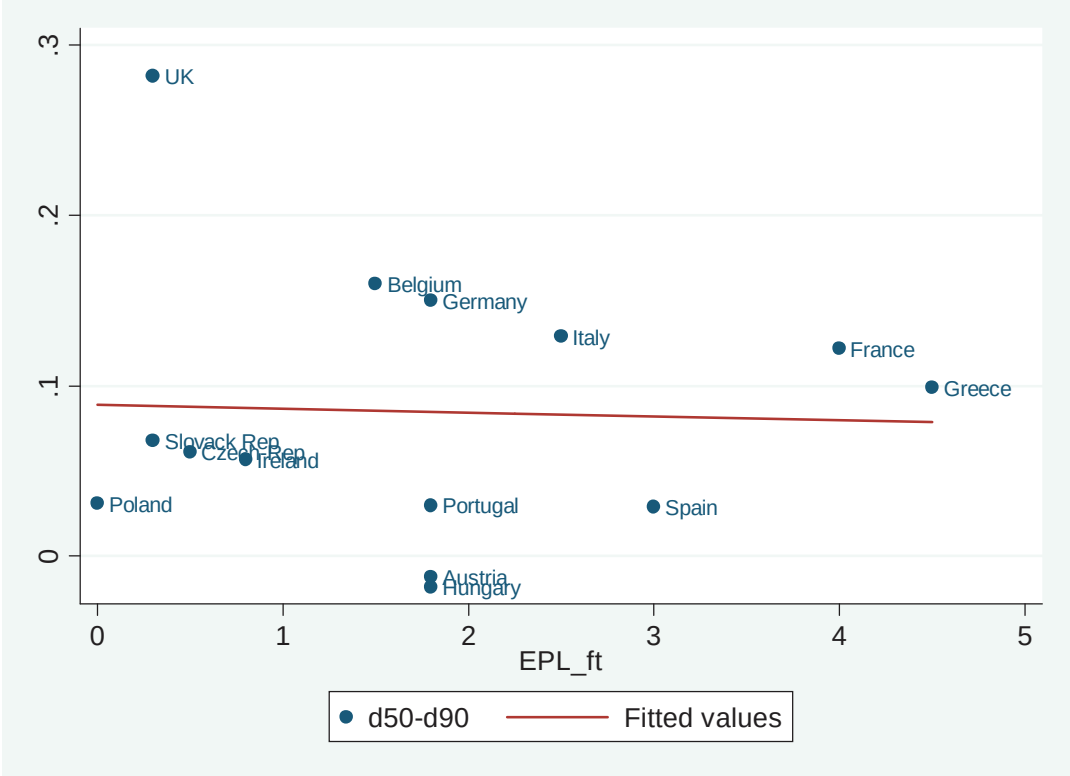
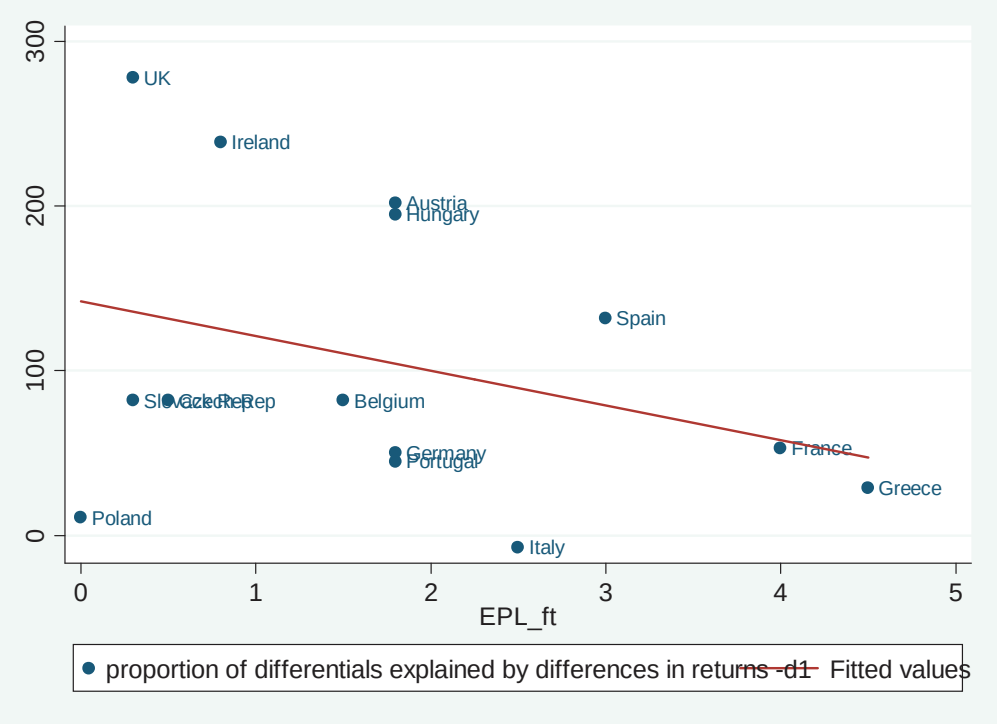


Figure 3c:Simple correlation between the proportion of the first decile gap explained by differences in returns and Employment Protection of fixed-term workers



Notes: On the vertical axe there is the difference between the conditional wage gap observed at the first decile and that observed at the median, taken from table 3. EPL versus fixed term workers is taken from OECD (2004)- table 2.A2.2, first column, and refers to year 2003

Figure 4a:Simple correlation between d10-d50 and Employment Protection of regular workers

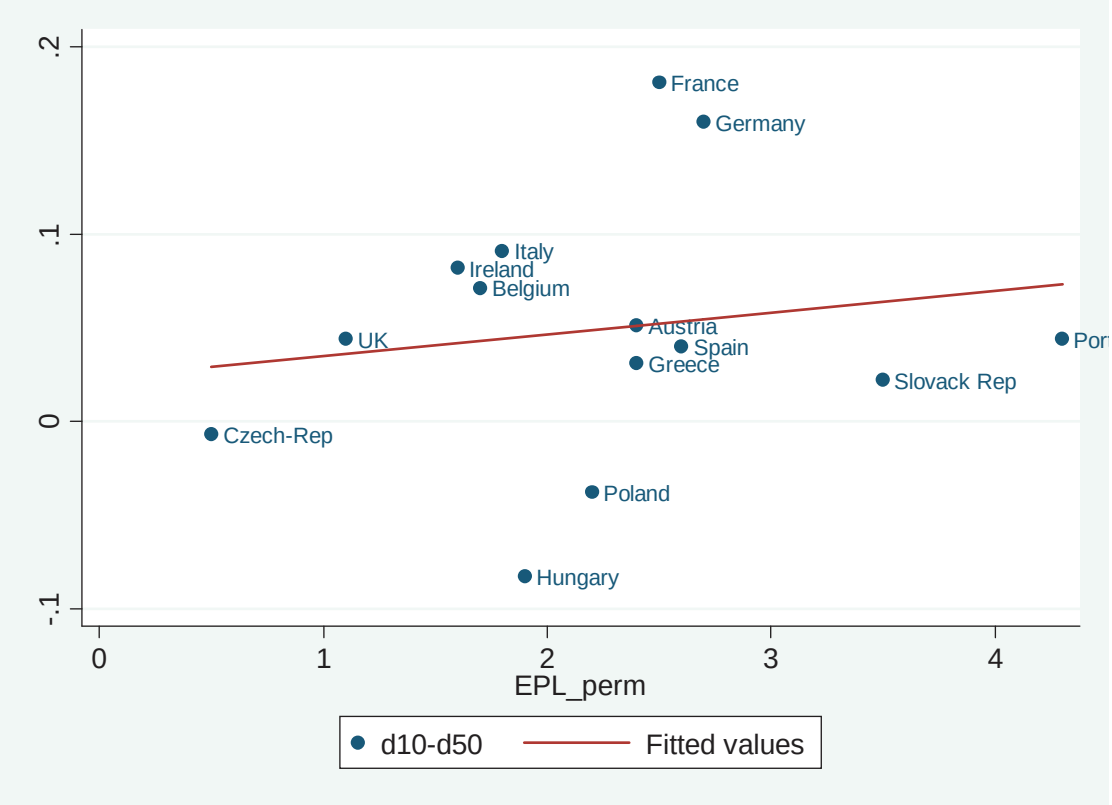


Figure 4b:Simple correlation between d50-d90 and Employment Protection of regular workers

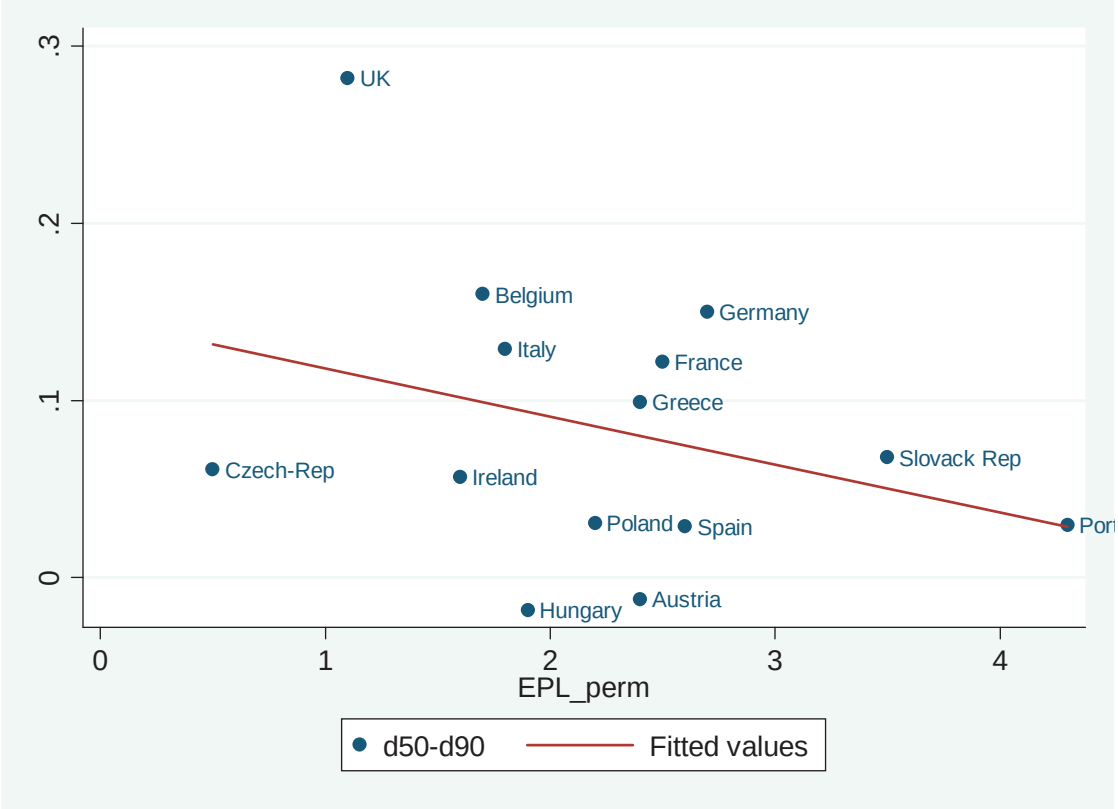
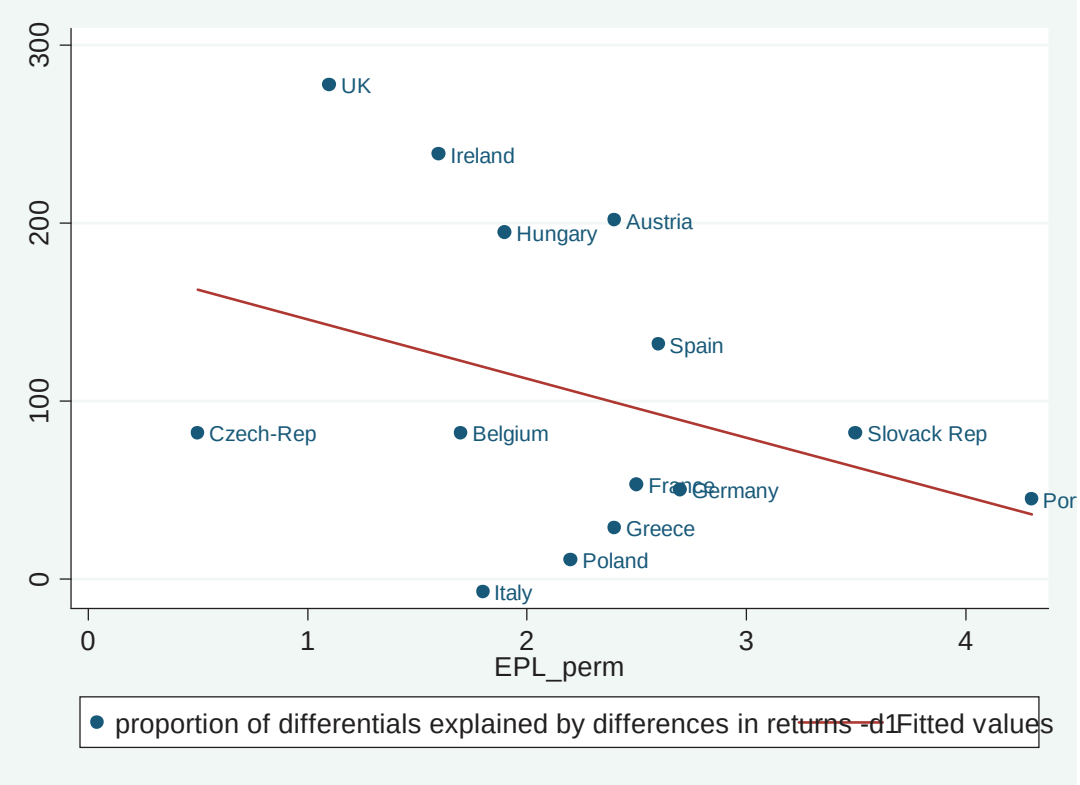
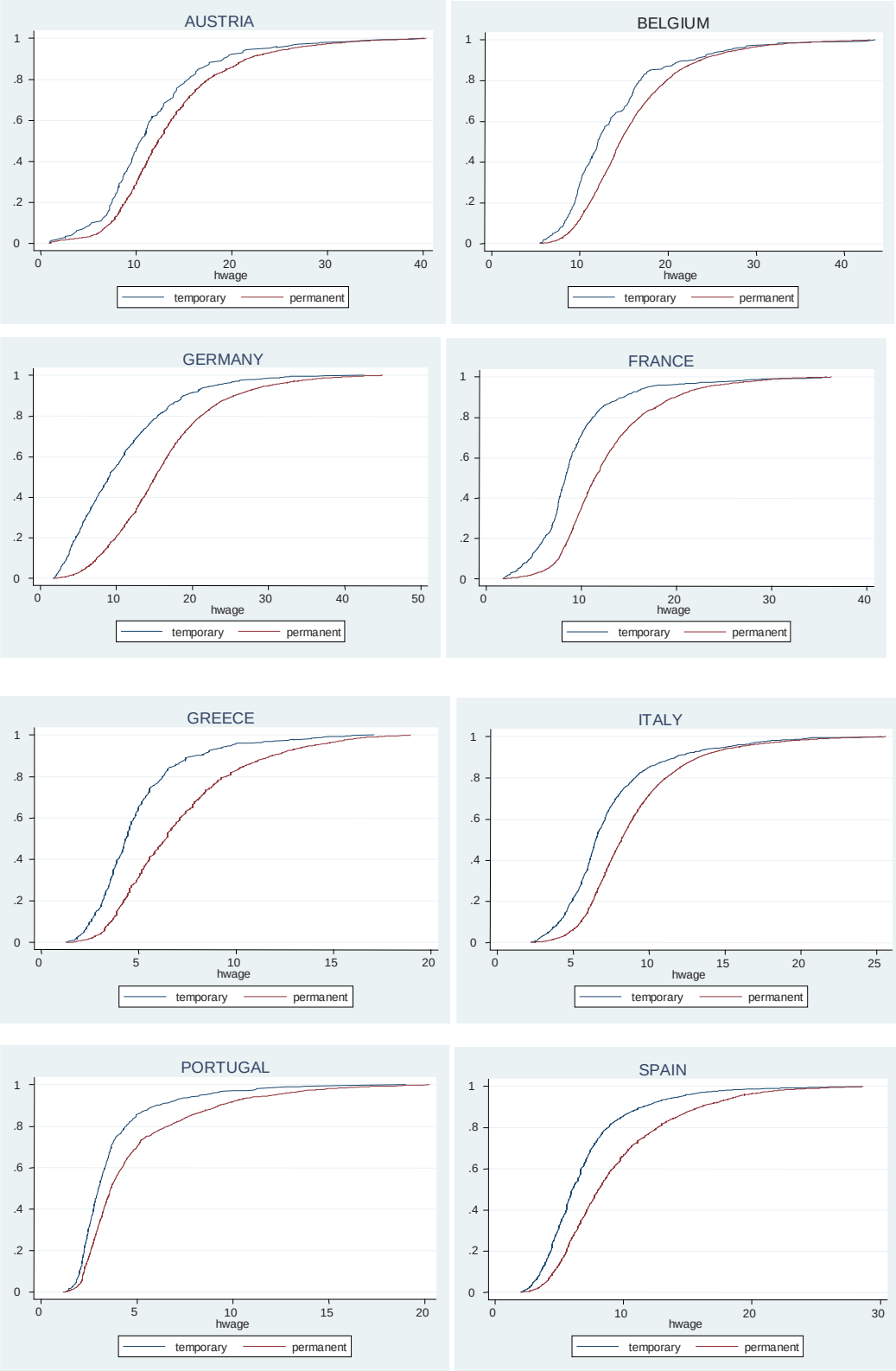


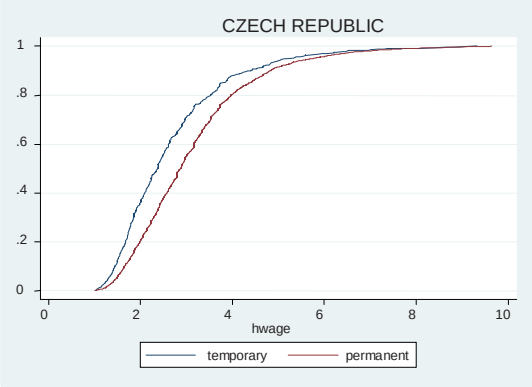
Figure 4c: Simple correlation between the proportion of the first decile gap explained by differences in returns and Employment Protection of regular workers

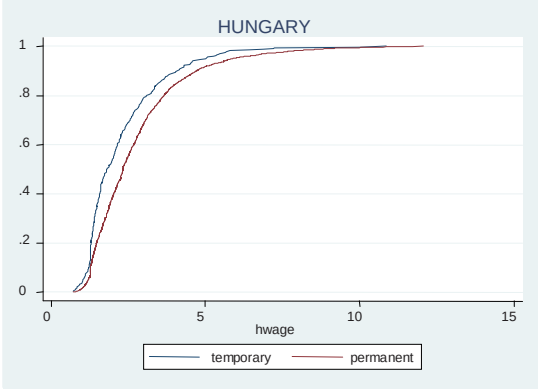


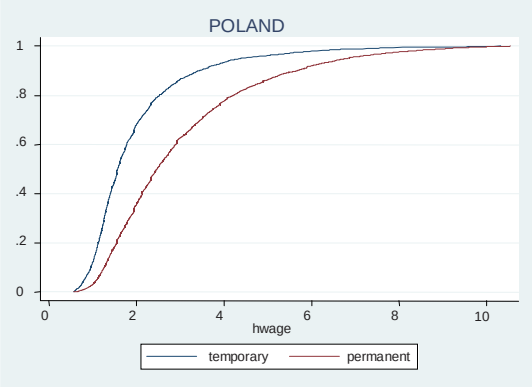
Appendix A

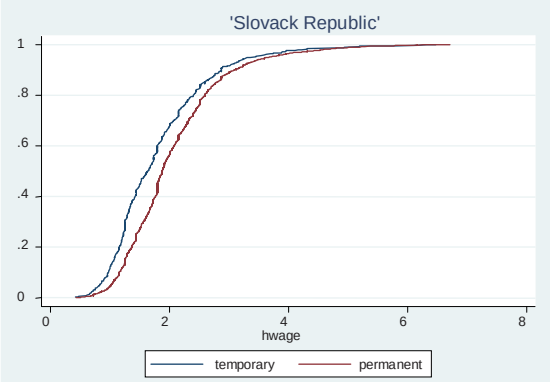
Figure A1: cumulative functions of log wage for temporary and permanent contracts. By country (2006).

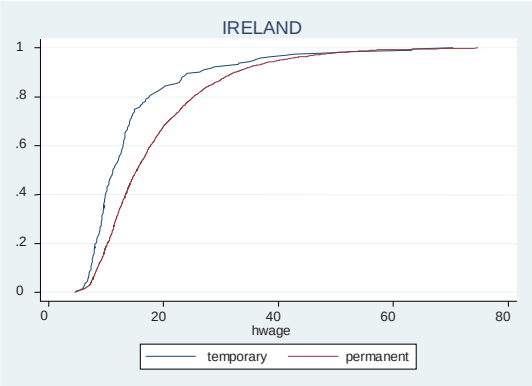



CZECH REPUBLIC
1
.8
.6
.4
.2
0
0
2
4
6
8
10
hwage
temporary
permanent


HUNGARY
1
.8
.6
.4
.2
0
0
5
10
15
hwage
temporary
permanent


POLAND
1
.8
.6
.4
.2
0
0
2
4
6
8
10
hwage
temporary
permanent


'Slovack Republic'
1
.8
.6
.4
.2
0
0
2
4
6
8
hwage
temporary
permanent


IRELAND
1
.8
.6
.4
.2
0
0
20
40
60
80
hwage
temporary
permanent

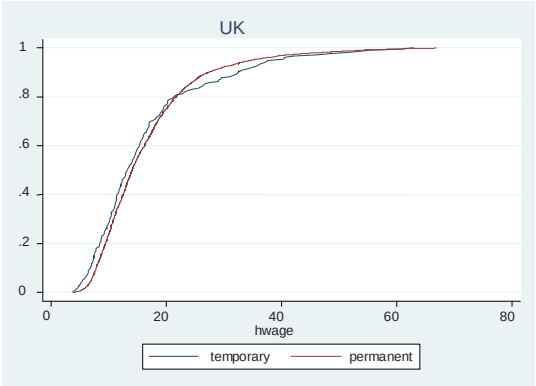

UK
1
.8
.6
.4
.2
0
0
20
40
60
80
hwage
temporary
permanent

Table 1A: Tests for coefficient equality between pair wise deciles

Quantiles being tested: Countries:	10 vs. 50	10 vs. 90	20 vs. 50	20 vs. 80	50 vs. 80	50 vs. 90
Austria	0.5073	0.6293	0.9207	0.2383	0.0855	0.7790
Belgium	0.0872	0.0043	0.2050	0.0041	0.0018	0.0182
Germany	0.0004	0.0000	0.0000	0.0000	0.0000	0.0001
France	0.0000	0.0000	0.2558	0.0001	0.0000	0.0002
Greece	0.4364	0.0116	0.3094	0.0488	0.1817	0.0089
Italy	0.0000	0.0000	0.0749	0.0000	0.0047	0.0000
Portugal	0.2147	0.1966	0.0778	0.2475	0.9050	0.4916
Spain	0.0332	0.0239	0.1777	0.0282	0.1120	0.2317
Czech Republic	0.7939	0.1496	0.8563	0.1410	0.1112	0.0588
Hungary	0.0541	0.0736	0.0387	0.0327	0.6284	0.6943
Slovack Republic	0.5645	0.0681	0.4074	0.0109	0.0461	0.0840
Poland	0.0363	0.8178	0.0216	0.1092	0.8553	0.2029
Ireland	0.1927	0.0682	0.1294	0.3095	0.8817	0.3806
UK	0.4499	0.0026	0.6954	0.0188	0.0011	0.0029

The table reports the prob-values for the F-test.