Asymmetries in the Pay-penalty from Skill Mismatches in Europe: How different is the effect on high educated workers?

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Abstract

In this paper, we use quantile regression and comparable data from 12 European countries to explore the effects of being skill mismatched on the conditional distribution of wages among workers with different levels of education for the 1994-2001 period. In Europe as a whole, and for each educational level and year, the top quantiles of the distribution are less affected by pay-penalty, leading to increased within-group inequality. Asymmetries were also found by countries, although the type of asymmetry changes. In 1994, no asymmetries were found in almost all cases. When asymmetries do exist the top quantiles were more penalized in terms of wages than the bottom quantiles and inequality increased within education groups. However, more countries show asymmetries in 2001, most of which consist of lesser penalized top quantiles, giving rise to greater inequality within education groups.

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JEL-Codes: C29, I21, J31

1. Introduction

Investing in human capital is a key tool for economic development and, as such, a major policy concern for most governments. In recent decades, developed economies have experienced rapid educational expansion. However, the real economic benefits of such a process might be lower than previously thought in terms of inequality and efficiency implications.

In terms of inequality, it is commonly argued that a more balanced distribution of education will result in a more balanced distribution of earnings. However, even though such policies may reduce average differences among differently educated individuals, their final impact is not so conclusive. The related literature points out two different aspects driving educational expansion. First, in most countries, more educated individuals show higher wage dispersion (see for example, Pereira & Martins for international data, 2004; Buchinsky for the US, 1994; Gosling, Machin & Meghir for the UK, 2000; Hartog, Pereira & Vieira for Portugal, 2001; and Budria & Moro-Egido for Spain, 2008). These findings warn that educational expansion is expected to raise wage inequality among similarly educated individuals. Secondly, recent international research has used the quantile regression technique to show that returns to education tend to increase when moving up along the wage distribution (Buchinsky, 1994; Machado & Mata, 2001; Pereira & Martins, 2002 and 2004). Therefore, if conditional wage dispersion is higher among more educated individuals, educational expansion may raise overall wage inequality by enlarging the high-spread group.

In terms of the efficiency implications of educational investment, recent empirical research has shown the existence of different educational mismatches in the labour force of developed countries. On the one hand, it is shown that a significant proportion of the labour force has more education than is actually required for their jobs (for a detailed summary see McGuiness, 2006). This phenomenon raises serious efficiency concerns, as it suggests that a fraction of the workforce is not fully using their skills at their current job, resulting in a waste of resources. This finding alerts prospective students and policy makers that achieving a certain qualification is not a sufficient condition for attaining a high-paying job. There is consistent evidence that over-educated[1] workers earn, on average, less than their well-matched counterparts. To cite some examples, the estimated differential can be as large as 11% in Groot (1996), 12% in Dolton & Vignoles (2000), 27% in Chevalier (2003) and about 35% in Dolton & Silles (2008) for the UK; 11% in Cohn & Kahn (1995) and 13% in Verdugo & Verdugo (1989) for the US and 8% in Kiker, Santos & Mendes de Oliveiria (1997) for Portugal. For a detailed summary of the pay-penalty from over-education see McGuiness (2006). Related literature examines the wage effects of mismatches along the conditional distribution of wages. This seems particularly relevant from a public policy perspective since the effects of over-qualification among the earnings-poor will likely be of more interest than the effects among the earnings-rich.

[1] Most measures of mismatch used in the literature are based exclusively on the level of education attained where individuals with excess education are typically regarded as 'overeducated'.

On the other hand, and despite rising education levels, there is a changing demand for specific skills in the labour market as well as a lack of specific training or educational schemes that can provide workers the necessary skills in their jobs (Green, McIntosch &Vignoles, 2002). While the over-qualification or over-education phenomenon has been widely documented in the literature, the labour market effects of skill mismatches are less known. However, skill mismatch has recently become an issue of particular policy concern. In a report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, the European Union pointed to this phenomenon as being damaging to competitiveness[2]. Recent empirical research, i.e. Budría & Moro-Egido (2009), shows the existence of pay-penalty for different types of educational mismatches using comparable data for 12 European countries. Budría & Moro-Egido (2009) compare the effect of over-qualification or over-education and skill mismatch on wages for a group of countries. On average, they find that skill mismatches are more harmful in terms of wages than over-qualification. Specifically, the pay-penalty of skill mismatch (5.4%) is 4.5 times higher than the pay-penalty for over-qualification (1.2%) in the pooled sample for Europe. They point out that, in general, the earnings gap between matched and mismatched workers cannot be regarded as constant across the earnings distribution. They also find that the extent of variation across quantiles is larger for the skill mismatch effect than for the over-qualification effect.

The goal of this paper is threefold: to analyze in depth (i) the pay-penalty from skill mismatches by level of education; (ii) the evolution over time of that pay-penalty and finally (iii) the influence on within-group inequality. We focus our analysis on skill mismatches for the following reasons. First of all, skill mismatch is less-well documented than over-qualification or over-education. Secondly, most measures of mismatch used in the related literature are based exclusively on the level of education attained by the individual. However, even if workers do not respond that they are over-qualified, they may still hold an inappropriate job in terms of type, but not level, of education (see Sloane, 2002)[3]. The implications of our analysis could be the following. If skill mismatch is associated with a substantial pay-penalty, then it contributes to enlarging wage differentials within education groups. Furthermore, the impact of skill mismatches on wages (and, hence on within-group inequality) might not be constant over the wage distribution. Thus, for example, if the pay-penalty of skill mismatches is higher for the earnings-poor, then an expansion in the proportion of skill-mismatched workers is expected to deteriorate the labour market position of already disadvantaged individuals. Such an expansion is therefore expected to increase wage inequality by enlarging the lower tail of the wage distribution.

The paper by Budría & Moro-Egido (2009) share several similarities with ours, but with two main differences. First, we try to determine whether or not the pay-penalty affects different education groups differently; and, second, we analyze the evolution of that pay-penalty. Budría & Moro-Egido

[2] See the report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions "New Skills for New Jobs; Anticipating and Matching Labor Market and Skills Needs", Director for Education and Culture, April 2009.

[3] Throughout the paper we refer to workers who are skill mismatched in the broad sense of the term as workers who 'lack necessary skills'.

consider a pooled data (1994-2001) without differentiating between education groups. In our analysis, we use recent and comparable data from European countries included in the European Community Household Panel (ECHP). The analysis is conducted using Ordinary Least Squares (OLS) and quantile returns (QR) methodology. Estimation by OLS assumes that the marginal impact of skill mismatch on wages is constant over the wage distribution. However, while there is a range of observable human capital characteristics that determine wages, there are also some unobservable factors that can affect the distribution of wages. Several methods allow for interactions between unobservable factors and observable wage determinants[4]. We choose the QR framework, in which the estimates at different quantiles represent the effects of a given covariate for individuals having the same observable characteristics, but who are located at different points of the earnings distribution due to unobservable earnings capacity. Conditional on observable characteristics, individuals that are located at higher quantiles of the earnings distribution presumably have more skills; where skills are understood as ability, motivation, better academic credentials and other unobservable characteristics affecting productivity. Assuming that unexplained earnings capacity is given by individuals' unobserved ability, we document how workers who are skill mismatched within the various ability segments of the earnings distribution are impacted relative to their well-matched counterparts. The major advantage to this approach is that it prevents us from comparing higher ability matched individuals with lower ability mismatched individuals, thus eliminating the potential bias arising from unobserved heterogeneity. By combining OLS with quantile regression, we can assess the impact of education on wage inequality between and within groups: while OLS returns measure the average differential between education groups, differences in quantile returns represent the wage differential between individuals that are in the same group but located at different quantiles.

The paper is structured as follows. The dataset and variables are presented in Section 1, including the definition of skill mismatch used in the paper and the summary statistics of relevant variables. In Section 2 the quantile regression model is presented. The results are given in Section 3. Finally, conclusions are drawn in Section 4 and the main findings and their theoretical implications discussed. The paper includes two appendices. The estimating sample and the variables used in the regressions are described in Appendix A, while the tables and figures are presented in Appendix B.

2. Data and measurement of skill mismatch

We use data from 12 countries included in the European Community Household Panel (ECHP, henceforth). The ECHP is a representative survey that contains personal and labour market characteristics,

[4] Previous results controlling for unobserved heterogeneity were based on panel data and instrumental variables (Chevalier, 2003, Dolton & Silles, 2001). These approaches have their own limitations. On the one hand, the estimates using panel data are based on the transition of workers from "over-educated" to "non-over-educated" status. To the extent that these transitions are not exogenous, the results arising from panel data may be biased. On the other hand, the instrumental variables approach requires finding instruments that are related to wages and, at the same time, unrelated to over-education. This imposes a strong condition, as variables related to unobserved individual characteristics presumably have an impact on wages as well. Due to the difficulty of finding similar and valid instruments for different countries, the instrumental variables approach almost precludes conducting any comparative work.

including wage, education, hours worked, tenure, experience, sector, firm size, marital status and immigrant status, among other variables. For the present study, we use data from 1994 and 2001. The dataset and the variables are described in Appendix A.

We use the same estimation procedure and population group for all countries. Our estimating sample consists of private-sector males aged 24 to 60 years old who normally work between 15 and 80 hours a week and are not employed in the agricultural sector. Self-employed individuals, as well as those whose main activity is paid apprenticeship or training and unpaid family workers have been excluded from the sample[5]. Workers with a monthly wage rate that is less than 10% or over 10 times the mean wage have also been excluded.

Much debate has arisen in the related literature about the current methods used to measure educational mismatch[6]. For the purpose of the present paper, we follow the subjective approach given that the ECHP contains two self-assessed measures of the quality of the match between the worker's education and the requirements of the job. These questions have already been used by Alba-Ramírez & Blázquez (2002), Wasmer, Fredriksson, Lamo, Messina & Peri (2007) and Budría & Moro-Egido (2008, 2009). The first question is

- **(Q1)** *Do you feel that you have skills or qualifications to do a more demanding job than the one you have now?*

We use this information to denote workers who are 'overqualified' (Q1: 'yes'). As pointed out in the introduction, since most measures of mismatch used in the literature are based exclusively on the level of education attained, individuals with excess education are typically regarded as 'overeducated'. However, the term 'overeducation' may be seriously misleading due to the fact that workers who state that they are not overqualified may actually have an inappropriate job match when the content, not the level, of their education is evaluated. For that reason, we choose to denote excess education (level) as "over-qualification" to distinguish it from the situation in which a fraction of the labour force lacks specific training or education to provide the necessary skill, i.e. "skill mismatch". Therefore, we will focus our analysis on the following question

- **(Q2)** *Have you had formal training or education that has given you skills needed for your present type of work?*

[5] The case of women is disregarded on account of the extra complication of potential selectivity bias.

[6] The literature distinguishes between two ways of measuring educational mismatch: the 'subjective' approach and the 'objective' approach. The subjective approach is based on workers' self-assessment regarding the quality of the match between their education and the educational requirements of the job (e.g., Chevalier, 2003). The objective approach, in turn, consists of finding out the educational requirements externally. This requirement can be determined by the formal evaluation of independent job analysts or, alternatively, using a 'statistical' approach in which the education requirement is given by the mean/mode education level within occupations (e.g., Verdugo & Verdugo, 1989; Kiker, Santos & Mendes de Oliveiria, 1997; Bauer, 2002). McGoldrick & Robst (1996), Battu, Belfield & Sloane (2000), Groot & Van den Brink (2000) and Rubb (2004) report that the alternative approaches generate broadly consistent evidence in terms of the estimated effect of mismatch on earnings.

This information allows us to identify workers who are 'skill mismatched', i.e. workers who did not acquire the necessary skills through training and education (Q2: 'no'). Exploring the effects of having inappropriate qualifications seems compelling as there is no presumption that these are less important than the effects of having excess qualifications[7].

In Table 1, we report summary statistics of the incidence of skills mismatch and its evolution across time. The first column reports the European averages[8]. In 1994, the incidence of skills mismatches ranged from 28.1% in Finland or 28.5% in Greece to 80% in Portugal, with an average of 43.8%. These figures indicate that a remarkably large fraction of the European working population engages in jobs that are not perfectly commensurate with their skills. In 2001, the incidence decreased with the exception of Finland, Greece, Spain and the UK. Although the incidence ranges from 23.4% in Germany to 73.7% in Italy, with an average of 41.7%, it remains quite large. By country we find that the largest decrease in the percentage of skill-mismatched workers occurred in Belgium (10.7 percentage points or p.p.), while the lowest decrease took place in Italy and France (less than 1 p.p.). Among countries where the incidence has increased, Greece shows the largest increase with 43.2 p.p., while in the rest of the countries the changes are about 1-3 p.p.

---------- Insert Table 1 about here ----------

By level of education we observe that the impact of skill mismatch is lower among workers with tertiary education for both years in any country. On average, 9.2% of workers in Europe with tertiary education reported being skill mismatched in 1994, while this percentage increased to 13.8% in 2001. By country, we observe that Portugal suffered the lowest impact (less than 1%) in 1994, while the highest impact occurred in the UK (20.9%). In 2001, both Portugal and UK again displayed the lowest and the highest impact, with 1.2% and 37.2%, respectively. However, no common trend is found: for some countries the impact increases, while for others it decreases.

Finally, Table 2 reports summary statistics for skill-mismatched workers by different levels of education. Some interesting differences emerge across groups. Skill-mismatched workers with tertiary education and those with less than tertiary education are roughly similar in terms of hours worked, tenure and marital status. As regards the group of skill mismatched workers with lower education, higher educated workers are more likely to have a supervisory role in their job, employer-financed training, less experience, work in larger firms (although more than half work in a firm with less than 100 workers) and less unemployment experiences. The high educated workers tend to work as 'legislators, senior officials

[7] As pointed out in Budría & Moro-Egido (2009), some individuals might not have received formal education and training for unskilled jobs but have acquired the necessary background through other sources, including peer observation, learning by doing and general work experience. Although these channels are typically less relevant, they might be important for a small fraction of uneducated individuals working in low level jobs.As most other measures of mismatch, a limitation of our definition is that it focuses on formal education and training and disregards other sources of skills acquisition.

[8] These results are obtained by pooling all the countries together and re-scaling the sampling weights so that each country's relative size in the sample is equal to its relative size in the census data. Specifically, the sampling weight of country's *i* observation *j* in the pooled sample is $\omega_{j,i} = (\gamma_i/\alpha_i)$, where γ_i is the ratio between country's *i* population and the population of all countries included in the ECHP according to census data and α_i is country's *i* sample size relative to the ECHP sample size.

and managers', 'professionals' and 'technicians and associate professionals' (59% of them in 1994 and 58% in 2001), while the less educated ones are more likely to work as 'craft and related trades workers', 'plant and machine operators and assemblers' and 'elementary occupations' (69% of them in 1994 and 63% in 2001). These differences are more marked in 2001 than in 1994. That is, among skill-mismatched workers with tertiary education, the proportion of workers receiving on-the-job training increases, their experience decreases, their unemployment experience decreases and permanent contracts increase more than for those with a lower level of education.

---------- Insert Table 2 about here ----------

3. The model

Our econometric strategy is based on Koenker & Basset's (1978) quantile regression (QR). The main feature of this approach is that it allows us to examine the effects of a given covariate (skills mismatch in our case) among workers with different unobservable earnings capacity. The quantile regression model can be written as:

$$ln\ w_i = X_i\beta_\theta + e_{\theta i} \qquad \text{with} \quad Quant_\theta(ln\ w_i \mid X_i) = X_i\beta_\theta \qquad (1)$$

where X_i is the vector of exogenous variables and β_θ is the vector of parameters. $Quant_\theta(ln\ w_i \mid X_i)$ denotes the θth conditional quantile of $ln\ w$ given X. The θth regression quantile, $0<\theta<1$, is defined as a solution to the problem

$$\underset{\beta \in R^k}{Min}\left\{ \sum_{i:ln\ w_i \geq x_i\beta_\theta} \theta \left| ln\ w_i - X_i\beta_\theta \right| + \sum_{i:ln\ w_i < x_i\beta_\theta} (1-\theta)\left| ln\ w_i - X_i\beta_\theta \right| \right\} \qquad (2)$$

which, after defining the check function $\rho_\theta(z)=\theta z$ if $z \geq 0$ or $\rho_\theta(z)=(\theta-1)z$ if $z < 0$, can be written as

$$\underset{\beta \in R^k}{\text{Min}}\left\{ \sum_i \rho_\theta(\ln w_i - X_i\beta_\theta) \right\} \qquad (3)$$

This problem is solved using linear programming methods, where standard errors for the vector of coefficients are obtained using the bootstrap method described in Buchinsky (1998). For our particular problem, we use the following earnings equation

$$\ln w_i = \alpha_\theta + \delta_\theta X_i + \beta_{\theta 1}\, mismatch_i + e_{\theta i} \qquad (4)$$

where $ln\ w_i$ is the logarithm of the net hourly wage, X_i is a vector of controls, and *mismatch* is a dummy variable indicating whether the individual is skills mismatched[9].

[9] The use of a categorical variable to measure the wage effects of educational mismatches is inspired in previous work by Verdugo & Verdugo (1989), Dolton & Vignoles (2000) and Chevalier (2003). An alternative specification is the ORU model, in which years of schooling are decomposed into required, surplus and deficit years of schooling in relation to those required to do the job. This

4. Empirical results

We report the results by country and, to obtain a more general view, for Europe as a whole. All the estimates control for personal characteristics (completed education, labour market experience and squared labour market experience, unemployment experience, marital status, immigrant status and health status), and job characteristics (job tenure and industry). In Tables 3 and 4, we report the OLS and QR estimation results. For the sake of comparison, all the results from the QR estimations are plotted in Figure 1.

4.1 Average estimates

In the first row of tables, we report the results of a simple OLS estimation. Amongst all employees in Europe, the mismatched earned, on average, 9.4% less than their well-matched counterparts in 1994 and 14.6% less in 2001. Therefore the mismatch has a negative effect on wages that increases over time. By country, we observe that all countries (with the exception of France and Spain) suffered a pay-penalty in 1994, ranging from 5.4% in Austria to 14.9% in Portugal. In 2001, Belgium was the only country that did not exhibit the negative effect of being skill mismatched. The pay-penalty ranges from 5% in France to 14.5% in Ireland. However, this trend is not shared by all countries. In terms of percentage points, France and Ireland show the largest increase in the pay-penalty (around 5 p.p.), while Belgium shows the largest decrease (around 7 p.p.).

---------- Insert Tables 3 and 4 about here -------

If we consider only those workers that possess tertiary education, the results change. On average in Europe in 1994, the pay-penalty was 7.7%, decreasing to 5.1% in 2001. By country, in 1994[10], the effect of being skill mismatched appears to be negative only in Denmark, Finland, Germany and Spain. In 2001 the negative effect appears in Austria, Denmark, Germany, Spain and Portugal.

Therefore, the first implication of this analysis is that pay-penalty affects both education groups, but has a greater effect on skill-mismatched workers with less than tertiary education. Furthermore, while the pay-penalty decreases over time among high educated workers, pay-penalty among less educated workers increases. Although not presented here[11], the estimations for low educated workers show that, on average, the pay-penalty was about 15% in Europe in 1994, with a minimum of 5.5% in Germany and a maximum of 23.8% in Portugal. In 2001 the average pay-penalty increased to 22% in Europe with a minimum of 5.8% in Denmark and a maximum of 17% in Portugal.

4.2 Quantile estimates

approach, however, is not open to us, as the ECHP does not contain sufficiently detailed information on occupational categories and years of schooling.

[10] It is important to note that countries like Austria, Italy and Portugal have a low proportion of workers with tertiary education; therefore the estimation results are less reliable. This is a phenomenon we observe not only in 1994, but also in 2001.

[11] Estimation results for the group of skill-mismatched workers with less than tertiary education are available upon request from the authors.

The previous analysis is confined to changes in average wage differentials. The main advantage of QR techniques is that we can identify different effects of skill mismatch along wage distribution. We perform some global and pair-wise tests to determine if the effect of any two different quantiles are significantly different from zero. All the test results are reported in Tables 5 and 6.

---------- Insert Tables 5 and 6 about here -------

In the QR framework, the estimates at different quantiles represent the effects of a given covariate for individuals that have the same observable characteristics but which are located at different quantiles of the conditional distribution due to unobservable earnings capacity,. Therefore, workers who end up in high-paying jobs (located at the upper end of the wage distribution) are, arguably, those who have higher abilities. By higher abilities we refer to the marketable skills, academic credentials and motivations that allow a worker to earn a higher wage given a vector of observable characteristics. By segmenting the labour market into ability deciles, the estimates at different quantiles provide evidence of how mismatched individuals within the different ability groups are impacted[12].

When there are no differences among quantiles, the OLS estimated coefficient is sufficiently informative. In contrast, if there are differences among quantiles, the trend is downward (upward) whenever the upper quantiles are less (more) affected by pay-penalty.

One hypothesis argues that mismatches are due to a lack of skills that position the worker at the bottom of the distribution. If there is a downward trend, it could confirm this hypothesis. If skill mismatches were simply a consequence of low ability and the lack of marketable skills, then the effect of mismatched skills should be restricted to the lower segments of the earnings distribution. In turn, we find that individuals with high unobservable earnings capacity are exposed to significant wage losses if they end up in jobs for which they lack the necessary skills.

We start by analyzing the whole sample of mismatched workers independently of their level of education. We observe that, in Europe, high ability workers suffer less pay-penalty than low ability ones. We plot the trend in Figure 1 for both years. We observe that when moving from the bottom to the upper quantile, the pay-penalty of skill mismatches decreased from 12.1% to 9.6% in Europe in 1994. In 2001, however, the pay-penalty decreased from 17.7 % to 11.0%. Almost all quantiles suffered more pay-penalty in 2001 than in 1994, while the trend corresponding to 2001 is steeper than the one of 1994[13]. Therefore, our first finding is that the pay-penalty from being skill mismatched affects individuals differently along the wage distribution.

[12] A distinct feature of our analysis is that we do not use test scores or degree classification to proxy for ability. Rather, we use a broad definition of ability, including all those unmeasured characteristics that actually affect the worker's position in the wage distribution.

[13] We have tested the hypothesis that all quantiles suffer more pay-penalty in 2001 than in 1994. This is true for almost all quantiles except for Q10, Q70 and Q90. We have also tested whether the trend in 2001 is steeper than the one in 1994, being unable to reject it.

---------- Insert Figure 1 about here -------

By country, we find that, in 1994, being skill mismatched implies different effects along the wage distribution only in Italy, Spain and Finland. In particular, workers at the top of the distribution suffer more pay-penalty than the ones at the bottom[14]. In the rest of the countries, the OLS estimation gives us all the information we need to quantify the pay-penalty. In 2001, however we find two types of asymmetries on the effect of being skill mismatched. On the one hand, we find that the pay-penalty is larger at the top of the distribution than at the bottom of the distribution in Italy, Portugal and the UK. On the other hand, the opposite occurs in Denmark and France, meaning that the top quantiles are less affected by pay-penalty than the bottom quantiles. For the rest of the countries, the pay-penalty affected the wage distribution symmetrically in 2001. To sum up, we observe some changes in the type of asymmetries of the effect of being skill mismatched by country. In Denmark, France, Portugal and the UK the pay-penalty evolved from a symmetric effect along the distribution of wages to an asymmetric effect. In Italy, the asymmetry holds over time, while in Spain the asymmetry observed in 1994 no longer exists in 2001. Since there are no asymmetries for the rest of countries in any of the years under consideration, we only can compare the magnitude of the pay-penalty. We find that skill-mismatched workers in Austria, Greece and Ireland suffered a greater pay-penalty in 2001 than in 1994, while skill-mismatched workers in Belgium and Germany suffered less.

To sum up, the results we have found without differentiating by level of education are as follows. First, asymmetries are observed when considering Europe as a whole. In both years, high ability workers suffer less pay-penalty from being skill mismatched than low ability workers. This is not the case when analyzing country by country. Secondly, when considering country by country, we find that although there are asymmetries, they do not occur in all countries. However, more countries show such asymmetries in 2001 than in 1994. Among the countries showing asymmetries in any year, the upper quantiles suffer less pay-penalty than those at the bottom of the distribution only in Denmark and France.

By level of education in Europe, the pay-penalty corresponding to workers with tertiary education also displays a downward trend in both years, although we cannot state that the pay-penalty is larger for all quantiles in 2001 as it was for the whole sample[15]. The upper quantiles do not display effects that are significantly different from zero. Again, when moving from the lower to the upper quantile, the pay-penalty for high educated workers moved from 16.3% to no effect, while for low educated workers the pay-penalty decreased from 23.9% to 14% in 1994. In 2001, the effect is fairly similar, going from 6.9% to a null effect in the case of tertiary educated workers, and from 34% to 14.7% for less than tertiary educated workers.

In both years, the pay-penalty due to being skill mismatched is larger in the case of workers with less than tertiary education than in the case of workers with tertiary education, and even more in

[14] The results only refer to those quantiles that are statistically significant at the 5% significance level.

[15] We tested the hypothesis that all quantiles suffer more pay-penalty in 2001 than in 1994. This is not true, except for Q10.

2001. We also find that the bottom quantiles are worse off than the top quantiles, especially when considering low educated workers. Although not reported here, we calculate the ratio of pay-penalty for workers with tertiary education to less than tertiary education. We find that, in 2001, all the skill-mismatched workers with tertiary education along the wage distribution were relatively better off in terms of pay-penalty than skill-mismatched workers with less than tertiary education. Although the pay-penalty increased for all types of workers, the increase was more severe for low educated workers[16].

To sum up, when considering Europe as a whole, we cannot conclude that the effects among skill-mismatched workers with tertiary education differ from the effects among less educated workers, apart from the magnitude of the pay-penalty. High educated workers suffer less pay-penalty than low educated ones and this effect is more prominent in 2001. For both levels of education, the upper tail of the distribution suffers less pay-penalty than the bottom tail.

When controlling for level of education by country, we find differences in the effect of being skill mismatched along the wage distribution. In 1994, the pattern of pay-penalty concerning high educated workers was different from the pattern of low educated workers in Belgium, France, Ireland, Spain and Portugal. In 2001, all countries except France, Finland and Germany showed such differences.

In 1994, when both levels of education show the same type of trend it is due to a lack of asymmetries. Among countries with different pay-penalty trends, the group of high educated workers in France, Ireland and Portugal share a symmetrical pay-penalty pattern. However, within the group of low educated workers, the upper quantiles suffer more pay-penalty in Ireland and Portugal and less in France. In Belgium, the opposite case arises, in the sense that there are symmetric effects along the wage distribution within the group of low educated workers, but an asymmetric effect of being skill mismatched, with the top quantiles being more affected than the bottom quantiles. Spain is the only country in which both levels of education present an asymmetric effect of being skill mismatched. High educated workers with lower ability are more penalized in terms of wages from being skill mismatched, while among low educated workers, the lower ability ones are less penalized. To sum up, when there is a different effect by level of education in 1994, the pay-penalty is asymmetric and consists of the upper quantiles suffering more pay-penalty, except for the low educated in France and the high educated in Spain.

In 2001 almost all countries present a different effect on wages when controlling for education. Although no differences are found among levels of education solely in Finland, France and Germany, there do exist asymmetries.

This is the case of Finland and Germany, but not the case of France, where both levels of education present an asymmetric pay-penalty, consisting of upper quantiles suffering less pay-penalty.

[16] We have tested the hypothesis that there has been an increase in pay-penalty for all workers, which is larger for low educated ones. We reject the null hypothesis.

In countries where we find different patterns between levels of education, we can distinguish two groups. The first group comprises Austria, Greece, Spain and Portugal. In these three countries, the pay-penalty affects the conditional distribution of income equally among tertiary educated workers, but has a different effect among less educated workers. In particular, the upper quantiles are less penalized, with the exception of Portugal where the upper quantiles are more penalized. The second group includes Belgium, Ireland, Italy and the UK. In these four countries, the pay-penalty is symmetric among low educated workers along the wages distribution, ,while the pay-penalty is found to be asymmetric among high educated workers in which the top quantiles are less penalized.. The UK is the exception, where the opposite case holds. The case of Denmark is different from the others since both levels of education present opposite trends, in the sense that high educated workers with high ability and low educated workers with low ability are the least penalized from being skill mismatched. To sum up, in 2001, when the pay-penalty of skill mismatch differs along the conditional distribution, the upper quantiles suffer less pay-penalty, except for high educated workers in the UK and low educated workers in Denmark and Portugal.

In terms of the evolution of asymmetries and differences among levels of education, Finland and Germany are the only countries with no changes or differences between years and levels of education.. For the case of Portugal, differences are only observed between the high and the low educated, but they do not change over time. In one group of countries, only one level of education presents the same trends over time, but not the other one. This is the case of Austria, Belgium, France, Greece, Italy and the UK. Austria and Greece are the only countries in which the pay-penalty does not show any asymmetries among high educated workers. However, the low educated workers evolve from a symmetric pay-penalty to an asymmetric one, where top quantiles are less penalized. In Belgium, France, Italy and the UK, the effects among workers with less than tertiary education are constant overtime (with symmetric pay-penalty in all of them with the exception of France) and changes are driven by workers with tertiary education that end up showing an asymmetric effect in 2001 (the top quantiles are less penalized) in all of the countries except the UK. Finally, there are changes over time and differences between levels of education in Denmark, Ireland and Spain.

The main findings in this section can be summarized as follows. First, Europe shows an asymmetric pay-penalty, i.e. the top quantiles are more penalized. This asymmetry is also found for each type of education. Second, by countries, there are asymmetries in the pay-penalty; which changes in type. In 1994, there are no asymmetries in almost all cases. When they do exist it turns out that the top quantiles are more penalized in terms of wages than the bottom quantiles. In 2001, there are more countries with asymmetries, most of which consist of top quantiles that are less penalized, with the exception of Denmark and France. Third, in 1994, when the effect of skill mismatch differs by level of education along the conditional distribution, the upper quantiles suffer more pay-penalty except for the low educated in France and the high educated in Spain. In 2001, when the effect of skill mismatch differs along the conditional distribution (which occurs in a large number of countries), the upper quantiles suffer less pay-penalty. This is true except for the case of high educated workers in the UK

and low educated workers in Denmark and Portugal. Finally, there are no clear results over time: in some countries there are no changes among high educated workers, in others there are no changes among low educated workers, and in yet others there are changes in both types of workers or none.

Inequality implications

In related literature, such as Machin (1996), Green, McIntosh & Vignoles (1999), Fersterer & Winter-Ebmer (2003) and Pereira & Martins (2004), it has been suggested that educational mismatches may account for the positive association between higher education and within-group dispersion found in the data. A situation where a proportion of high-educated individuals take unskilled, low-paying jobs would be consistent with having increasing returns to higher education over the wage distribution. Budría (2006) finds that returns among matched workers also exhibit a substantial amount of dispersion. For instance, the return to a tertiary level earned by the adequately-educated clearly grows over the wage distribution; increasing from 32.9% to 52.2% among men and from 48.2% to 58.8% among women. This variation is somewhat lower than for the total sample but still large enough to conclude that the positive association between tertiary education and within-group earnings dispersion hinges, at least in Spain, on factors other than educational mismatches.

In the present paper, our focus is different. We analyze the impact of the pay-penalty from being skill mismatched on between-group and within-group inequality. We consider the OLS estimates to consider between-group inequality[17]. In Europe, the pay-penalty is larger for low educated workers than it is for high educated workers, thus increasing between-group inequality. By country, there is a high level of heterogeneity. While inequality between groups increased in 1994 since low educated workers suffered a higher pay-penalty in France, Italy, Portugal and UK, the same thing occurred in Greece, France, Ireland, Italy and UK in 2001.

The QR estimates permit us to talk about within-group inequality. In Europe, we have found that there is an asymmetric pay-penalty consisting of a lower pay-penalty at the top of the distribution for any level of education and year. This effect increases within-group inequality. By countries, we find that the asymmetric pay-penalty increased within-group inequality in 1994 only in Spain and France for low and high educated workers, respectively. In this same year, within-group inequality was reduced by means of the asymmetries in the pay-penalty for high educated workers in Belgium. In contrast, the pay-penalty was reduced for low educated workers in Ireland, Spain and Portugal.. No effect on within-group inequality was found for the rest of the countries..

In 2001, there were more countries in which the asymmetric pay-penalty did not reduce within-group inequality. This occurred for high educated workers in Belgium, Denmark, France, Ireland and Italy. The pay-penalty was found to reduce inequality among high educated workers only in the UK. For the case of low educated workers, the skill mismatch effect on wages increased within-group inequality in

[17] For the implications in terms of inequality, see the OLS estimates in Tables 3, 3a, 3b, 4, 4a, 4b.

France, Greece, Spain and Austria. The pay-penalty only shows a positive effect on within-group inequality in Denmark and Portugal, with no effect found on within-group inequality for the rest of countries.

5. Conclusions

Our results indicate that, in general, the wage effects of skill mismatches cannot be well described in an average sense, as these effects show variations across individuals having the same observable characteristics, but which are located at different quantiles of the earnings distribution. There are several factors that can potentially account for this observation. In this paper we focus our analysis on the existence of unobserved ability. In the quantile regression framework, the estimates at different quantiles represent the effects of a given covariate for individuals that have the same observable characteristics but, due to unobservable earnings capacity, are located at different quantiles of the conditional distribution. Therefore, workers who end up in high-paying jobs (located at the upper end of the wage distribution) are, arguably, those who have more productive abilities. By productive abilities we mean marketable skills, academic credentials, motivations, etc., that allow a worker to earn a higher wage given a vector of observable characteristics. By segmenting the labour market into ability deciles, with individual ability indexed by the individual's position in the conditional wage distribution, the estimates at different quantiles provide snap-shots of how mismatched individuals within the different ability groups are impacted.

Interestingly, we find that skill mismatches reduce wages amongst all ability groups. If skill mismatches were simply a consequence of low ability and the lack of marketable skills, then their influence should be restricted to the lower segments of the earnings distribution. In turn, we find that individuals with high unobservable earnings capacity are exposed to significant wage losses if they end up in jobs for which they lack the necessary skills. Indeed, the pay-penalty of skill mismatches is larger in several countries precisely among workers in the upper range of the ability distribution. Our main interpretation is that educational mismatches are the result of real inefficiencies in which the workers productivity potential is constrained by their job class.

In terms of inequality, pay-penalty increases inequality between groups in Europe as a whole. However there is a high degree of heterogeneity by country. While inequality between groups increased in France, Italy, Portugal and UK in 1994, inequality increased in Greece, France, Ireland, Italy and the UK in 2001. In terms of within-group inequality, we have found an increase in within-group inequality in Europe. By countries, we find that the asymmetric pay-penalty increased within-group inequality in 1994 only in Spain and France for low and high educated workers, respectively. In 2001, there were more countries in which the asymmetric pay-penalty did not reduce within-group inequality.

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Tables

Table 1. The incidence of skills mismatches, by country and year

1994	Europe	Austria	Belgium	Denmark	Finland	France	Germany	Greece	Ireland	Italy	Portugal	Spain	UK
Tertiary	0,226	0,052	0,349	0,322	0,302	0,185	0,215	0,213	0,205	0,062	0,039	0,203	0,404
Secondary	0,398	0,811	0,358	0,489	0,477	0,488	0,592	0,315	0,392	0,381	0,098	0,179	0,152
Skill mismatch	0,438	0,370	0,410	0,372	0,281	0,544	0,311	0,285	0,450	0,740	0,800	0,504	0,324
Tertiary	0,092	0,028	0,166	0,197	0,084	0,113	0,055	0,106	0,051	0,042	0,004	0,080	0,209
Secondary	0,336	0,647	0,386	0,429	0,430	0,446	0,520	0,337	0,322	0,303	0,054	0,146	0,155
N. Obs.	15204	1072	854	940	886	1558	1881	926	911	1677	1140	2046	1313

2001	Europe	Austria	Belgium	Denmark	Finland	France	Germany	Greece	Ireland	Italy	Portugal	Spain	UK
Tertiary	0,295	0,061	0,419	0,290	0,263	0,273	0,276	0,177	0,205	0,090	0,078	0,267	0,528
Secondary	0,361	0,844	0,343	0,581	0,585	0,082	0,591	0,411	0,414	0,443	0,125	0,218	0,236
Skill mismatch	0,417	0,303	0,303	0,301	0,311	0,513	0,234	0,717	0,395	0,737	0,725	0,516	0,319
Tertiary	0,138	0,017	0,110	0,126	0,144	0,176	0,054	0,097	0,069	0,065	0,012	0,110	0,372
Secondary	0,325	0,729	0,477	0,571	0,511	0,081	0,588	0,375	0,339	0,383	0,084	0,202	0,363
N. Obs.	11812	755	568	582	289	1130	1579	789	440	1238	1442	1678	1322

Table 2. Descriptive statistics - Pooled sample of skill mismatched workers.

Variables	Total Sample		Tertiary Education		Less than tertiary Education	
	1994	2001	1994	2001	1994	2001
Ln hours	3,743	3,729	3,789	3,764	3,738	3,723
Supervisor	0,094	0,102	0,316	0,259	0,072	0,077
Training	0,119	0,080	0,198	0,092	0,111	0,078
Experience	22,17	19,89	17,50	12,27	22,64	21,11
Tenure <5	0,396	0,505	0,520	0,675	0,384	0,478
5≤Tenure<10	0,190	0,156	0,224	0,152	0,186	0,156
Tenure ≥10	0,094	0,220	0,072	0,131	0,096	0,234
Married	0,743	0,651	0,679	0,553	0,750	0,667
Immigrant	0,043	0,027	0,050	0,026	0,042	0,027
Permanent	0,026	0,861	0,012	0,917	0,027	0,852
Employees<20	0,369	0,344	0,337	0,266	0,372	0,357
20≤Employees<100	0,333	0,289	0,280	0,250	0,338	0,295
100≤Employees<500	0,166	0,120	0,176	0,115	0,164	0,120
Employees≥500	0,112	0,083	0,181	0,160	0,104	0,071
Badhealth	0,061	0,041	0,044	0,020	0,063	0,045
Unemployment Experience	0,380	0,341	0,347	0,187	0,384	0,368
Legislator, senior officials and managers	0,052	0,056	0,229	0,175	0,035	0,037
Professionals	0,024	0,042	0,191	0,202	0,007	0,017
Technicians and associate professionals	0,071	0,089	0,158	0,202	0,062	0,071
Clerks	0,088	0,088	0,096	0,085	0,087	0,089
Service workers and shop and market sales worker	0,067	0,082	0,060	0,072	0,067	0,084
Skilled agricultural and fishery workers	0,006	0,002	0,000	0,001	0,006	0,002
Craft and related trades workers	0,330	0,291	0,139	0,125	0,349	0,318
Plant and machine operators and assemblers	0,221	0,228	0,079	0,106	0,235	0,248
Elementary occupations.	0,142	0,120	0,047	0,032	0,151	0,134

Table 3. The skills mismatch effect at different segments of the wage distribution in 1994

	EUROPE	AUSTRIA	BELGIUM	DENMARK	FINLAND	FRANCE	GERMANY	GREECE	IRELAND	ITALY	PORTUGAL	SPAIN	UK
OLS	-0.094***	-0.054*	-0.063**	-0.081***	-0.109***	0.025	-0.094***	-0.088***	-0.091***	-0.075***	-0.149***	-0.036	-0.077***
	[0.008]	[0.030]	[0.026]	[0.025]	[0.027]	[0.026]	[0.023]	[0.033]	[0.029]	[0.026]	[0.051]	[0.023]	[0.026]
Q10	-0.121***	-0.023	-0.050	-0.116**	-0.103***	-0.048	-0.060	-0.108	-0.085	-0.021	-0.044	0.000	-0.080
	[0.015]	[0.039]	[0.058]	[0.048]	[0.030]	[0.042]	[0.037]	[0.066]	[0.058]	[0.048]	[0.083]	[0.042]	[0.050]
Q20	-0.106***	-0.081***	-0.096**	-0.071**	-0.103***	-0.002	-0.065**	-0.073	-0.109**	-0.039	-0.124	-0.010	-0.113***
	[0.011]	[0.029]	[0.046]	[0.034]	[0.030]	[0.024]	[0.032]	[0.054]	[0.046]	[0.028]	[0.076]	[0.031]	[0.035]
Q25	-0.100***	-0.068**	-0.090**	-0.059*	-0.091***	-0.016	-0.075***	-0.116**	-0.100**	-0.038	-0.145**	-0.023	-0.102***
	[0.013]	[0.031]	[0.038]	[0.030]	[0.030]	[0.025]	[0.027]	[0.047]	[0.045]	[0.025]	[0.058]	[0.028]	[0.032]
Q30	-0.083***	-0.065**	-0.099***	-0.079***	-0.130***	-0.011	-0.085***	-0.126***	-0.084*	-0.035	-0.157***	-0.004	-0.105***
	[0.010]	[0.032]	[0.037]	[0.026]	[0.032]	[0.025]	[0.022]	[0.043]	[0.043]	[0.025]	[0.056]	[0.025]	[0.029]
Q40	-0.087***	-0.077**	-0.080**	-0.069**	-0.112***	0.010	-0.079***	-0.083**	-0.069*	-0.048**	-0.145***	-0.015	-0.102***
	[0.008]	[0.032]	[0.033]	[0.028]	[0.036]	[0.025]	[0.025]	[0.038]	[0.039]	[0.024]	[0.055]	[0.025]	[0.029]
Q50	-0.079***	-0.084***	-0.081**	-0.064**	-0.111***	0.010	-0.063**	-0.069*	-0.067*	-0.036	-0.155***	-0.015	-0.074***
	[0.010]	[0.032]	[0.034]	[0.028]	[0.030]	[0.026]	[0.026]	[0.040]	[0.036]	[0.034]	[0.056]	[0.029]	[0.022]
Q60	-0.081***	-0.078**	-0.047	-0.053**	-0.099***	0.004	-0.073***	-0.071**	-0.085**	-0.073**	-0.102	-0.030	-0.065**
	[0.007]	[0.033]	[0.034]	[0.027]	[0.028]	[0.028]	[0.024]	[0.033]	[0.039]	[0.034]	[0.066]	[0.029]	[0.026]
Q70	-0.084***	-0.062*	-0.061*	-0.058**	-0.087***	0.035	-0.085***	-0.085**	-0.088**	-0.069***	-0.145*	-0.016	-0.091***
	[0.009]	[0.036]	[0.032]	[0.028]	[0.029]	[0.031]	[0.024]	[0.042]	[0.040]	[0.025]	[0.082]	[0.029]	[0.032]
Q75	-0.086***	-0.066*	-0.061*	-0.056*	-0.094***	0.031	-0.096***	-0.078*	-0.114***	-0.056	-0.138	-0.036	-0.091***
	[0.008]	[0.040]	[0.033]	[0.030]	[0.029]	[0.034]	[0.024]	[0.046]	[0.038]	[0.037]	[0.090]	[0.032]	[0.035]
Q80	-0.085***	-0.066	-0.054	-0.025	-0.087**	0.003	-0.082***	-0.083*	-0.123***	-0.096**	-0.172*	-0.067*	-0.072*
	[0.010]	[0.041]	[0.035]	[0.033]	[0.037]	[0.045]	[0.028]	[0.045]	[0.042]	[0.039]	[0.095]	[0.038]	[0.038]
Q90	-0.096***	-0.072	-0.094*	-0.016	-0.079	0.028	-0.090**	-0.133***	-0.103**	-0.082	-0.234*	-0.086**	-0.054
	[0.014]	[0.070]	[0.048]	[0.042]	[0.064]	[0.068]	[0.035]	[0.051]	[0.045]	[0.054]	[0.126]	[0.037]	[0.053]
No. of obs.	12472	654	493	719	609	1063	1251	632	638	878	684	1256	1172

Notes: i) * signals significant at the 10% level, ** signals significant at the 5% level, and *** signals significant at the 1% level; ii) standard errors are in brackets iii) OLS estimates are heteroskedastic-robust; iv) standard errors of quantile estimates have been calculated using a bootstrap method of 500 replications; v) All results are controlling for year-specific effects; vi) The results for 'Europe' are controlling for country-specific effects.

Table 3a. The skills mismatch effect at different segments of the wage distribution in 1994 (tertiary education)

	EUROPE	AUSTRIA	BELGIUM	DENMARK	FINLAND	FRANCE	GERMANY	GREECE	IRELAND	ITALY	PORTUGAL	SPAIN	UK
OLS	-0.077***	-0.111	-0.080	-0.159***	-0.143*	0.042	-0.327***	-0.109	-0.130	0.002	0.297**	-0.165**	-0.035
	[0.023]	[0.088]	[0.048]	[0.050]	[0.079]	[0.080]	[0.111]	[0.132]	[0.106]	[0.073]	[0.120]	[0.067]	[0.058]
Q10	-0.163***	0.053	0.041	-0.195	-0.160**	-0.084	-0.280	-0.126	-0.306	0.041	0.627	-0.352**	-0.106
	[0.036]	[0.245]	[0.099]	[0.132]	[0.072]	[0.122]	[0.432]	[0.134]	[0.186]	[0.091]	[0.363]	[0.152]	[0.111]
Q20	-0.116***	0.003	-0.058	-0.195***	-0.252***	0.038	-0.242**	-0.212**	-0.126	-0.027	0.632*	-0.182	-0.029
	[0.034]	[0.217]	[0.077]	[0.057]	[0.074]	[0.107]	[0.115]	[0.106]	[0.172]	[0.086]	[0.353]	[0.113]	[0.088]
Q25	-0.097***	-0.082	-0.087	-0.196***	-0.182**	-0.037	-0.231**	-0.276**	-0.144	-0.010	0.632*	-0.174*	-0.066
	[0.034]	[0.190]	[0.075]	[0.047]	[0.076]	[0.100]	[0.097]	[0.110]	[0.175]	[0.083]	[0.342]	[0.095]	[0.074]
Q30	-0.090***	-0.046	-0.113	-0.203***	-0.255***	-0.017	-0.267***	-0.259**	-0.235	-0.003	0.632*	-0.129	-0.052
	[0.026]	[0.173]	[0.070]	[0.045]	[0.072]	[0.096]	[0.093]	[0.124]	[0.187]	[0.076]	[0.329]	[0.080]	[0.060]
Q40	-0.079***	-0.150	-0.168**	-0.198***	-0.227**	-0.035	-0.206*	-0.113	-0.146	0.001	0.330	-0.159**	-0.039
	[0.028]	[0.167]	[0.072]	[0.044]	[0.098]	[0.092]	[0.108]	[0.140]	[0.186]	[0.080]	[0.291]	[0.078]	[0.063]
Q50	-0.074***	-0.160	-0.126	-0.190***	-0.233**	-0.030	-0.195*	-0.182	-0.072	-0.042	0.238	-0.190**	-0.084*
	[0.028]	[0.169]	[0.082]	[0.051]	[0.109]	[0.112]	[0.112]	[0.145]	[0.191]	[0.088]	[0.277]	[0.086]	[0.045]
Q60	-0.076***	-0.059	-0.094	-0.166**	-0.189	-0.011	-0.247**	-0.200	-0.062	-0.077	0.141	-0.149	-0.100**
	[0.022]	[0.178]	[0.087]	[0.083]	[0.128]	[0.113]	[0.102]	[0.136]	[0.184]	[0.104]	[0.273]	[0.100]	[0.050]
Q70	-0.069***	-0.052	-0.103	-0.081	-0.072	-0.025	-0.264***	-0.236	-0.027	-0.011	0.074	-0.048	-0.084
	[0.022]	[0.185]	[0.089]	[0.083]	[0.129]	[0.111]	[0.093]	[0.166]	[0.147]	[0.121]	[0.254]	[0.096]	[0.059]
Q75	-0.068***	-0.054	-0.034	-0.095	-0.083	0.020	-0.184**	-0.253	-0.002	-0.042	0.043	-0.077	-0.064
	[0.022]	[0.230]	[0.088]	[0.083]	[0.148]	[0.117]	[0.090]	[0.221]	[0.127]	[0.120]	[0.247]	[0.088]	[0.081]
Q80	-0.070**	-0.040	-0.055	-0.135	-0.137	0.097	-0.231**	-0.256	0.007	0.058	0.042	-0.121	0.030
	[0.029]	[0.271]	[0.072]	[0.086]	[0.148]	[0.116]	[0.092]	[0.307]	[0.124]	[0.139]	[0.240]	[0.093]	[0.108]
Q90	-0.003	-0.526	-0.140**	-0.089	-0.018	0.141	-0.201	0.254	0.010	-0.131	0.042	-0.167	0.077
	[0.042]	[0.370]	[0.069]	[0.123]	[0.120]	[0.147]	[0.146]	[0.448]	[0.105]	[0.168]	[0.236]	[0.111]	[0.098]
No. of obs.	3153	46	186	242	216	219	290	151	146	60	26	287	497

Notes: i) * signals significant at the 10% level, ** signals significant at the 5% level, and *** signals significant at the 1% level; ii) standard errors are in brackets; iii) OLS estimates are heteroskedastic-robust; iv) standard errors of quantile estimates have been calculated using a bootstrap method of 500 replications; v) All results are controlling for year-specific effects; vi) The results for 'Europe' are controlling for country-specific effects.

Table 3b. The skills mismatch effect at different segments of the wage distribution in 1994 (not tertiary education)

	EUROPE	AUSTRIA	BELGIUM	DENMARK	FINLAND	FRANCE	GERMANY	GREECE	IRELAND	ITALY	PORTUGAL	SPAIN	UK
OLS	-0.149***	-0.067**	-0.077**	-0.068***	-0.104***	0.002	-0.055***	-0.091***	-0.116***	-0.138***	-0.238***	-0.027	-0.108***
	[0.008]	[0.029]	[0.031]	[0.025]	[0.026]	[0.026]	[0.021]	[0.031]	[0.029]	[0.027]	[0.052]	[0.024]	[0.028]
Q10	-0.239***	-0.055	-0.167**	-0.093**	-0.072**	-0.032	-0.040	-0.099	-0.106**	-0.080	-0.063	0.026	-0.073
	[0.020]	[0.051]	[0.080]	[0.045]	[0.035]	[0.043]	[0.043]	[0.067]	[0.054]	[0.054]	[0.091]	[0.039]	[0.048]
Q20	-0.164***	-0.094***	-0.117*	-0.033	-0.063**	-0.034	-0.023	-0.073	-0.099***	-0.085**	-0.197***	0.002	-0.106**
	[0.014]	[0.031]	[0.060]	[0.033]	[0.030]	[0.021]	[0.039]	[0.049]	[0.038]	[0.035]	[0.055]	[0.038]	[0.041]
Q25	-0.155***	-0.083***	-0.093	-0.021	-0.085***	-0.021	-0.031	-0.072	-0.116***	-0.072**	-0.167***	-0.014	-0.111***
	[0.011]	[0.030]	[0.057]	[0.029]	[0.030]	[0.024]	[0.035]	[0.046]	[0.040]	[0.034]	[0.055]	[0.031]	[0.036]
Q30	-0.148***	-0.074**	-0.097*	-0.028	-0.089***	-0.006	-0.057*	-0.084**	-0.100**	-0.095***	-0.183***	-0.007	-0.112***
	[0.011]	[0.029]	[0.049]	[0.029]	[0.031]	[0.029]	[0.034]	[0.042]	[0.040]	[0.030]	[0.056]	[0.023]	[0.034]
Q40	-0.132***	-0.092***	-0.077**	-0.037	-0.099***	-0.010	-0.054*	-0.056	-0.089***	-0.100***	-0.186***	-0.014	-0.115***
	[0.010]	[0.028]	[0.039]	[0.026]	[0.030]	[0.026]	[0.030]	[0.036]	[0.034]	[0.021]	[0.058]	[0.025]	[0.034]
Q50	-0.124***	-0.074**	-0.072**	-0.046*	-0.093***	0.013	-0.045*	-0.048	-0.108***	-0.103***	-0.189***	-0.056**	-0.080**
	[0.008]	[0.030]	[0.035]	[0.025]	[0.032]	[0.029]	[0.024]	[0.031]	[0.031]	[0.025]	[0.067]	[0.026]	[0.036]
Q60	-0.113***	-0.073***	-0.072**	-0.050**	-0.094***	0.021	-0.036	-0.083***	-0.090***	-0.108***	-0.255***	-0.037	-0.085***
	[0.009]	[0.027]	[0.036]	[0.024]	[0.031]	[0.028]	[0.024]	[0.032]	[0.034]	[0.028]	[0.061]	[0.024]	[0.033]
Q70	-0.111***	-0.065*	-0.087**	-0.062**	-0.079**	-0.013	-0.059**	-0.105***	-0.148***	-0.127***	-0.247***	-0.011	-0.093***
	[0.010]	[0.034]	[0.041]	[0.029]	[0.037]	[0.037]	[0.026]	[0.032]	[0.042]	[0.031]	[0.074]	[0.031]	[0.029]
Q75	-0.121***	-0.083**	-0.092**	-0.077**	-0.101***	-0.006	-0.063**	-0.082**	-0.146***	-0.119***	-0.234**	-0.043	-0.089**
	[0.009]	[0.041]	[0.042]	[0.033]	[0.036]	[0.043]	[0.024]	[0.037]	[0.040]	[0.033]	[0.096]	[0.031]	[0.036]
Q80	-0.121***	-0.086*	-0.091*	-0.089**	-0.110***	0.001	-0.072***	-0.087**	-0.191***	-0.128***	-0.349***	-0.056*	-0.134***
	[0.011]	[0.045]	[0.047]	[0.036]	[0.041]	[0.048]	[0.027]	[0.039]	[0.043]	[0.042]	[0.120]	[0.031]	[0.042]
Q90	-0.140***	-0.159**	-0.099*	-0.075	-0.080	-0.058	-0.093***	-0.143**	-0.125**	-0.162**	-0.439***	-0.073	-0.128**
	[0.014]	[0.077]	[0.057]	[0.047]	[0.060]	[0.063]	[0.032]	[0.064]	[0.054]	[0.070]	[0.112]	[0.050]	[0.057]
No. of obs.	9319	608	307	477	393	844	961	481	492	818	658	969	675

Notes: i) * signals significant at the 10% level, ** signals significant at the 5% level, and *** signals significant at the 1% level; ii) standard errors are in brackets; iii) OLS estimates are heteroskedastic-robust; iv) standard errors of quantile estimates have been calculated using a bootstrap method of 500 replications; v) All results are controlling for year-specific effects; vi) The results for 'Europe' are controlling for country-specific effects.

Table 4. The skills mismatch effect at different segments of the wage distribution in 2001

	EUROPE	AUSTRIA	BELGIUM	DENMARK	FINLAND	FRANCE	GERMANY	GREECE	IRELAND	ITALY	PORTUGAL	SPAIN	UK
OLS	-0.146***	-0.112***	0.003	-0.059**	-0.080*	-0.050*	-0.077***	-0.093***	-0.145***	-0.066***	-0.137***	-0.071***	-0.071***
	[0.008]	[0.025]	[0.030]	[0.024]	[0.043]	[0.029]	[0.023]	[0.032]	[0.035]	[0.022]	[0.025]	[0.020]	[0.025]
Q10	-0.177***	-0.116**	-0.024	-0.104**	-0.077	-0.099**	-0.038	-0.076*	-0.148**	-0.072*	-0.087***	-0.091***	-0.024
	[0.015]	[0.048]	[0.056]	[0.042]	[0.066]	[0.045]	[0.050]	[0.045]	[0.064]	[0.037]	[0.033]	[0.031]	[0.023]
Q20	-0.184***	-0.129***	-0.016	-0.031	-0.096*	-0.098***	-0.048	-0.081**	-0.161***	-0.063**	-0.101***	-0.061***	-0.075***
	[0.013]	[0.031]	[0.047]	[0.038]	[0.057]	[0.035]	[0.035]	[0.032]	[0.056]	[0.025]	[0.028]	[0.022]	[0.022]
Q25	-0.178***	-0.113***	-0.006	-0.014	-0.111*	-0.075**	-0.064*	-0.054	-0.123**	-0.072***	-0.107***	-0.041*	-0.085***
	[0.012]	[0.030]	[0.042]	[0.032]	[0.058]	[0.033]	[0.033]	[0.035]	[0.050]	[0.024]	[0.025]	[0.021]	[0.025]
Q30	-0.164***	-0.104***	0.019	-0.019	-0.123**	-0.100***	-0.044	-0.078**	-0.127***	-0.071***	-0.085***	-0.048**	-0.101***
	[0.010]	[0.025]	[0.038]	[0.028]	[0.056]	[0.033]	[0.030]	[0.036]	[0.046]	[0.020]	[0.023]	[0.020]	[0.028]
Q40	-0.164***	-0.084***	0.006	-0.042**	-0.065	-0.070**	-0.056**	-0.088**	-0.147***	-0.057***	-0.111***	-0.077***	-0.117***
	[0.009]	[0.026]	[0.033]	[0.021]	[0.052]	[0.033]	[0.028]	[0.038]	[0.046]	[0.021]	[0.030]	[0.023]	[0.028]
Q50	-0.154***	-0.116***	0.002	-0.042*	-0.058	-0.071**	-0.058**	-0.094***	-0.145***	-0.056*	-0.101***	-0.077***	-0.101***
	[0.009]	[0.025]	[0.031]	[0.022]	[0.053]	[0.035]	[0.025]	[0.035]	[0.042]	[0.029]	[0.031]	[0.022]	[0.032]
Q60	-0.144***	-0.114***	-0.034	-0.062**	-0.047	-0.075**	-0.068***	-0.122***	-0.155***	-0.078***	-0.150***	-0.075***	-0.070**
	[0.007]	[0.030]	[0.035]	[0.028]	[0.055]	[0.031]	[0.021]	[0.040]	[0.039]	[0.027]	[0.050]	[0.025]	[0.035]
Q70	-0.140***	-0.119***	0.001	-0.076**	-0.015	-0.064*	-0.082***	-0.117***	-0.144***	-0.055*	-0.206***	-0.071**	-0.105***
	[0.009]	[0.031]	[0.038]	[0.032]	[0.056]	[0.034]	[0.027]	[0.041]	[0.045]	[0.030]	[0.042]	[0.030]	[0.029]
Q75	-0.123***	-0.124***	0.011	-0.076**	-0.065	-0.059	-0.075***	-0.104**	-0.176***	-0.056	-0.196***	-0.071**	-0.088**
	[0.009]	[0.031]	[0.043]	[0.038]	[0.064]	[0.038]	[0.029]	[0.045]	[0.060]	[0.038]	[0.035]	[0.031]	[0.035]
Q80	-0.118***	-0.104***	0.015	-0.077**	-0.065	-0.066	-0.076***	-0.127**	-0.187***	-0.104***	-0.152***	-0.061**	-0.063
	[0.008]	[0.032]	[0.051]	[0.039]	[0.073]	[0.052]	[0.029]	[0.052]	[0.069]	[0.038]	[0.038]	[0.030]	[0.045]
Q90	-0.110***	-0.148***	0.065	-0.097**	-0.042	0.048	-0.111***	-0.045	-0.179**	-0.090**	-0.203***	-0.067*	-0.093**
	[0.013]	[0.053]	[0.063]	[0.048]	[0.102]	[0.075]	[0.028]	[0.067]	[0.078]	[0.042]	[0.064]	[0.036]	[0.043]
No. of obs.	12679	543	439	511	244	537	1362	693	358	951	1185	1393	1282

Notes: i) * signals significant at the 10% level, ** signals significant at the 5% level, and *** signals significant at the 1% level; ii) standard errors are in brackets; iii) OLS estimates are heteroskedastic-robust; iv) standard errors of quantile estimates have been calculated using a bootstrap method of 500 replications; v) All results are controlling for year-specific effects; vi) The results for 'Europe' are controlling for country-specific effects.

Table 4a. The skills mismatch effect at different segments of the wage distribution in 2001 (tertiary education)

	EUROPE	AUSTRIA	BELGIUM	DENMARK	FINLAND	FRANCE	GERMANY	GREECE	IRELAND	ITALY	PORTUGAL	SPAIN	UK
OLS	-0.051***	-0.551**	-0.042	-0.115*	-0.127	0.042	-0.227**	-0.071	-0.153	-0.096	-0.505***	-0.132***	-0.042
	[0.019]	[0.215]	[0.080]	[0.063]	[0.159]	[0.079]	[0.105]	[0.085]	[0.117]	[0.063]	[0.121]	[0.047]	[0.043]
Q10	-0.030	-0.352	-0.208	-0.241*	-0.182	-0.008	-0.361	-0.099	-0.219	-0.140*	-0.246	-0.103*	0.044
	[0.037]	[0.942]	[0.155]	[0.133]	[0.142]	[0.114]	[0.326]	[0.097]	[0.196]	[0.084]	[0.247]	[0.059]	[0.048]
Q20	-0.069***	-0.123	-0.135	-0.282*	-0.184	-0.101	-0.007	-0.187*	-0.249	-0.098	-0.457**	-0.100*	-0.054
	[0.020]	[0.847]	[0.161]	[0.152]	[0.142]	[0.074]	[0.241]	[0.102]	[0.172]	[0.075]	[0.178]	[0.057]	[0.036]
Q25	-0.087***	-0.125	-0.161	-0.025	-0.215	-0.105	-0.024	-0.153	-0.280*	-0.073	-0.491***	-0.094*	-0.054
	[0.020]	[0.770]	[0.156]	[0.141]	[0.152]	[0.073]	[0.190]	[0.105]	[0.150]	[0.072]	[0.169]	[0.057]	[0.047]
Q30	-0.081***	-0.190	0.019	-0.033	-0.306*	-0.125	-0.048	-0.101	-0.136	-0.092	-0.540***	-0.101**	-0.078
	[0.019]	[0.593]	[0.147]	[0.123]	[0.156]	[0.077]	[0.158]	[0.101]	[0.152]	[0.065]	[0.163]	[0.051]	[0.050]
Q40	-0.106***	-0.278	-0.028	-0.096	-0.194	-0.105	-0.114	-0.137	-0.146	-0.177**	-0.598***	-0.122**	-0.111***
	[0.022]	[0.532]	[0.116]	[0.080]	[0.151]	[0.077]	[0.110]	[0.095]	[0.165]	[0.069]	[0.181]	[0.048]	[0.041]
Q50	-0.099***	-0.526	0.069	-0.023	-0.165	-0.090	-0.199*	-0.109	-0.178	-0.154*	-0.595***	-0.159***	-0.094
	[0.022]	[0.461]	[0.088]	[0.066]	[0.173]	[0.099]	[0.103]	[0.086]	[0.188]	[0.078]	[0.171]	[0.051]	[0.060]
Q60	-0.087***	-0.714*	0.012	-0.037	-0.129	-0.058	-0.268**	-0.198**	-0.263	-0.168*	-0.675***	-0.172***	-0.037
	[0.023]	[0.418]	[0.092]	[0.057]	[0.204]	[0.124]	[0.114]	[0.083]	[0.210]	[0.092]	[0.199]	[0.062]	[0.066]
Q70	-0.055**	-0.700*	0.026	-0.112*	-0.119	0.049	-0.186	-0.136	0.005	-0.091	-0.664***	-0.180**	-0.063
	[0.024]	[0.404]	[0.096]	[0.062]	[0.267]	[0.158]	[0.118]	[0.101]	[0.230]	[0.106]	[0.205]	[0.075]	[0.067]
Q75	-0.039	-0.659	0.044	-0.109	-0.105	0.150	-0.217*	-0.127	0.038	-0.053	-0.668***	-0.169*	-0.079
	[0.034]	[0.402]	[0.095]	[0.070]	[0.295]	[0.170]	[0.126]	[0.110]	[0.238]	[0.111]	[0.198]	[0.087]	[0.064]
Q80	-0.002	-0.661	0.091	-0.119*	-0.170	0.306*	-0.235*	-0.061	0.076	-0.017	-0.671***	-0.163*	-0.037
	[0.030]	[0.388]	[0.110]	[0.070]	[0.390]	[0.168]	[0.127]	[0.133]	[0.279]	[0.111]	[0.202]	[0.084]	[0.060]
Q90	0.059	-0.656	0.059	-0.092	-0.210	0.248*	-0.237**	0.128	0.213	0.104	-0.602***	-0.224***	0.016
	[0.039]	[0.419]	[0.116]	[0.104]	[0.541]	[0.138]	[0.115]	[0.224]	[0.274]	[0.138]	[0.192]	[0.086]	[0.092]
No. of obs.	3694	37	195	155	68	146	398	124	75	100	97	391	682

Notes: i) * signals significant at the 10% level, ** signals significant at the 5% level, and *** signals significant at the 1% level; ii) standard errors are in brackets; iii) OLS estimates are heteroskedastic-robust; iv) standard errors of quantile estimates have been calculated using a bootstrap method of 500 replications; v) All results are controlling for year-specific effects; vi) The results for 'Europe' are controlling for country-specific effects.

Table 4b. The skills mismatch effect at different segments of the wage distribution in 2001 (not tertiary education)

	EUROPE	AUSTRIA	BELGIUM	DENMARK	FINLAND	FRANCE	GERMANY	GREECE	IRELAND	ITALY	PORTUGAL	SPAIN	UK
OLS	-0.222***	-0.125***	0.015	-0.058**	-0.069	-0.070**	-0.063***	-0.142***	-0.163***	-0.100***	-0.170***	-0.070***	-0.096***
	[0.008]	[0.025]	[0.032]	[0.024]	[0.045]	[0.030]	[0.022]	[0.033]	[0.034]	[0.023]	[0.026]	[0.022]	[0.030]
Q10	-0.340***	-0.154***	-0.057	-0.066	-0.040	-0.104**	-0.021	-0.100*	-0.158***	-0.098***	-0.109***	-0.100***	-0.092**
	[0.015]	[0.041]	[0.065]	[0.044]	[0.100]	[0.047]	[0.051]	[0.059]	[0.051]	[0.035]	[0.036]	[0.037]	[0.044]
Q20	-0.304***	-0.119***	-0.019	-0.043	-0.054	-0.112***	-0.027	-0.104***	-0.146**	-0.102***	-0.136***	-0.065***	-0.096***
	[0.012]	[0.032]	[0.041]	[0.036]	[0.057]	[0.041]	[0.040]	[0.037]	[0.062]	[0.022]	[0.024]	[0.025]	[0.034]
Q25	-0.279***	-0.137***	-0.013	-0.044	-0.048	-0.104***	-0.029	-0.086**	-0.093*	-0.086***	-0.120***	-0.036	-0.090***
	[0.011]	[0.030]	[0.041]	[0.037]	[0.051]	[0.037]	[0.037]	[0.039]	[0.054]	[0.021]	[0.021]	[0.024]	[0.035]
Q30	-0.258***	-0.131***	0.008	-0.039	-0.054	-0.086**	-0.042	-0.070*	-0.105**	-0.077***	-0.125***	-0.027	-0.109***
	[0.010]	[0.031]	[0.037]	[0.033]	[0.047]	[0.035]	[0.033]	[0.039]	[0.048]	[0.022]	[0.024]	[0.029]	[0.034]
Q40	-0.227***	-0.089***	0.005	-0.039*	-0.033	-0.066*	-0.032	-0.142***	-0.141***	-0.083***	-0.113***	-0.062**	-0.101**
	[0.010]	[0.030]	[0.037]	[0.023]	[0.046]	[0.036]	[0.026]	[0.043]	[0.036]	[0.024]	[0.025]	[0.031]	[0.039]
Q50	-0.205***	-0.117***	0.019	-0.045**	-0.039	-0.056	-0.056**	-0.139***	-0.161***	-0.093***	-0.163***	-0.071**	-0.074*
	[0.009]	[0.025]	[0.034]	[0.021]	[0.043]	[0.042]	[0.024]	[0.033]	[0.033]	[0.025]	[0.041]	[0.028]	[0.043]
Q60	-0.187***	-0.116***	0.007	-0.066**	-0.006	-0.059*	-0.061**	-0.143***	-0.172***	-0.095***	-0.231***	-0.075**	-0.083**
	[0.009]	[0.031]	[0.036]	[0.026]	[0.049]	[0.035]	[0.025]	[0.040]	[0.034]	[0.031]	[0.039]	[0.029]	[0.035]
Q70	-0.172***	-0.118***	-0.003	-0.082**	-0.013	-0.065*	-0.085***	-0.194***	-0.172***	-0.113***	-0.229***	-0.080***	-0.100**
	[0.008]	[0.027]	[0.040]	[0.034]	[0.058]	[0.039]	[0.031]	[0.056]	[0.037]	[0.029]	[0.030]	[0.030]	[0.051]
Q75	-0.165***	-0.129***	-0.008	-0.060	-0.049	-0.083**	-0.067**	-0.209***	-0.186***	-0.101***	-0.215***	-0.074**	-0.091*
	[0.010]	[0.030]	[0.047]	[0.041]	[0.065]	[0.039]	[0.030]	[0.053]	[0.038]	[0.031]	[0.030]	[0.032]	[0.054]
Q80	-0.158***	-0.117***	-0.038	-0.121**	-0.064	-0.043	-0.068**	-0.196***	-0.200***	-0.099***	-0.180***	-0.071**	-0.066
	[0.012]	[0.033]	[0.060]	[0.047]	[0.074]	[0.053]	[0.032]	[0.054]	[0.048]	[0.035]	[0.042]	[0.034]	[0.053]
Q90	-0.147***	-0.166***	0.059	-0.119**	-0.173*	0.055	-0.102***	-0.178***	-0.235***	-0.128*	-0.220***	-0.080**	-0.082
	[0.015]	[0.038]	[0.067]	[0.051]	[0.093]	[0.064]	[0.032]	[0.069]	[0.057]	[0.069]	[0.047]	[0.033]	[0.054]
No. of obs.	8985	506	244	356	176	391	964	569	283	851	1088	1002	600

Notes: i) * signals significant at the 10% level, ** signals significant at the 5% level, and *** signals significant at the 1% level; ii) standard errors are in brackets; iii) OLS estimates are heteroskedastic-robust; iv) standard errors of quantile estimates have been calculated using a bootstrap method of 500 replications; v) All results are controlling for year-specific effects; vi) The results for 'Europe' are controlling for country-specific effects.

Table 5. Tests for the equality of coefficients at different quantiles (P-value) – Skills Mismatch 1994

EUROPE	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q20		0.01	0.00	0.01	0.01	0.00	0.04	0.01	0.04	0.07	
Q25			0.10	0.41	0.31	0.11	0.58	0.21	0.46	0.50	
Q30				0.70	0.98	0.41	0.71	0.60	0.99	0.99	
Q40					0.56	0.12	0.90	0.32	0.76	0.81	
Q50						0.16	0.55	0.50	1.00	0.99	
Q60							0.02	0.69	0.33	0.53	
Q70								0.07	0.56	0.74	
Q75									0.43	0.64	
Q80										0.99	

AUSTRIA	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.10	0.24	0.31	0.23	0.17	0.25	0.47	0.47	0.44	0.54	0.69
Q20		0.53	0.50	0.88	0.93	0.94	0.66	0.75	0.76	0.91	
Q25			0.83	0.75	0.60	0.75	0.89	0.96	0.97	0.96	
Q30				0.57	0.46	0.64	0.95	0.98	0.97	0.92	
Q40					0.71	0.93	0.68	0.79	0.81	0.95	
Q50						0.78	0.47	0.61	0.65	0.87	
Q60							0.49	0.68	0.74	0.93	
Q70								0.87	0.89	0.88	
Q75									0.98	0.92	
Q80										0.92	

DENMARK	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.20	0.15	0.36	0.28	0.24	0.16	0.21	0.24	0.11	0.08	0.50
Q20		0.55	0.76	0.95	0.83	0.60	0.73	0.71	0.33	0.23	
Q25			0.22	0.73	0.88	0.85	0.99	0.94	0.44	0.30	
Q30				0.67	0.57	0.34	0.47	0.47	0.16	0.11	
Q40					0.75	0.43	0.67	0.65	0.22	0.20	
Q50						0.48	0.80	0.77	0.26	0.25	
Q60							0.77	0.90	0.40	0.36	
Q70								0.89	0.23	0.27	
Q75									0.16	0.28	
Q80										0.79	

FRANCE	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.18	0.39	0.37	0.17	0.18	0.26	0.12	0.12	0.38	0.30	0.62
Q20		0.38	0.66	0.59	0.66	0.82	0.31	0.35	0.91	0.63	
Q25			0.72	0.22	0.34	0.53	0.17	0.19	0.70	0.48	
Q30				0.26	0.40	0.60	0.20	0.24	0.77	0.52	
Q40					1.00	0.84	0.43	0.50	0.88	0.77	
Q50						0.79	0.37	0.46	0.87	0.76	
Q60							0.19	0.34	0.96	0.67	
Q70								0.86	0.35	0.89	
Q75									0.30	0.95	
Q80										0.59	

BELGIUM	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.34	0.49	0.41	0.64	0.64	0.97	0.86	0.86	0.95	0.57	0.82
Q20		0.83	0.91	0.68	0.75	0.29	0.40	0.42	0.39	0.97	
Q25			0.54	0.73	0.82	0.28	0.45	0.44	0.40	0.95	
Q30				0.41	0.60	0.15	0.30	0.27	0.24	0.92	
Q40					0.95	0.29	0.59	0.60	0.51	0.79	
Q50						0.15	0.52	0.55	0.48	0.81	
Q60							0.54	0.58	0.82	0.33	
Q70								0.98	0.81	0.48	
Q75									0.71	0.45	
Q80										0.33	

FINLAND	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	1.00	0.73	0.45	0.83	0.84	0.93	0.72	0.85	0.76	0.75	0.98
Q20		0.60	0.33	0.80	0.82	0.92	0.68	0.83	0.73	0.73	
Q25			0.02	0.49	0.57	0.81	0.92	0.93	0.93	0.86	
Q30				0.49	0.59	0.34	0.25	0.34	0.30	0.45	
Q40					0.99	0.64	0.52	0.65	0.57	0.65	
Q50						0.58	0.47	0.64	0.57	0.65	
Q60							0.65	0.85	0.73	0.75	
Q70								0.74	0.99	0.90	
Q75									0.77	0.80	
Q80										0.89	

GERMANY	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.88	0.68	0.51	0.65	0.93	0.75	0.56	0.41	0.61	0.55	0.70
Q20		0.63	0.42	0.66	0.95	0.83	0.60	0.42	0.64	0.56	
Q25			0.55	0.88	0.68	0.95	0.76	0.52	0.83	0.71	
Q30				0.76	0.41	0.66	0.98	0.70	0.94	0.88	
Q40					0.40	0.80	0.78	0.51	0.91	0.75	
Q50						0.57	0.25	0.16	0.49	0.43	
Q60							0.45	0.25	0.72	0.59	
Q70								0.46	0.90	0.86	
Q75									0.47	0.84	
Q80										0.77	

GREECE	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.48	0.89	0.74	0.68	0.54	0.54	0.72	0.65	0.73	0.75	0.71
Q20		0.09	0.07	0.80	0.93	0.95	0.77	0.91	0.86	0.35	
Q25			0.66	0.35	0.25	0.27	0.50	0.42	0.56	0.79	
Q30				0.11	0.12	0.13	0.32	0.28	0.44	0.91	
Q40					0.63	0.70	0.94	0.91	1.00	0.45	
Q50						0.95	0.60	0.79	0.77	0.30	
Q60							0.57	0.81	0.77	0.28	
Q70								0.73	0.94	0.38	
Q75									0.85	0.29	
Q80										0.31	

ITALY	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.59	0.67	0.74	0.54	0.74	0.28	0.31	0.51	0.17	0.40	0.91
Q20		0.94	0.85	0.74	0.93	0.28	0.37	0.68	0.19	0.52	
Q25			0.84	0.63	0.95	0.22	0.30	0.63	0.14	0.50	
Q30				0.45	0.96	0.16	0.25	0.57	0.12	0.47	
Q40					0.55	0.28	0.43	0.81	0.19	0.58	
Q50						0.04	0.18	0.53	0.09	0.45	
Q60							0.81	0.53	0.50	0.88	
Q70								0.52	0.37	0.81	
Q75									0.10	0.66	
Q80										0.81	

SPAIN	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.76	0.51	0.91	0.69	0.72	0.50	0.72	0.42	0.18	0.10	0.47
Q20		0.46	0.77	0.86	0.89	0.58	0.87	0.46	0.17	0.10	
Q25			0.21	0.71	0.75	0.81	0.80	0.65	0.24	0.13	
Q30				0.50	0.64	0.36	0.62	0.24	0.07	0.04	
Q40					0.98	0.54	0.97	0.43	0.12	0.07	
Q50						0.42	0.95	0.38	0.10	0.09	
Q60							0.48	0.78	0.23	0.16	
Q70								0.24	0.07	0.06	
Q75									0.11	0.15	
Q80										0.57	

IRELAND	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.59	0.77	0.98	0.76	0.73	0.99	0.96	0.61	0.51	0.77	0.70
Q20		0.72	0.38	0.26	0.28	0.56	0.61	0.90	0.77	0.92	
Q25			0.43	0.35	0.35	0.70	0.78	0.75	0.64	0.95	
Q30				0.62	0.58	0.99	0.92	0.51	0.41	0.74	
Q40					0.92	0.61	0.54	0.23	0.20	0.50	
Q50						0.49	0.52	0.20	0.17	0.49	
Q60							0.90	0.40	0.33	0.70	
Q70								0.21	0.30	0.75	
Q75									0.77	0.80	
Q80										0.64	

PORTUGAL	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.26	0.15	0.11	0.16	0.15	0.50	0.30	0.36	0.27	0.16	0.49
Q20		0.62	0.57	0.74	0.68	0.80	0.83	0.89	0.70	0.43	
Q25			0.71	0.99	0.85	0.54	0.99	0.95	0.80	0.49	
Q30				0.73	0.97	0.35	0.88	0.82	0.88	0.53	
Q40					0.79	0.44	1.00	0.93	0.78	0.46	
Q50						0.20	0.87	0.81	0.85	0.49	
Q60							0.34	0.53	0.35	0.22	
Q70								0.87	0.66	0.37	
Q75									0.50	0.33	
Q80										0.46	

UK	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.39	0.59	0.56	0.65	0.91	0.77	0.82	0.84	0.90	0.72	0.61
Q20		0.67	0.81	0.75	0.23	0.19	0.58	0.62	0.40	0.33	
Q25			0.86	1.00	0.30	0.25	0.75	0.78	0.51	0.40	
Q30				0.87	0.21	0.17	0.65	0.70	0.43	0.36	
Q40					0.16	0.17	0.70	0.75	0.47	0.37	
Q50						0.61	0.35	0.52	0.96	0.70	
Q60							0.17	0.30	0.83	0.83	
Q70								0.99	0.52	0.43	
Q75									0.43	0.41	
Q80										0.68	

Table 5a. Tests for the equality of coefficients at different quantiles (P-value) – Skills Mismatch 1994 tertiary

EUROPE	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00
Q20		0.22	0.30	0.18	0.19	0.24	0.19	0.40	0.61	0.00	
Q25			0.96	0.55	0.60	0.67	0.55	0.84	1.00	0.02	
Q30				0.39	0.46	0.57	0.45	0.79	0.98	0.01	
Q40					0.94	0.89	0.83	0.77	0.65	0.02	
Q50						0.91	0.74	0.76	0.63	0.01	
Q60							0.63	0.81	0.65	0.00	
Q70								0.35	0.39	0.00	
Q75									0.72	0.00	
Q80										0.00	

AUSTRIA	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.79	0.56	0.68	0.36	0.37	0.67	0.70	0.72	0.76	0.15	0.53
Q20		0.56	0.77	0.29	0.36	0.80	0.83	0.84	0.89	0.17	
Q25			0.75	0.64	0.67	0.92	0.90	0.92	0.88	0.24	
Q30				0.45	0.55	0.96	0.98	0.97	0.98	0.22	
Q40					0.93	0.61	0.63	0.67	0.67	0.28	
Q50						0.42	0.56	0.62	0.63	0.28	
Q60							0.96	0.98	0.93	0.14	
Q70								0.98	0.94	0.13	
Q75									0.93	0.13	
Q80										0.06	

BELGIUM	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.17	0.11	0.07	0.02	0.12	0.23	0.20	0.52	0.42	0.13	0.32
Q20		0.51	0.33	0.12	0.46	0.70	0.67	0.83	0.98	0.46	
Q25			0.47	0.18	0.64	0.93	0.87	0.63	0.78	0.62	
Q30				0.23	0.87	0.81	0.91	0.42	0.57	0.79	
Q40					0.47	0.32	0.47	0.17	0.24	0.78	
Q50						0.59	0.77	0.29	0.44	0.89	
Q60							0.88	0.42	0.63	0.63	
Q70								0.08	0.39	0.66	
Q75									0.57	0.21	
Q80										0.29	

DENMARK	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	1.00	0.99	0.96	0.98	0.97	0.86	0.51	0.55	0.73	0.60	0.76
Q20		0.97	0.88	0.96	0.94	0.73	0.26	0.32	0.57	0.48	
Q25			0.79	0.96	0.89	0.68	0.17	0.22	0.48	0.43	
Q30				0.84	0.74	0.59	0.11	0.15	0.40	0.39	
Q40					0.80	0.64	0.12	0.15	0.42	0.41	
Q50						0.68	0.12	0.18	0.49	0.44	
Q60							0.19	0.35	0.73	0.57	
Q70								0.77	0.43	0.95	
Q75									0.31	0.95	
Q80										0.63	

FINLAND	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.15	0.74	0.20	0.49	0.52	0.84	0.58	0.62	0.89	0.37	0.65
Q20		0.09	0.95	0.75	0.84	0.63	0.23	0.24	0.45	0.12	
Q25			0.08	0.53	0.59	0.96	0.43	0.45	0.74	0.23	
Q30				0.64	0.79	0.55	0.17	0.18	0.38	0.09	
Q40					0.92	0.69	0.23	0.23	0.50	0.14	
Q50						0.57	0.19	0.21	0.49	0.18	
Q60							0.21	0.29	0.69	0.30	
Q70								0.82	0.51	0.72	
Q75									0.50	0.65	
Q80										0.38	

FRANCE	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.22	0.67	0.56	0.69	0.69	0.62	0.71	0.49	0.21	0.17	0.74
Q20		0.20	0.42	0.41	0.54	0.70	0.63	0.89	0.64	0.52	
Q25			0.64	0.98	0.94	0.82	0.93	0.66	0.28	0.25	
Q30				0.76	0.89	0.96	0.95	0.78	0.36	0.31	
Q40					0.93	0.80	0.93	0.65	0.27	0.26	
Q50						0.81	0.97	0.67	0.27	0.27	
Q60							0.87	0.76	0.32	0.35	
Q70								0.43	0.13	0.27	
Q75									0.17	0.36	
Q80										0.69	

GERMANY	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.91	0.88	0.97	0.81	0.80	0.92	0.96	0.77	0.89	0.82	0.99
Q20		0.85	0.72	0.70	0.66	0.97	0.83	0.60	0.92	0.79	
Q25			0.52	0.78	0.74	0.88	0.76	0.68	1.00	0.86	
Q30				0.41	0.47	0.84	0.98	0.46	0.76	0.68	
Q40					0.90	0.66	0.59	0.82	0.81	0.98	
Q50						0.44	0.49	0.90	0.74	0.97	
Q60							0.82	0.36	0.87	0.76	
Q70								0.20	0.73	0.68	
Q75									0.44	0.90	
Q80										0.81	

GREECE	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.46	0.24	0.34	0.94	0.77	0.69	0.63	0.63	0.68	0.46	0.49
Q20		0.29	0.61	0.47	0.85	0.94	0.91	0.87	0.88	0.36	
Q25			0.78	0.21	0.53	0.63	0.86	0.93	0.95	0.30	
Q30				0.19	0.58	0.69	0.92	0.98	0.99	0.31	
Q40					0.43	0.47	0.53	0.53	0.60	0.44	
Q50						0.87	0.75	0.72	0.77	0.36	
Q60							0.78	0.77	0.81	0.33	
Q70								0.88	0.92	0.27	
Q75									0.98	0.23	
Q80										0.18	

IRELAND	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.29	0.42	0.75	0.48	0.32	0.30	0.21	0.19	0.16	0.13	0.66
Q20		0.90	0.53	0.92	0.79	0.75	0.62	0.55	0.51	0.50	
Q25			0.38	0.99	0.68	0.66	0.57	0.51	0.48	0.46	
Q30				0.44	0.32	0.35	0.32	0.29	0.27	0.25	
Q40					0.53	0.59	0.52	0.46	0.44	0.44	
Q50						0.93	0.78	0.68	0.66	0.66	
Q60							0.77	0.66	0.66	0.70	
Q70								0.64	0.74	0.80	
Q75									0.91	0.93	
Q80										0.98	

ITALY	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.33	0.54	0.62	0.70	0.42	0.32	0.70	0.58	0.91	0.34	0.88
Q20		0.73	0.73	0.74	0.87	0.63	0.90	0.91	0.56	0.52	
Q25			0.89	0.88	0.68	0.50	0.99	0.81	0.62	0.44	
Q30				0.95	0.59	0.46	0.95	0.78	0.67	0.43	
Q40					0.44	0.41	0.92	0.75	0.68	0.40	
Q50						0.60	0.76	1.00	0.44	0.55	
Q60							0.36	0.68	0.23	0.69	
Q70								0.61	0.47	0.36	
Q75									0.18	0.47	
Q80										0.08	

PORTUGAL	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.96	0.97	0.98	0.22	0.16	0.11	0.09	0.09	0.10	0.11	0.38
Q20		1.00	1.00	0.13	0.11	0.08	0.06	0.06	0.07	0.07	
Q25			1.00	0.09	0.10	0.07	0.05	0.05	0.06	0.07	
Q30				0.03	0.07	0.05	0.03	0.03	0.04	0.05	
Q40					0.60	0.36	0.24	0.22	0.24	0.25	
Q50						0.50	0.30	0.28	0.30	0.32	
Q60							0.44	0.41	0.46	0.48	
Q70								0.70	0.77	0.79	
Q75									0.99	0.99	
Q80										1.00	

SPAIN	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.13	0.14	0.09	0.19	0.26	0.19	0.04	0.08	0.14	0.32	0.31
Q20		0.91	0.53	0.83	0.94	0.77	0.27	0.41	0.64	0.92	
Q25			0.35	0.85	0.87	0.81	0.25	0.40	0.65	0.96	
Q30				0.64	0.47	0.83	0.42	0.61	0.94	0.75	
Q40					0.60	0.89	0.21	0.36	0.70	0.94	
Q50						0.53	0.10	0.20	0.49	0.86	
Q60							0.17	0.37	0.77	0.88	
Q70								0.58	0.32	0.28	
Q75									0.43	0.40	
Q80										0.65	

UK	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.43	0.71	0.64	0.57	0.85	0.96	0.86	0.76	0.39	0.17	0.31
Q20		0.44	0.71	0.87	0.42	0.33	0.52	0.72	0.63	0.30	
Q25			0.73	0.61	0.76	0.59	0.82	0.98	0.41	0.14	
Q30				0.78	0.55	0.39	0.67	0.89	0.45	0.17	
Q40					0.22	0.17	0.50	0.76	0.48	0.18	
Q50						0.67	0.99	0.80	0.25	0.04	
Q60							0.75	0.60	0.15	0.02	
Q70								0.71	0.18	0.05	
Q75									0.17	0.11	
Q80										0.59	

Notes to Table 8: i) The element in the Qj column and the Qi row is the p-value of a pair-wise test between the estimates at the j and the i quantiles, H_0: $\beta_j=\beta i$ and H_1: $\beta_j\neq\beta i$; ii) the joint equality test reports the p-value of the F-test H_0: $\beta_{0.10}=\beta_{0.20}= ...=\beta_{0.90}$ and H_1: $\beta_m\neq\beta_n$; for some $m\neq n$; iii) p-value < 0.10: significant at the 10% confidence level, p-value < 0.05: significant at the 5% confidence level, p-value < 0.01: significant at the 1% confidence level.

Table 5b. Tests for the equality of coefficients at different quantiles (P-value) – Skills Mismatch 1994 no tertiary

EUROPE	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Q20		0,46	0,21	0,00	0,00	0,00	0,00	0,00	0,01	0,18	
Q25			0,41	0,00	0,00	0,00	0,00	0,00	0,02	0,31	
Q30				0,01	0,00	0,00	0,00	0,00	0,04	0,50	
Q40					0,04	0,03	0,06	0,13	0,64	0,45	
Q50						0,55	0,48	0,76	0,42	0,07	
Q60							0,66	0,92	0,16	0,02	
Q70								0,53	0,05	0,01	
Q75									0,05	0,01	
Q80										0,13	

AUSTRIA	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,79	0,56	0,68	0,36	0,37	0,67	0,70	0,72	0,76	0,15	0,53
Q20		0,56	0,77	0,29	0,36	0,80	0,83	0,84	0,89	0,17	
Q25			0,75	0,64	0,67	0,92	0,90	0,92	0,88	0,24	
Q30				0,45	0,55	0,96	0,98	0,97	0,98	0,22	
Q40					0,93	0,61	0,63	0,67	0,67	0,28	
Q50						0,42	0,56	0,62	0,63	0,28	
Q60							0,96	0,98	0,93	0,14	
Q70								0,98	0,94	0,13	
Q75									0,93	0,13	
Q80										0,06	

DENMARK	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	1,00	0,99	0,96	0,98	0,97	0,86	0,51	0,55	0,73	0,60	0,76
Q20		0,97	0,88	0,96	0,94	0,73	0,26	0,32	0,57	0,48	
Q25			0,79	0,96	0,89	0,68	0,17	0,22	0,48	0,43	
Q30				0,84	0,74	0,59	0,11	0,15	0,40	0,39	
Q40					0,80	0,64	0,12	0,15	0,42	0,41	
Q50						0,68	0,12	0,18	0,49	0,44	
Q60							0,19	0,35	0,73	0,57	
Q70								0,77	0,43	0,95	
Q75									0,31	0,95	
Q80										0,63	

FRANCE	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,22	0,67	0,56	0,69	0,69	0,62	0,71	0,49	0,21	0,17	0,74
Q20		0,20	0,42	0,41	0,54	0,70	0,63	0,89	0,64	0,52	
Q25			0,64	0,98	0,94	0,82	0,93	0,66	0,28	0,25	
Q30				0,76	0,89	0,96	0,95	0,78	0,36	0,31	
Q40					0,93	0,80	0,93	0,65	0,27	0,26	
Q50						0,81	0,97	0,67	0,27	0,27	
Q60							0,87	0,76	0,32	0,35	
Q70								0,43	0,13	0,27	
Q75									0,17	0,36	
Q80										0,69	

BELGIUM	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,17	0,11	0,07	0,02	0,12	0,23	0,20	0,52	0,42	0,13	0,32
Q20		0,51	0,33	0,12	0,46	0,70	0,67	0,83	0,98	0,46	
Q25			0,47	0,18	0,64	0,93	0,87	0,63	0,78	0,62	
Q30				0,23	0,87	0,81	0,91	0,42	0,57	0,79	
Q40					0,47	0,32	0,47	0,17	0,24	0,78	
Q50						0,59	0,77	0,29	0,44	0,89	
Q60							0,88	0,42	0,63	0,63	
Q70								0,08	0,39	0,66	
Q75									0,57	0,21	
Q80										0,29	

FINLAND	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,15	0,74	0,20	0,49	0,52	0,84	0,58	0,62	0,89	0,37	0,65
Q20		0,09	0,95	0,75	0,84	0,63	0,23	0,24	0,45	0,12	
Q25			0,08	0,53	0,59	0,96	0,43	0,45	0,74	0,23	
Q30				0,64	0,79	0,55	0,17	0,18	0,38	0,09	
Q40					0,92	0,69	0,23	0,23	0,50	0,14	
Q50						0,57	0,19	0,21	0,49	0,18	
Q60							0,21	0,29	0,69	0,30	
Q70								0,82	0,51	0,72	
Q75									0,50	0,65	
Q80										0,38	

GERMANY	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,91	0,88	0,97	0,81	0,80	0,92	0,96	0,77	0,89	0,82	0,99
Q20		0,85	0,72	0,70	0,66	0,97	0,83	0,60	0,92	0,79	
Q25			0,52	0,78	0,74	0,88	0,76	0,68	1,00	0,86	
Q30				0,41	0,47	0,84	0,98	0,46	0,76	0,68	
Q40					0,90	0,66	0,59	0,82	0,81	0,98	
Q50						0,44	0,49	0,90	0,74	0,97	
Q60							0,82	0,36	0,87	0,76	
Q70								0,20	0,73	0,68	
Q75									0,44	0,90	
Q80										0,81	

GREECE	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,46	0,24	0,34	0,94	0,77	0,69	0,63	0,63	0,68	0,46	0,49
Q20		0,29	0,61	0,47	0,85	0,94	0,91	0,87	0,88	0,36	
Q25			0,78	0,21	0,53	0,63	0,86	0,93	0,95	0,30	
Q30				0,19	0,58	0,69	0,92	0,98	0,99	0,31	
Q40					0,43	0,47	0,53	0,53	0,60	0,44	
Q50						0,87	0,75	0,72	0,77	0,36	
Q60							0,78	0,77	0,81	0,33	
Q70								0,88	0,92	0,27	
Q75									0,98	0,23	
Q80										0,18	

IRELAND	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,29	0,42	0,75	0,48	0,32	0,30	0,21	0,19	0,16	0,13	0,66
Q20		0,90	0,53	0,92	0,79	0,75	0,62	0,55	0,51	0,50	
Q25			0,38	0,99	0,68	0,66	0,57	0,51	0,48	0,46	
Q30				0,44	0,32	0,35	0,32	0,29	0,27	0,25	
Q40					0,53	0,59	0,52	0,46	0,44	0,44	
Q50						0,93	0,78	0,68	0,66	0,66	
Q60							0,77	0,66	0,66	0,70	
Q70								0,64	0,74	0,80	
Q75									0,91	0,93	
Q80										0,98	

ITALY	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,33	0,54	0,62	0,70	0,42	0,32	0,70	0,58	0,91	0,34	0,88
Q20		0,73	0,73	0,74	0,87	0,63	0,90	0,91	0,56	0,52	
Q25			0,89	0,88	0,68	0,50	0,99	0,81	0,62	0,44	
Q30				0,95	0,59	0,46	0,95	0,78	0,67	0,43	
Q40					0,44	0,41	0,92	0,75	0,68	0,40	
Q50						0,60	0,76	1,00	0,44	0,55	
Q60							0,36	0,68	0,23	0,69	
Q70								0,61	0,47	0,36	
Q75									0,18	0,47	
Q80										0,08	

PORTUGAL	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,96	0,97	0,98	0,22	0,16	0,11	0,09	0,09	0,10	0,11	0,38
Q20		1,00	1,00	0,13	0,11	0,08	0,06	0,06	0,07	0,07	
Q25			1,00	0,09	0,10	0,07	0,05	0,05	0,06	0,07	
Q30				0,03	0,07	0,05	0,03	0,03	0,04	0,05	
Q40					0,60	0,36	0,24	0,22	0,24	0,25	
Q50						0,50	0,30	0,28	0,30	0,32	
Q60							0,44	0,41	0,46	0,48	
Q70								0,70	0,77	0,79	
Q75									0,99	0,99	
Q80										1,00	

SPAIN	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,13	0,14	0,09	0,19	0,26	0,19	0,04	0,08	0,14	0,32	0,31
Q20		0,91	0,53	0,83	0,94	0,77	0,27	0,41	0,64	0,92	
Q25			0,35	0,85	0,87	0,81	0,25	0,40	0,65	0,96	
Q30				0,64	0,47	0,83	0,42	0,61	0,94	0,75	
Q40					0,60	0,89	0,21	0,36	0,70	0,94	
Q50						0,53	0,10	0,20	0,49	0,86	
Q60							0,17	0,37	0,77	0,88	
Q70								0,58	0,32	0,28	
Q75									0,43	0,40	
Q80										0,65	

UK	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,43	0,71	0,64	0,57	0,85	0,96	0,86	0,76	0,39	0,17	0,31
Q20		0,44	0,71	0,87	0,42	0,33	0,52	0,72	0,63	0,30	
Q25			0,73	0,61	0,76	0,59	0,82	0,98	0,41	0,14	
Q30				0,78	0,55	0,39	0,67	0,89	0,45	0,17	
Q40					0,22	0,17	0,50	0,76	0,48	0,18	
Q50						0,67	0,99	0,80	0,25	0,04	
Q60							0,75	0,60	0,15	0,02	
Q70								0,71	0,18	0,05	
Q75									0,17	0,11	
Q80										0,59	

Notes to Table 8: i) The element in the Qj column and the Qi row is the p-value of a pair-wise test between the estimates at the j and the i quantiles, H_0: $\beta_j=\beta i$ and H_1: $\beta_j\neq\beta i$; ii) the joint equality test reports the p-value of the F-test H_0: $\beta_{0.10}=\beta_{0.20}= ...=\beta_{0.90}$ and H_1: $\beta_m\neq\beta_n$; for some $m\neq n$; iii) p-value < 0.10: significant at the 10% confidence level, p-value < 0.05: significant at the 5% confidence level, p-value < 0.01: significant at the 1% confidence level.

Table 6. Tests for the equality of coefficients at different quantiles (P-value) – Skills Mismatch 2001

EUROPE	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.03	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Q20		0.00	0.08	0.18	0.00	0.00	0.00	0.00	0.00	0.00	
Q25			0.60	0.47	0.23	0.03	0.00	0.00	0.00	0.00	
Q30				0.73	0.09	0.01	0.00	0.00	0.00	0.00	
Q40					0.00	0.00	0.00	0.00	0.00	0.00	
Q50						0.03	0.00	0.00	0.00	0.00	
Q60							0.00	0.00	0.00	0.00	
Q70								0.10	0.04	0.01	
Q75									0.33	0.06	
Q80										0.19	

AUSTRIA	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.76	0.94	0.79	0.48	1.00	0.96	0.95	0.88	0.82	0.60	0.97
Q20		0.39	0.30	0.09	0.64	0.63	0.80	0.91	0.54	0.71	
Q25			0.61	0.27	0.90	0.97	0.86	0.78	0.83	0.51	
Q30				0.30	0.61	0.72	0.67	0.62	0.99	0.41	
Q40					0.07	0.22	0.28	0.27	0.60	0.18	
Q50						0.91	0.91	0.79	0.71	0.46	
Q60							0.82	0.71	0.75	0.42	
Q70								0.79	0.53	0.47	
Q75									0.27	0.52	
Q80										0.19	

BELGIUM	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.83	0.63	0.31	0.48	0.57	0.85	0.62	0.50	0.50	0.22	0.82
Q20		0.62	0.25	0.57	0.66	0.69	0.72	0.59	0.58	0.24	
Q25			0.22	0.72	0.84	0.49	0.88	0.71	0.69	0.29	
Q30				0.63	0.60	0.18	0.65	0.86	0.93	0.51	
Q40					0.86	0.21	0.88	0.89	0.84	0.38	
Q50						0.15	0.97	0.78	0.76	0.31	
Q60							0.22	0.16	0.24	0.10	
Q70								0.64	0.70	0.27	
Q75									0.88	0.32	
Q80										0.31	

DENMARK	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.09	0.04	0.06	0.16	0.17	0.37	0.58	0.57	0.62	0.91	0.19
Q20		0.47	0.74	0.77	0.80	0.50	0.34	0.36	0.38	0.30	
Q25			0.80	0.29	0.36	0.18	0.10	0.13	0.14	0.13	
Q30				0.21	0.35	0.17	0.09	0.12	0.13	0.14	
Q40					0.98	0.42	0.23	0.31	0.31	0.28	
Q50						0.29	0.17	0.23	0.24	0.27	
Q60							0.50	0.61	0.60	0.51	
Q70								0.97	0.97	0.66	
Q75									0.93	0.65	
Q80										0.64	

FINLAND	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.75	0.61	0.51	0.86	0.81	0.70	0.47	0.90	0.91	0.76	0.81
Q20		0.67	0.55	0.56	0.54	0.47	0.28	0.71	0.73	0.62	
Q25			0.62	0.22	0.26	0.25	0.14	0.52	0.55	0.51	
Q30				0.06	0.14	0.15	0.08	0.39	0.43	0.43	
Q40					0.85	0.70	0.37	0.99	0.99	0.83	
Q50						0.74	0.38	0.91	0.92	0.88	
Q60							0.43	0.73	0.78	0.97	
Q70								0.22	0.34	0.76	
Q75									0.99	0.79	
Q80										0.78	

FRANCE	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.98	0.56	0.98	0.53	0.54	0.60	0.49	0.45	0.57	0.03	0.25
Q20		0.25	0.94	0.38	0.37	0.49	0.37	0.35	0.50	0.02	
Q25			0.18	0.85	0.87	0.99	0.74	0.67	0.84	0.05	
Q30				0.15	0.22	0.35	0.23	0.23	0.43	0.02	
Q40					0.97	0.83	0.84	0.77	0.93	0.06	
Q50						0.83	0.81	0.74	0.91	0.05	
Q60							0.65	0.62	0.83	0.04	
Q70								0.85	0.94	0.04	
Q75									0.79	0.04	
Q80										0.02	

GERMANY	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.81	0.57	0.90	0.74	0.72	0.61	0.46	0.53	0.52	0.23	0.46
Q20		0.46	0.89	0.80	0.78	0.62	0.43	0.53	0.53	0.17	
Q25			0.27	0.76	0.84	0.92	0.64	0.77	0.76	0.24	
Q30				0.59	0.59	0.40	0.25	0.32	0.33	0.06	
Q40					0.92	0.64	0.44	0.57	0.55	0.11	
Q50						0.59	0.39	0.54	0.54	0.08	
Q60							0.55	0.75	0.74	0.12	
Q70								0.69	0.80	0.33	
Q75									0.97	0.20	
Q80										0.13	

GREECE	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.92	0.66	0.97	0.84	0.76	0.47	0.53	0.65	0.44	0.72	0.46
Q20		0.25	0.93	0.85	0.74	0.36	0.44	0.60	0.36	0.62	
Q25			0.28	0.25	0.24	0.08	0.11	0.21	0.11	0.89	
Q30				0.71	0.63	0.21	0.34	0.53	0.28	0.63	
Q40					0.79	0.21	0.39	0.65	0.32	0.50	
Q50						0.24	0.47	0.79	0.42	0.47	
Q60							0.84	0.62	0.90	0.23	
Q70								0.64	0.78	0.25	
Q75									0.32	0.26	
Q80										0.08	

ITALY	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.77	0.99	0.98	0.69	0.72	0.90	0.71	0.76	0.54	0.75	0.93
Q20		0.58	0.69	0.82	0.83	0.64	0.82	0.88	0.32	0.54	
Q25			0.96	0.40	0.53	0.81	0.58	0.69	0.38	0.66	
Q30				0.34	0.55	0.79	0.56	0.69	0.35	0.64	
Q40					0.95	0.30	0.92	0.97	0.15	0.43	
Q50						0.30	0.96	1.00	0.12	0.44	
Q60							0.21	0.42	0.34	0.73	
Q70								0.96	0.05	0.35	
Q75									0.02	0.40	
Q80										0.70	

SPAIN	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.25	0.06	0.15	0.64	0.68	0.67	0.58	0.62	0.45	0.60	0.16
Q20		0.15	0.51	0.50	0.48	0.64	0.75	0.75	1.00	0.88	
Q25			0.57	0.06	0.07	0.20	0.31	0.35	0.52	0.52	
Q30				0.08	0.12	0.29	0.41	0.44	0.67	0.65	
Q40					0.96	0.93	0.82	0.85	0.61	0.82	
Q50						0.87	0.78	0.81	0.54	0.79	
Q60							0.84	0.88	0.57	0.85	
Q70								0.98	0.64	0.92	
Q75									0.55	0.91	
Q80										0.83	

IRELAND	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.78	0.64	0.72	0.98	0.95	0.91	0.95	0.70	0.64	0.76	0.91
Q20		0.20	0.38	0.75	0.73	0.91	0.77	0.82	0.73	0.86	
Q25			0.87	0.46	0.58	0.45	0.67	0.35	0.34	0.54	
Q30				0.49	0.65	0.51	0.74	0.40	0.38	0.57	
Q40					0.94	0.80	0.95	0.58	0.54	0.72	
Q50						0.67	0.99	0.51	0.47	0.68	
Q60							0.72	0.62	0.57	0.76	
Q70								0.23	0.29	0.61	
Q75									0.72	0.96	
Q80										0.88	

PORTUGAL	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.61	0.50	0.96	0.46	0.70	0.24	0.01	0.01	0.11	0.07	0.04
Q20		0.71	0.42	0.67	0.99	0.31	0.01	0.01	0.15	0.10	
Q25			0.13	0.84	0.84	0.35	0.01	0.01	0.19	0.12	
Q30				0.13	0.51	0.14	0.00	0.00	0.05	0.05	
Q40					0.63	0.33	0.01	0.02	0.26	0.13	
Q50						0.15	0.00	0.00	0.12	0.08	
Q60							0.14	0.28	0.97	0.42	
Q70								0.59	0.04	0.96	
Q75									0.01	0.90	
Q80										0.33	

UK	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.03	0.04	0.02	0.01	0.05	0.29	0.07	0.21	0.47	0.20	0.26
Q20		0.54	0.22	0.08	0.38	0.88	0.42	0.77	0.81	0.72	
Q25			0.29	0.16	0.60	0.70	0.57	0.94	0.65	0.86	
Q30				0.49	1.00	0.41	0.91	0.77	0.44	0.88	
Q40					0.50	0.14	0.70	0.45	0.18	0.61	
Q50						0.20	0.88	0.71	0.35	0.86	
Q60							0.17	0.59	0.86	0.59	
Q70								0.43	0.17	0.77	
Q75									0.39	0.90	
Q80										0.50	

Notes to Table 8: i) The element in the Qj column and the Qi row is the p-value of a pair-wise test between the estimates at the j and the i quantiles, H_0: $\beta_j=\beta i$ and H_1: $\beta_j\neq\beta i$; ii) the joint equality test reports the p-value of the F-test H_0: $\beta_{0.10}=\beta_{0.20}= ...=\beta_{0.90}$ and H_1: $\beta_m\neq\beta_n$; for some $m\neq n$; iii) p-value < 0.10: significant at the 10% confidence level, p-value < 0.05: significant at the 5% confidence level, p-value < 0.01: significant at the 1% confidence level.

Table 6a. Tests for the equality of coefficients at different quantiles (P-value) – Skills Mismatch 2001 tertiary

EUROPE	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.45	0.42	0.32	0.00
Q20		0.84	0.38	0.05	0.19	0.85	0.35	0.05	0.03	0.00	
Q25			0.38	0.03	0.20	0.77	0.30	0.03	0.02	0.00	
Q30				0.11	0.41	0.49	0.16	0.02	0.01	0.00	
Q40					0.60	0.04	0.01	0.00	0.00	0.00	
Q50						0.04	0.01	0.00	0.00	0.00	
Q60							0.24	0.01	0.02	0.00	
Q70								0.06	0.09	0.01	
Q75									0.99	0.06	
Q80										0.05	

AUSTRIA	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.58	0.67	0.79	0.91	0.80	0.65	0.66	0.70	0.70	0.69	0.89
Q20		0.99	0.88	0.75	0.48	0.39	0.40	0.43	0.45	0.42	
Q25			0.80	0.69	0.41	0.32	0.33	0.36	0.37	0.36	
Q30				0.80	0.45	0.36	0.39	0.43	0.44	0.44	
Q40					0.47	0.33	0.39	0.43	0.46	0.48	
Q50						0.47	0.60	0.72	0.74	0.76	
Q60							0.95	0.84	0.87	0.88	
Q70								0.74	0.85	0.88	
Q75									0.99	0.99	
Q80										0.98	

DENMARK	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.74	0.12	0.16	0.31	0.13	0.17	0.39	0.40	0.43	0.40	0.37
Q20		0.01	0.04	0.15	0.05	0.09	0.25	0.26	0.31	0.29	
Q25			0.92	0.46	0.98	0.92	0.52	0.53	0.49	0.67	
Q30				0.39	0.92	0.97	0.51	0.52	0.48	0.68	
Q40					0.18	0.44	0.86	0.90	0.80	0.97	
Q50						0.74	0.14	0.20	0.17	0.50	
Q60							0.08	0.21	0.19	0.59	
Q70								0.94	0.88	0.84	
Q75									0.79	0.86	
Q80										0.75	

FRANCE	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.29	0.30	0.24	0.39	0.52	0.69	0.73	0.44	0.11	0.15	0.16
Q20		0.91	0.65	0.96	0.92	0.70	0.34	0.19	0.03	0.03	
Q25			0.63	0.99	0.88	0.67	0.33	0.18	0.03	0.03	
Q30				0.70	0.70	0.53	0.25	0.14	0.02	0.02	
Q40					0.83	0.61	0.28	0.15	0.02	0.02	
Q50						0.66	0.30	0.18	0.02	0.03	
Q60							0.33	0.17	0.01	0.04	
Q70								0.36	0.04	0.21	
Q75									0.13	0.58	
Q80										0.71	

BELGIUM	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.61	0.76	0.18	0.26	0.08	0.15	0.15	0.13	0.09	0.15	0.43
Q20		0.78	0.24	0.47	0.18	0.34	0.32	0.28	0.21	0.31	
Q25			0.08	0.32	0.12	0.26	0.25	0.23	0.17	0.26	
Q30				0.65	0.67	0.96	0.96	0.87	0.67	0.82	
Q40					0.20	0.67	0.61	0.53	0.37	0.57	
Q50						0.40	0.67	0.82	0.86	0.94	
Q60							0.85	0.72	0.48	0.72	
Q70								0.71	0.42	0.79	
Q75									0.45	0.91	
Q80										0.78	

FINLAND	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.99	0.78	0.31	0.93	0.91	0.75	0.77	0.76	0.97	0.95	0.98
Q20		0.66	0.20	0.93	0.90	0.77	0.77	0.76	0.97	0.96	
Q25			0.14	0.84	0.72	0.63	0.66	0.68	0.90	0.99	
Q30				0.21	0.27	0.29	0.39	0.44	0.70	0.84	
Q40					0.74	0.65	0.70	0.70	0.94	0.97	
Q50						0.71	0.79	0.78	0.99	0.92	
Q60							0.94	0.90	0.88	0.85	
Q70								0.90	0.82	0.81	
Q75									0.69	0.76	
Q80										0.89	

GERMANY	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.15	0.18	0.23	0.32	0.55	0.74	0.55	0.61	0.66	0.69	0.69
Q20		0.87	0.80	0.54	0.34	0.23	0.43	0.34	0.30	0.36	
Q25			0.83	0.56	0.35	0.23	0.44	0.35	0.30	0.36	
Q30				0.55	0.33	0.17	0.42	0.32	0.28	0.34	
Q40					0.35	0.14	0.55	0.38	0.33	0.40	
Q50						0.33	0.89	0.87	0.76	0.79	
Q60							0.34	0.59	0.76	0.82	
Q70								0.66	0.63	0.69	
Q75									0.84	0.86	
Q80										0.98	

GREECE	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.34	0.61	0.99	0.73	0.93	0.44	0.77	0.84	0.83	0.30	0.66
Q20		0.64	0.35	0.62	0.51	0.93	0.70	0.69	0.47	0.16	
Q25			0.37	0.84	0.67	0.70	0.89	0.85	0.58	0.21	
Q30				0.54	0.92	0.36	0.76	0.84	0.81	0.30	
Q40					0.67	0.49	0.99	0.93	0.63	0.20	
Q50						0.12	0.76	0.87	0.74	0.24	
Q60							0.36	0.44	0.31	0.09	
Q70								0.88	0.50	0.15	
Q75									0.44	0.14	
Q80										0.27	

ITALY	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.56	0.37	0.56	0.66	0.88	0.77	0.68	0.49	0.31	0.13	0.29
Q20		0.58	0.92	0.27	0.46	0.41	0.95	0.69	0.49	0.22	
Q25			0.62	0.09	0.24	0.24	0.87	0.86	0.62	0.26	
Q30				0.07	0.30	0.30	0.99	0.71	0.47	0.18	
Q40					0.59	0.88	0.37	0.20	0.09	0.05	
Q50						0.78	0.49	0.29	0.15	0.07	
Q60							0.29	0.15	0.09	0.05	
Q70								0.49	0.28	0.15	
Q75									0.51	0.24	
Q80										0.33	

SPAIN	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.95	0.88	0.97	0.79	0.44	0.38	0.43	0.52	0.60	0.28	0.67
Q20		0.86	0.98	0.69	0.33	0.30	0.33	0.44	0.54	0.23	
Q25			0.82	0.54	0.21	0.24	0.28	0.38	0.49	0.20	
Q30				0.59	0.24	0.26	0.29	0.39	0.51	0.21	
Q40					0.27	0.33	0.42	0.52	0.64	0.25	
Q50						0.78	0.74	0.89	0.97	0.47	
Q60							0.88	0.97	0.91	0.54	
Q70								0.80	0.78	0.59	
Q75									0.89	0.48	
Q80										0.39	

IRELAND	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.85	0.74	0.69	0.73	0.86	0.86	0.45	0.42	0.36	0.21	0.51
Q20		0.70	0.33	0.49	0.68	0.94	0.32	0.29	0.25	0.12	
Q25			0.05	0.26	0.51	0.93	0.23	0.21	0.18	0.08	
Q30				0.92	0.78	0.51	0.56	0.49	0.44	0.21	
Q40					0.79	0.47	0.49	0.45	0.40	0.20	
Q50						0.49	0.35	0.35	0.32	0.16	
Q60							0.10	0.14	0.13	0.06	
Q70								0.76	0.65	0.36	
Q75									0.72	0.39	
Q80										0.46	

PORTUGAL	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.40	0.35	0.29	0.25	0.27	0.20	0.24	0.23	0.24	0.33	0.83
Q20		0.71	0.50	0.41	0.44	0.33	0.39	0.39	0.39	0.58	
Q25			0.55	0.44	0.54	0.40	0.45	0.45	0.46	0.66	
Q30				0.61	0.72	0.50	0.57	0.57	0.58	0.81	
Q40					0.98	0.67	0.73	0.74	0.74	0.99	
Q50						0.44	0.67	0.69	0.68	0.98	
Q60							0.93	0.96	0.98	0.74	
Q70								0.97	0.96	0.77	
Q75									0.98	0.74	
Q80										0.69	

UK	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0.02	0.07	0.04	0.01	0.03	0.26	0.11	0.07	0.29	0.79	0.18
Q20		1.00	0.54	0.14	0.44	0.78	0.87	0.66	0.80	0.46	
Q25			0.45	0.15	0.45	0.79	0.89	0.67	0.80	0.48	
Q30				0.29	0.73	0.48	0.78	0.98	0.53	0.34	
Q40					0.64	0.11	0.33	0.52	0.20	0.18	
Q50						0.09	0.50	0.77	0.33	0.26	
Q60							0.57	0.41	1.00	0.60	
Q70								0.61	0.60	0.40	
Q75									0.25	0.27	
Q80										0.51	

Notes to Table 8: i) The element in the Qj column and the Qi row is the p-value of a pair-wise test between the estimates at the j and the i quantiles, H_0: $\beta_j=\beta i$ and H_1: $\beta_j\neq\beta i$; ii) the joint equality test reports the p-value of the F-test H_0: $\beta_{0.10}=\beta_{0.20}= ...=\beta_{0.90}$ and H_1: $\beta_m\neq\beta_n$; for some $m\neq n$; iii) p-value < 0.10: significant at the 10% confidence level, p-value < 0.05: significant at the 5% confidence level, p-value < 0.01: significant at the 1% confidence level.

Table 6b. Tests for the equality of coefficients at different quantiles (P-value) – Skills Mismatch 2001 no tertiary

EUROPE	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00
Q20		0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	
Q25			0,00	0,00	0,00	0,00	0,00	0,00	0,00	0,00	
Q30				0,00	0,00	0,00	0,00	0,00	0,00	0,00	
Q40					0,00	0,00	0,00	0,00	0,00	0,00	
Q50						0,69	0,00	0,00	0,00	0,00	
Q60							0,00	0,00	0,00	0,00	
Q70								0,24	0,98	0,40	
Q75									0,27	0,71	
Q80										0,36	

AUSTRIA	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,58	0,67	0,79	0,91	0,80	0,65	0,66	0,70	0,70	0,69	0,89
Q20		0,99	0,88	0,75	0,48	0,39	0,40	0,43	0,45	0,42	
Q25			0,80	0,69	0,41	0,32	0,33	0,36	0,37	0,36	
Q30				0,80	0,45	0,36	0,39	0,43	0,44	0,44	
Q40					0,47	0,33	0,39	0,43	0,46	0,48	
Q50						0,47	0,60	0,72	0,74	0,76	
Q60							0,95	0,84	0,87	0,88	
Q70								0,74	0,85	0,88	
Q75									0,99	0,99	
Q80										0,98	

BELGIUM	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,61	0,76	0,18	0,26	0,08	0,15	0,15	0,13	0,09	0,15	0,43
Q20		0,78	0,24	0,47	0,18	0,34	0,32	0,28	0,21	0,31	
Q25			0,08	0,32	0,12	0,26	0,25	0,23	0,17	0,26	
Q30				0,65	0,67	0,96	0,96	0,87	0,67	0,82	
Q40					0,20	0,67	0,61	0,53	0,37	0,57	
Q50						0,40	0,67	0,82	0,86	0,94	
Q60							0,85	0,72	0,48	0,72	
Q70								0,71	0,42	0,79	
Q75									0,45	0,91	
Q80										0,78	

DENMARK	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,74	0,12	0,16	0,31	0,13	0,17	0,39	0,40	0,43	0,40	0,37
Q20		0,01	0,04	0,15	0,05	0,09	0,25	0,26	0,31	0,29	
Q25			0,92	0,46	0,98	0,92	0,52	0,53	0,49	0,67	
Q30				0,39	0,92	0,97	0,51	0,52	0,48	0,68	
Q40					0,18	0,44	0,86	0,90	0,80	0,97	
Q50						0,74	0,14	0,20	0,17	0,50	
Q60							0,08	0,21	0,19	0,59	
Q70								0,94	0,88	0,84	
Q75									0,79	0,86	
Q80										0,75	

FINLAND	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,99	0,78	0,31	0,93	0,91	0,75	0,77	0,76	0,97	0,95	0,98
Q20		0,66	0,20	0,93	0,90	0,77	0,77	0,76	0,97	0,96	
Q25			0,14	0,84	0,72	0,63	0,66	0,68	0,90	0,99	
Q30				0,21	0,27	0,29	0,39	0,44	0,70	0,84	
Q40					0,74	0,65	0,70	0,70	0,94	0,97	
Q50						0,71	0,79	0,78	0,99	0,92	
Q60							0,94	0,90	0,88	0,85	
Q70								0,90	0,82	0,81	
Q75									0,69	0,76	
Q80										0,89	

FRANCE	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,29	0,30	0,24	0,39	0,52	0,69	0,73	0,44	0,11	0,15	0,16
Q20		0,91	0,65	0,96	0,92	0,70	0,34	0,19	0,03	0,03	
Q25			0,63	0,99	0,88	0,67	0,33	0,18	0,03	0,03	
Q30				0,70	0,70	0,53	0,25	0,14	0,02	0,02	
Q40					0,83	0,61	0,28	0,15	0,02	0,02	
Q50						0,66	0,30	0,18	0,02	0,03	
Q60							0,33	0,17	0,01	0,04	
Q70								0,36	0,04	0,21	
Q75									0,13	0,58	
Q80										0,71	

GERMANY	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,15	0,18	0,23	0,32	0,55	0,74	0,55	0,61	0,66	0,69	0,69
Q20		0,87	0,80	0,54	0,34	0,23	0,43	0,34	0,30	0,36	
Q25			0,83	0,56	0,35	0,23	0,44	0,35	0,30	0,36	
Q30				0,55	0,33	0,17	0,42	0,32	0,28	0,34	
Q40					0,35	0,14	0,55	0,38	0,33	0,40	
Q50						0,33	0,89	0,87	0,76	0,79	
Q60							0,34	0,59	0,76	0,82	
Q70								0,66	0,63	0,69	
Q75									0,84	0,86	
Q80										0,98	

GREECE	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,34	0,61	0,99	0,73	0,93	0,44	0,77	0,84	0,83	0,30	0,66
Q20		0,64	0,35	0,62	0,51	0,93	0,70	0,69	0,47	0,16	
Q25			0,37	0,84	0,67	0,70	0,89	0,85	0,58	0,21	
Q30				0,54	0,92	0,36	0,76	0,84	0,81	0,30	
Q40					0,67	0,49	0,99	0,93	0,63	0,20	
Q50						0,12	0,76	0,87	0,74	0,24	
Q60							0,36	0,44	0,31	0,09	
Q70								0,88	0,50	0,15	
Q75									0,44	0,14	
Q80										0,27	

ITALY	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,56	0,37	0,56	0,66	0,88	0,77	0,68	0,49	0,31	0,13	0,29
Q20		0,58	0,92	0,27	0,46	0,41	0,95	0,69	0,49	0,22	
Q25			0,62	0,09	0,24	0,24	0,87	0,86	0,62	0,26	
Q30				0,07	0,30	0,30	0,99	0,71	0,47	0,18	
Q40					0,59	0,88	0,37	0,20	0,09	0,05	
Q50						0,78	0,49	0,29	0,15	0,07	
Q60							0,29	0,15	0,09	0,05	
Q70								0,49	0,28	0,15	
Q75									0,51	0,24	
Q80										0,33	

SPAIN	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,95	0,88	0,97	0,79	0,44	0,38	0,43	0,52	0,60	0,28	0,67
Q20		0,86	0,98	0,69	0,33	0,30	0,33	0,44	0,54	0,23	
Q25			0,82	0,54	0,21	0,24	0,28	0,38	0,49	0,20	
Q30				0,59	0,24	0,26	0,29	0,39	0,51	0,21	
Q40					0,27	0,33	0,42	0,52	0,64	0,25	
Q50						0,78	0,74	0,89	0,97	0,47	
Q60							0,88	0,97	0,91	0,54	
Q70								0,80	0,78	0,59	
Q75									0,89	0,48	
Q80										0,39	

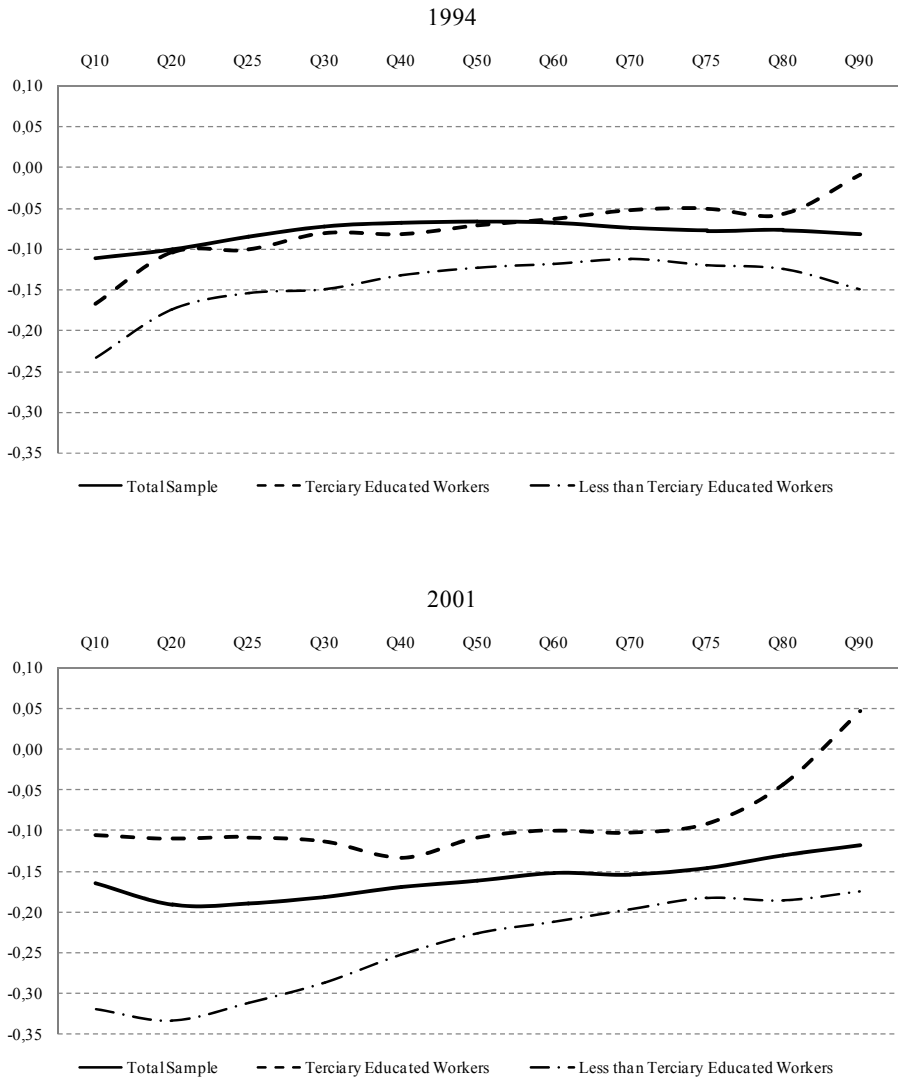
IRELAND	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,85	0,74	0,69	0,73	0,86	0,86	0,45	0,42	0,36	0,21	0,51
Q20		0,70	0,33	0,49	0,68	0,94	0,32	0,29	0,25	0,12	
Q25			0,05	0,26	0,51	0,93	0,23	0,21	0,18	0,08	
Q30				0,92	0,78	0,51	0,56	0,49	0,44	0,21	
Q40					0,79	0,47	0,49	0,45	0,40	0,20	
Q50						0,49	0,35	0,35	0,32	0,16	
Q60							0,10	0,14	0,13	0,06	
Q70								0,76	0,65	0,36	
Q75									0,72	0,39	
Q80										0,46	

PORTUGAL	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,40	0,35	0,29	0,25	0,27	0,20	0,24	0,23	0,24	0,33	0,83
Q20		0,71	0,50	0,41	0,44	0,33	0,39	0,39	0,39	0,58	
Q25			0,55	0,44	0,54	0,40	0,45	0,45	0,46	0,66	
Q30				0,61	0,72	0,50	0,57	0,57	0,58	0,81	
Q40					0,98	0,67	0,73	0,74	0,74	0,99	
Q50						0,44	0,67	0,69	0,68	0,98	
Q60							0,93	0,96	0,98	0,74	
Q70								0,97	0,96	0,77	
Q75									0,98	0,74	
Q80										0,69	

UK	Q20	Q25	Q30	Q40	Q50	Q60	Q70	Q75	Q80	Q90	Joint equality
Q10	0,02	0,07	0,04	0,01	0,03	0,26	0,11	0,07	0,29	0,79	0,18
Q20		1,00	0,54	0,14	0,44	0,78	0,87	0,66	0,80	0,46	
Q25			0,45	0,15	0,45	0,79	0,89	0,67	0,80	0,48	
Q30				0,29	0,73	0,48	0,78	0,98	0,53	0,34	
Q40					0,64	0,11	0,33	0,52	0,20	0,18	
Q50						0,09	0,50	0,77	0,33	0,26	
Q60							0,57	0,41	1,00	0,60	
Q70								0,61	0,60	0,40	
Q75									0,25	0,27	
Q80										0,51	

Notes to Table 8: i) The element in the Qj column and the Qi row is the p-value of a pair-wise test between the estimates at the j and the i quantiles, H_0: $\beta_j=\beta i$ and H_1: $\beta_j\neq\beta i$; ii) the joint equality test reports the p-value of the F-test H_0: $\beta_{0.10}=\beta_{0.20}= ...=\beta_{0.90}$ and H_1: $\beta_m\neq\beta_n$; for some $m\neq n$; iii) p-value < 0.10: significant at the 10% confidence level, p-value < 0.05: significant at the 5% confidence level, p-value < 0.01: significant at the 1% confidence level.

Figure 1. Quantile-return profile of the skills mismatch pay penalty – Europe



Appendix A. **Description of data source and estimating samples**

The European Community Household Panel (ECHP) is a sample of households and individuals who are interviewed over time. It is available from 1994 to 2001 for fifteen European countries. Individuals report personal and labour market characteristics, including educational attainment, hours worked and monthly wages. We have dropped workers with a monthly wage rate that is less than 10% or over 10 times the national average wage. Less than 0.2% of the working population is affected by this correction for outliers. The results reported in the paper are based on the waves corresponding to 1994 and 2001. We could not include Sweden and the Netherlands in the analysis, as the information on skill mismatched was missing in these countries. Luxemburg was neither considered due to the small number of years with information on skill mismatched. Data on Austria and Finland for 1994 refers to 1995 and 1996 respectively. In the following we describe the variables used in the paper, including their original name in the ECHP (in parenthesis).

Net hourly wage. Defined as monthly net salary in the main job divided by four times the weekly hours worked in the main job (PI211M, PE005A).

Tertiary education. Two dummy variables that are activated if the maximum level of education completed by the individual is tertiary education. The ECHP includes only three education categories, less than upper secondary, upper secondary and tertiary education. These education categories are constructed following the ISCED-97 classification (PT022).

Skills mismatch. Dummy, activated if the individual declares that his formal training and education did not give him skills needed for his present type of work (PE021).

Supervisor. Dummy, activated if the individual has a supervisory role in his job, zero if he has an intermediate level or a non-supervisory role (PE010).

Training. Dummy, activated if the individual received training from his employee (PT028).

Log hours. Logarithm of the number of hours worked per week in the main job. (PE005A).

Experience. Defined as age minus the age when the first job was obtained (PE003, PE039).

Tenure. Defined as the difference between the year of the survey and the year of the start of the current job. We have constructed three categories: from 0 to 4 years, from 5 to 14 years, and 15 years or more (PE011).

Married. Dummy variable. Takes the value 1 if the individual is married or cohabiting, zero if divorced, widowed, separated or never married (PD005).

Immigrant. Dummy. Activated if the individual was born in a foreign country (PM001).

Industry. Dummy. Takes the value 1 if the individual works in the industry sector, zero if he works in the service sector. The agricultural sector was dropped on the account of the particularities of this sector (PE007C)

Firm size. Individuals are asked to report the number of employees that actually work in their firm. We have constructed four categories, from 1 to 19 employees, from 20 to 99 employees, from 100 to 499 employees, and 500 employees or more (PE008).

Badhealth. Individuals are asked to report their health status according to five categories, ranging from 'very good' to 'very bad'. Badhealth is a dummy that activates when the answer is 1 ('very bad') or 2 ('Bad') (PH001).

Unemployment experience. Dummy. Takes the value 1 if the individual experienced an unemployment period before his current job, zero otherwise (PE014)

Occupation. A 9-point categorical variable transformed into 9 occupation dummies (PE006C).