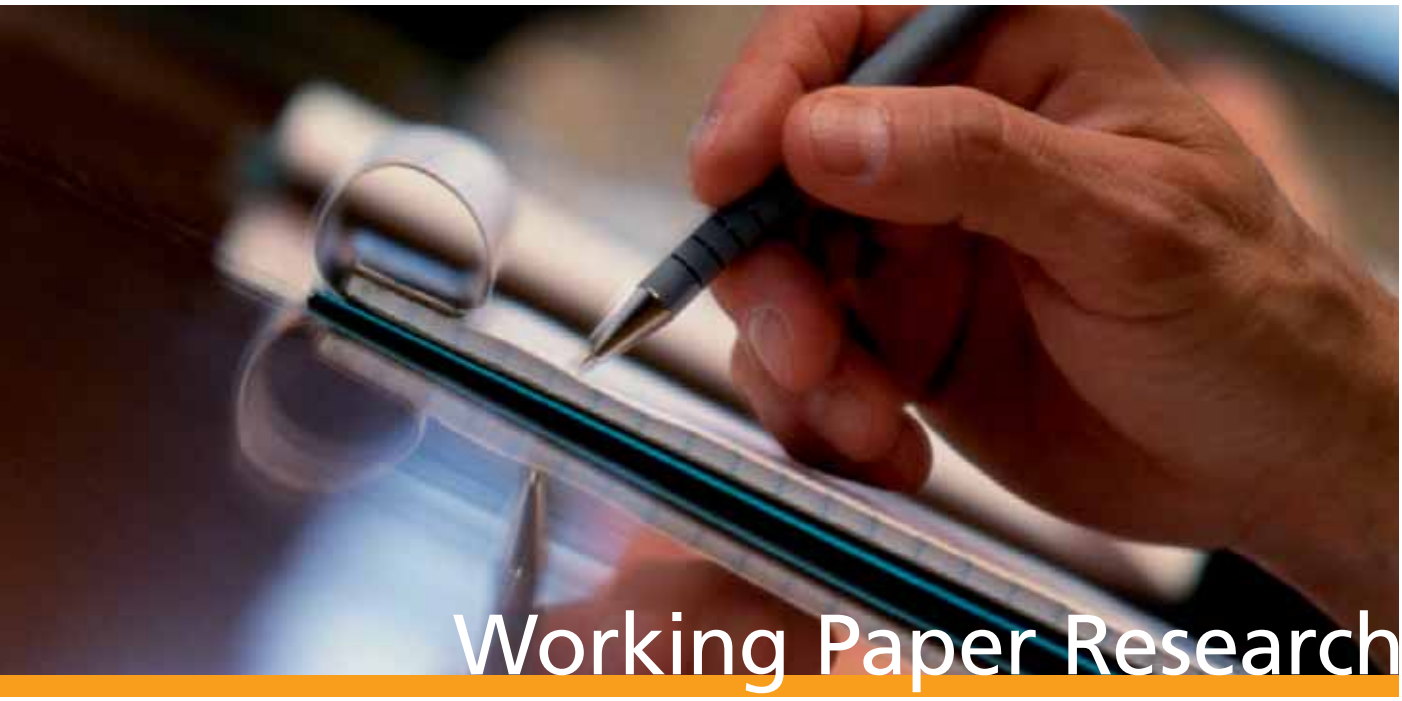
Inter-industry wage differentials in EU countries: What do cross-country time-varying data add to the picture?



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by Philip Du Caju, Gábor Kátay, Ana Lamo, Daphne Nicolitsas and Steven Poelhekke

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Abstract

This paper documents the existence of inter-industry wage differentials across a large number of industries for eight EU countries (Belgium, Germany, Greece, Hungary, Ireland, Italy, the Netherlands and Spain) at two different points in time (in general, 1995 and 2002). It then looks into possible explanations for the main patterns observed. The analysis uses the European Structure of Earnings Survey (SES), an internationally-harmonised matched employer-employee dataset, to estimate inter-industry wage differentials conditional on a rich set of employee, employer and job characteristics. After investigating the possibility that unobservable employee characteristics lie behind the conditional wage differentials, a hypothesis which cannot be accepted, the paper considers the role of institutional features, as well as industry structure and performance in explaining inter-industry wage differentials. The results suggest that inter-industry wage differentials are consistent with rent-sharing mechanisms and that rent-sharing is more likely in industries with firm-level collective agreements and with higher collective agreement coverage.

Key Words: inter-industry wage differentials, rent sharing, unobserved ability

JEL Classification: J31, J41, J51

Corresponding author:

Philip Du Caju, National Bank of Belgium, Research Department, philip.ducaju@nbb.be.
Gábor Kátay, Magyar Nemzeti Bank, katayg@mnb.hu.
Ana Lamo, European Central Bank, Ana.Lamo@ecb.int.
Daphne Nicolitsas, Bank of Greece, DNIKOLITSA@bankofgreece.gr.
Steven Poelhekke, De Nederlandsche Bank, S.Poelhekke@dnb.nl.

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1. Introduction

The discussion on the causes behind inter-industry wage differentials is still unresolved in the literature. One strand of the literature argues that such differentials are sizeable and only compatible with non-competitive theories of wage determination such as efficiency wage and rent sharing theories (see, for example, Krueger and Summers, 1987; Dickens and Katz, 1987). Another strand argues that inter-industry wage differentials are poorly measured and would significantly decrease in size if unobserved employer and employee effects were taken into account (see, for example, Murphy and Topel, 1987; Abowd, *et al.*, 1999; Carruth and Dickerson, 2004).

This paper provides additional evidence by exploiting cross-country, time varying information from eight European Union (EU) countries. The paper summarises work on this topic undertaken in the context of the Wage Dynamics Network (WDN).[1] More specifically, the paper starts by summarising the WDN evidence documenting the existence and persistence of inter-industry wage differentials for similar workers in comparable jobs in a large number of industries at two points in time (in general 1995 and 2002). The eight countries for which we have data (Belgium, Germany, Greece, Hungary, Ireland, Italy, Netherlands and Spain) represent a large proportion of the EU with different labour market institutions. Wage differentials are estimated using the so called Structure of Earnings Survey (SES), a dataset of matched employer-employee data, collected from a large sample of firms in each country. The SES contains rich information on the structure and distribution of earnings and on the individual characteristics of employers and employees on a comparable basis across countries, and thus provides a unique dataset to estimate inter-industry wage differentials. In addition, the fact that these data are available for two points in time, allows us to investigate the relationship between relative wage adjustments and changes in the industry structure and performance, changes in the degree of competition in both product and labour markets and changes in institutional features. The period covered is characterised by significant technological progress, economic globalization of European markets and changes in the environment in which European labour markets operate, which could have had an impact on the national wage structures. Having established the existence of sizeable raw and conditional wage differentials, the paper attempts to answer the following three questions. (a) Is there evidence to support the view that inter-industry wage differentials reflect

[1] The WDN is a ESCB/Eurosystem research network which studies the features and sources of wage and labour cost dynamics in EU countries. Recent work in a European context on the issue of inter-industry wage differentials was also conducted in the context of the *Pay Inequality and Economic Performance* project (PIEP) using only the 1995 SES data (see Marsden, 2005). While even more recently, Magda *et al*. (2008) look at the issue across a large number of countries using, however, only the 2002 SES data.

unobserved employee quality? (b) Are differences in industry rents and structure associated with the estimated conditional inter-industry wage differentials? (c) Do labour market institutions play a role in explaining differences across industries in their ability to capture rents?

The rest of the paper is structured as follows: the next section provides a selective overview of the related literature. Section 3 briefly describes the data sets used, Section 4 discusses the observed (raw) wage differentials in the 8 countries, and Section 5 presents and discusses the conditional differentials that emerge after having controlled for individual, job and firms' characteristics. Section 6 investigates the importance of unobserved workers' ability as a potential determinant of inter-industry wage differentials. Section 7 focuses on the hypothesis that conditional inter-industry wage differentials reflect rent-sharing between employers and employees. Finally, Section 8 concludes.

2. Literature review

The existence of industry wage differentials has been extensively documented in the economics literature. One of the earliest pieces of documentation is the evidence provided by Slichter (1950). In the late 1980s the interest in the topic was revived by a series of papers that focused on the US and investigated various facets of the issue. For example, Krueger and Summers (1987 and 1988), Murphy and Topel (1987) and Gibbons and Katz, (1992) looked at the role of unobserved quality in explaining inter-industry wage differentials; the influence of institutional factors, the persistence of these differentials over time and the similarity of the structure of wages across countries was addressed in Krueger and Summers (1987) and across occupations in Dickens and Katz (1987). All of the above studies conclude that industry wage differentials persist over time, but the explanations for this phenomenon differ. The aforementioned papers, with the exception of that of Murphy and Topel, appear to hold the view that inter-industry wage differentials cannot be explained by competitive labour market theories since individuals with similar ability appear to gain more in certain industries, and these are the same industries that pay higher wages across countries and over time. Non-competitive explanations along the lines of a combination of efficiency wage theories and rent sharing seem to fit the facts better. Murphy and Topel (1987), on the other hand, challenge this view by applying a different methodology taking into account the fact that the sorting of abilities across industries is correlated with job attributes. They conclude that about two-thirds of industry wage differentials are due to unmeasured worker characteristics while the remaining third is ascribed to compensation for the instability of jobs within certain industries.

The results of the ensuing literature would suggest that unobserved labour quality might be more important than found in the literature previously, and the similarity of the differentials across countries is not as great as claimed until then. One could say that since the late 1980s the literature has followed mainly three directions in trying to resolve the controversy between competitive and non-competitive explanations of inter-industry wage differentials. The first, is based on international comparisons (see, *inter alia*, the list of studies presented in Table 1), the second route focuses on the methodologies applied in measuring the magnitude of the differentials and on the various assumptions made about the endogeneity or otherwise of occupational and industry choice, while the third direction pertains to the exploration of longer panels of individuals (see, *inter alia*, Carruth *et al.*, 2004).

As already mentioned above, the verdict of the earlier literature regarding international comparisons was that despite certain differences in the magnitude of the inter-industry variation of wages, the rankings of industries remained relatively similar across countries a fact that was difficult to reconcile with an institutional factors' interpretation. Edin and Zetterberg (1992) is one of the first papers to question the similarity in the structures; using *micro* data for Sweden, the authors illustrate that the raw and conditional dispersion of wages in Sweden is narrower than in the US. They ascribe the difference between their findings and those reached in the earlier literature to the use of micro-level data, while earlier conclusions on cross-country comparisons were based on aggregate data. Zanchi (1995) using data for 5 countries (US, Canada, Australia, Germany and the Netherlands) also finds that there is not much similarity in the wage structure across countries. Both the Edin and Zetterberg and the Zanchi papers attribute the differences in the wage structure between countries to divergence in institutions.

As for the methodological differences, the 1990s literature on the topic makes use of more disaggregated industry information, uses individual level longitudinal data for long periods of time, explores the hypothesis that firm (rather than industry) wage policies are prevalent, and further examines the wage distribution within industries in order to test for evidence of differences in qualities between workers which are difficult to measure. Abowd, Kramarz and Margolis (1999) for example are able to separate worker and firm fixed effects and conclude that a large portion of wage variation in France is due to unobserved person fixed effects.[2] Goux and Maurin (1999) also estimate inter-industry wage differentials from a panel data set of individuals in France over the period 1990-95 and find that (a) the support

[2] Postel-Vinay and Robin (2002) allow for endogenous job mobility (on-the-job search) and search frictions. This creates heterogeneous bargaining power among firms and therefore different degrees of rent extraction. In that case the unobserved person effect is much smaller and decreases with the observed skill level of employees.

or otherwise of the unobserved quality hypothesis depends on the level of industry wage disaggregation used, (b) the most important factor in determining individuals' wages is not in which industry but in which firm the individual works in. Martins (2004) investigates the unobserved quality hypothesis by studying inter-industry wage differences in different quantiles of the distribution. The reasoning behind this line of investigation is that if unobserved ability is significant in explaining industry wage structure, industry wage differentials would be wider at the top quantile of the wage distribution. Using micro-level data for Portugal, Martins is unable, however, to find evidence in favour of the unobserved quality hypothesis. More recently, Gibbons *et al.* (2005) develop a model in which wage changes and sector mobility are endogenous. Their model is estimated using US longitudinal data for a large number of individuals over 17 years. The results suggest that while the higher wages paid in certain industries, such as *Financial intermediation* and *Professional and Business services* could be due to unobserved worker quality, this cannot explain the wage differences in *Extraction and Mining*, *Manufacturing* and *Construction*.

Table 1: Indicative studies on cross-country inter-industry wage differentials

Authors	Data	Countries and period covered	Main conclusions
Edin & Zetterberg (1992)	Micro-level data	Sweden and US for 1984	Magnitude of conditional inter-industry wage differentials significantly smaller in Sweden than in the US. Correlations of wage structures across countries estimated on the basis of wage differentials arising from aggregate data overestimate the similarities.
Gittleman & Wolff (1993)	Industry-level data	14 OECD countries, 1970-85	Ranking of industries within each country shows little variation over time. Size of differentials depends positively on productivity growth, output growth and capital intensity and negatively on the degree of import penetration.
Zanchi (1995)	Micro level data from the Luxembourg Income Study Databank	US (1986), Canada (1987), Australia (1986), Germany (1985), Netherlands (1987)	Little similarity of conditional wage differentials across countries. Importance of demographic, human capital and socio-economic characteristics in explaining inter-industry differentials varies across countries. Importance of institutional factors (e.g. degree of centralization of negotiations) in explaining cross-country differences in wage structure.
Erdil & Yetkiner (2001)	Industry-level data	20 countries, 1970-92	Wage structure similar across developed and developing world but explanations for this might differ across these two groups of countries.
Hartog, Opstal, & Teulings (1987)	Micro-level data	Netherlands and the US	Dutch and US wage differentials correlate strongly, but the standard deviation in The Netherlands is up to 50% smaller. Tenure profiles are flatter in The Netherlands and firm size matters less. The difference may be partly due to more the degree of bargaining centralisation.
Rycx, Tojerow & Valsamis (2008)	Micro-level data	6 West-European and 4 East-European countries, 2002	The ranking of sectors in terms of wages, even after controlling for characteristics, is quite similar in Eastern and Western European countries. A negative correlation between the dispersion of inter-industry wage differentials and the degree of corporatism across countries is found.

Source: Referenced papers.

3. Data

The present study is based on micro data from the first two waves (generally 1995 and 2002) of the Structure of Earnings Surveys (SES) carried out by the national statistical offices of Belgium, Germany, Greece, Hungary, Ireland, Italy, the Netherlands and Spain. The SES is a standardized survey conducted in 20 European countries. However, the choice of countries used in this paper was driven by data accessibility. From 2002, the survey is conducted every 4 years although at the moment this work was conducted only two waves were available.[3] The surveys are carried out on a sample of plants selected by stratified random sampling (stratification is done by economic activity, size and for certain countries region) while within plants a random sample of employees was chosen.[4] The SES provides individual earnings data for employees with detailed human capital and demographic characteristics per worker and information on firm (employer) features. The first wave refers to the mid-1990s (1995 for most countries, 1996 for Hungary and 1999 for Belgium), and the second wave refers to the start of the current decade (2002 for most countries except Germany for which it refers to 2001). The three main advantages of the data are: (a) the earnings information provided is standardised across countries, (b) this information is repeated over time and (c) since the data are collected through the employer, the measurement error usually associated with household data is much smaller.

The samples include, in most countries establishments with at least 10 employees, active in industry (including construction) and services.[5] The industries, at the 2-digit NACE rev 1.1. level, covered for each country are presented in Table A6, while a list with the description of each two-digit industry is given in Table A7. The sample of employees includes both full-time and part-time employees, but interim and occasional workers with the exception of apprentices are not sampled. The survey provides detailed information on monthly and annual earnings. The number of hours worked both normal and overtime, is also recorded. Employee characteristics include age, education, gender, citizenship, occupation, type of contract (fixed term or indefinite length), management or supervisory position, and length of tenure within the firm. Firm characteristics include region, industry, firm total employment, type of economic and financial control of the firm (private or public), the principal market for

[3] The most recent wave of the SES (2006) has only become available very recently and for a small number of the countries in this analysis.

[4] In Italy and the Netherlands employer information refers to the firm rather than the plant. The same is true for Belgium if the firm has several plants within the same municipality. For Hungary the sectoral classification of the unit of observation refers to the activity of the firm rather than the plant.

[5] This includes in general sections C to K of the economic activity classification scheme NACE rev. 1.1. Table A6 also presents details regarding sample size and the sectors covered in each country.

the firm's products, and the level at which wage bargaining takes place. A list and short description of the variables used in the analysis is presented in Table A5.

Four alternative measures of earnings were constructed, wherever possible, with the available data: (i) average annual earnings including overtime and regular bonuses but excluding irregular bonuses, (ii) average hourly earnings including regular bonuses and absences paid at full rate but excluding irregular bonuses, (iii) average hourly earnings including overtime, regular and irregular bonuses as well as absences paid at full rate, and (iv) total annual earnings before tax including all regular and irregular pay components. Our preferred variable is the first since this is the one typically used in similar studies and it was possible to construct it for every year and country.[6] For countries belonging to the Euro Area (EA) in 2002, monetary variables have been expressed in euros using the irrevocable exchange rates at which countries converted their national currencies to the euro.

The samples analysed for almost all countries contain both men and women aged between 16 and 65 years old.[7] In certain countries (Belgium, Greece, and Hungary) the sample includes only individuals in the private sector, while for the remaining countries public-private sector differences are taken into account by using a dummy in the regressions. The occupational classification used is the single-digit International Standard Classification of Occupations (ISCO-88) which organises occupations in ten main groups. The regressions contain occupational dummies for 8 groups.[8]

Individuals for which earnings information was either not available or which were thought to be outliers on the basis of their earnings information in the sample have been excluded. More specifically, workers with earnings falling below the first and above the 99th percentile within each sector have been excluded.[9] For each country the analysis is restricted to individuals belonging to sectors sampled in both waves.

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6 Except for Hungary, for which we cannot calculate it for 1996. Therefore, we use the second measure instead for both waves. We think this is a good proxy as in 2002 the two measures are very similar.

7 In Greece workers younger than 25 and older than 64 were excluded, to increase the homogeneity of the sample in terms of marital status which is a determinant of pay (married individuals receive a benefit equal to 10% of the basic wage) and is not available as a separate piece of information in 2002.

8 Employees classified as belonging either to the Armed Forces (ISCO group 0) or as 'Skilled agriculture and fishery workers' (ISCO group 6) have been excluded from the sample.

9 In Greece the excluded workers are those with monthly earnings less than 80% of the basic minimum monthly salary or over 20 times the basic minimum monthly salary.

4. Observed inter-industry differentials

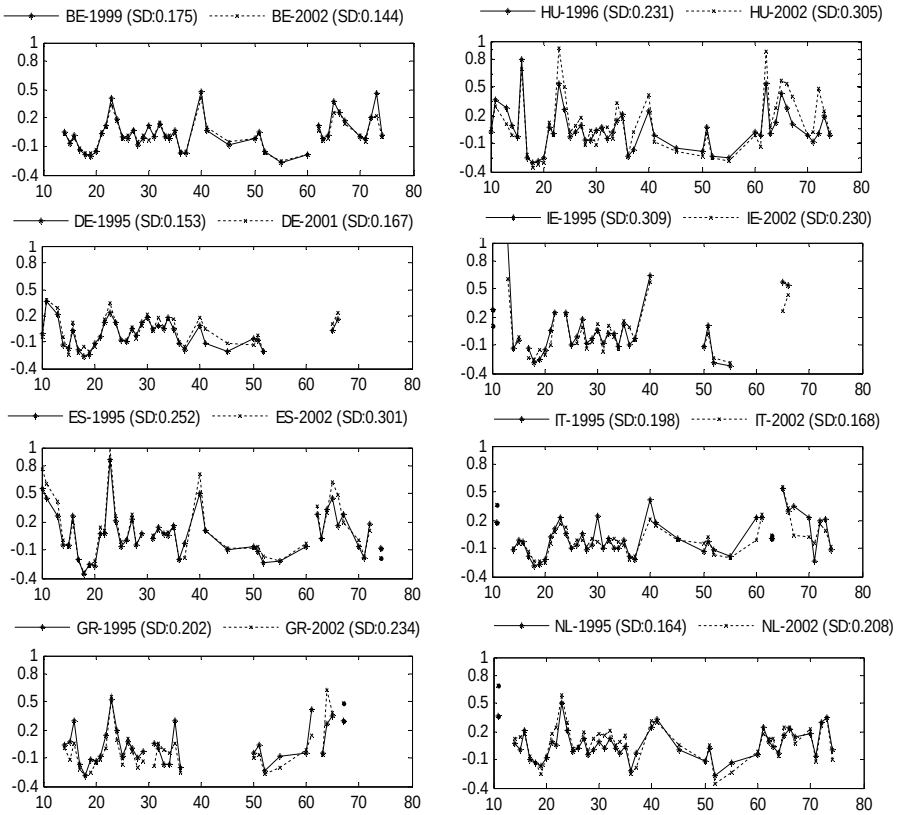
In this section we look at observed wage differentials across industries at the NACE2 level.[10] By this we mean raw differentials not controlling for worker, job or firm characteristics, calculated as the deviations of (log) mean sectoral wages from a measure of aggregate wages. Figure 1 summarises the main facts by plotting the raw industry differentials across around 40 2-digit (according to NACE Rev.1 classification) industries in each country in each of the two years for which SES data is available.[11] When comparing these differentials across countries and over the two years, the following four facts stand out. First, as already well-documented in the literature, inter-industry raw wage differentials are sizeable. In our sample, on average, the standard deviation of the raw differentials across countries and over time is around 22%. Second, the ranking of industries in terms of the size of the differentials appears to be similar across countries. In general, *Extraction and Mining*, *Petroleum, Nuclear and Chemical industries*, the *Utilities* and the *Financial and Insurance* sectors are amongst the highest paying industries in most countries. The lowest paying industries include *Clothing, Leather and Textiles* industries. Third, despite the similarity of industry rankings across countries, there appears to be some cross-country variation in the extent to which wages differ. Dispersion is highest in Spain, Ireland, Hungary, and Greece and lowest in Belgium, Germany and Italy. Fourth, differentials appear to persist over time. The Spearman rank correlation of the average observed wage differentials within countries between the two years varies between 0.8 and 0.9 (see Tables 2 and 3).

Appendix table A1 reports in more detail the observed wage differentials for eight EU countries in the first year of our sample where wage differences are expressed in 100 percentage points. Table A2 shows the same information for the second year.

[10] This level of classification is comparable to the 43 (2-digit SIC) industry groups used in Krueger and Summers (1988).

[11] The number of two-digit industries used in the analysis varies from 45 in the Netherlands to 31 in Ireland and 32 in Greece.

Figure 1: Raw industry wage differentials by two-digit NACE rev.1 industry, SES (industry classification code on the horizontal axes)



Industries classified as high and low paying respectively are more or less the same across countries; Table 2 reports Spearman rank correlation coefficients between observed industry wage differentials for all countries in 2002. The correlations range from 0.6226 between Ireland and Hungary to 0.9278 between Belgium and The Netherlands, and are all significant at the 5 p.c. level. While the rank correlation is very high, the data show cross-country differences in the actual size of the differentials by industry and in the overall extent of dispersion (Table 3). The observed wage differential for the *Chemical industries* varies from a mere 0.059 in Italy to 0.274 in Hungary, while the premium in the *Financial Intermediation* industry ranges from 0.582 in Ireland to only 0.04 in Germany. Similarly, at the lower end of the wage distribution where one finds industries that are classified as old in Europe, namely *Clothing, Leather and Textiles* industries and *Retail Trade* and *Hotels and Restaurants* - the negative observed differential for the *Clothing Industry* ranges from -0.127 in The Netherlands to -0.357 in Hungary, and in *Retail Trade* the negative premium lies between -0.160 in Italy and -0.360 in The Netherlands. As for the overall extent of dispersion this appears (Table 3) to be highest in Ireland, Spain, Hungary and Greece and lower in Belgium, Germany and Italy.

Table 2: Spearman rank correlation between observed wage differentials in countries in 2002

	BE	ES	DE[2]	GR	HU	IE	IT	NL
BE	1							
ES	0.9104*	1						
DE[2]	0.8626*	0.8443*	1					
GR	0.8400*	0.7757*	0.6957*	1				
HU	0.8635*	0.9078*	0.7435*	0.7574*	1			
IE	0.7461*	0.7296*	0.6757*	0.7391*	0.6226*	1		
IT	0.7748*	0.7530*	0.6809*	0.7574*	0.7139*	0.7591*	1	
NL	0.9278*	0.8983*	0.7774*	0.7539*	0.8096*	0.7217*	0.7296*	1

[2] Germany: 2001 instead of 2002. * Significant at the 5 p.c. level.

Table 3: Standard deviations of observed wage differentials in 1995 and 2002

	1995	2002	Change
BE[1]	0.175	0.144	-0.031
DE[2]	0.153	0.167	0.014
ES	0.252	0.301	0.049
GR	0.202	0.234	0.032
HU[3]	0.231	0.305	0.074
IE	0.309	0.230	-0.079
IT	0.198	0.168	-0.030
NL	0.164	0.208	0.044

[1] Belgium: 1999 instead of 1995.
[2] Germany: 2001 instead of 2002.
[3] Hungary: 1996 instead of 1995

Table 4: Spearman rank correlation of observed wage differentials between 1995 and 2002

BE[1]	DE[2]	ES	GR	HU[3]	IE	IT	NL
0.935	0.932	0.967	0.822	0.860	0.929	0.855	0.929

[1] Belgium: 1999 instead of 1995. [2] Germany: 2001 instead of 2002. [3] Hungary: 1996 instead of 1995. All correlations are significant at the 1 p.c. level.

Within countries, the ranking of sectors has remained broadly unchanged between 1995 and 2002. Table 4 shows that Spearman rank correlation coefficients of the industry rankings across the two years are highly significant (at the 1% level) and range from 0.822 in Greece to 0.967 in Spain. However, the change of the extent of dispersion varies across countries.

5. What role for observable workforce and job characteristics?

The observed differentials of the average wage across industries summarised in the previous section could reflect differences in worker and or job features across industries; an industry employing more skilled and productive workers is expected to offer higher wages. In this section we try to control for observable productive features of the employees and characteristics of the workplace they are employed in. To this effect we follow the literature

and rely on the estimates from extended Mincer (1974) equations for each year and each country. The estimated specification is of the following form

$$\ln w_i = \alpha + \sum_j \beta_j X_{ji} + \sum_k \gamma_k Y_{ki} + \sum_h \delta_h Z_{ih} + \eta_i \quad (1)$$

where w_i represents the wage of individual *i*, *X* is a vector of workers' observable individual and job related features (age, education, gender, citizenship, tenure, type of contract, management/supervisory position, etc.), *Y* is the vector of employers' characteristics (firm size, location, type of economic and financial control of the firm, principal market for the firm's products, level at which bargaining takes place, etc.).[12] Finally, *Z* represents the industry dummies. The parameters of interest are the δ_h where *h*=1,…,*H*, where *H+1* is the number of NACE 2-digit industries in each country sample, δ_h measures the wage differential, *ceteris paribus,* in industry *h* relative to the omitted industry *(H+1)*. Following Zanchi (1998) we calculate inter-industry wage differentials for all *H+1* industries with respect to a weighted (by sample employment) average as:

$$\begin{cases} d_{kh} = \delta_h - \pi \\ d_{H+1} = -\pi \end{cases} \quad (for\ h = 1,...,H) \qquad (2)$$

where

$\pi = \sum_{h=1}^{H} \overline{s}_h \delta_h \quad (for\ h = 1,...,H)$. With δ_h being the estimated sector coefficient from equation (1) and $\overline{s}_h = \frac{1}{N}\sum_{i=1}^{N} s_{h,i} \quad (for\ h = 1,...,H)$ being the sectoral employment share in the observed sample.

The standard errors of the industry wage differentials *d* in equation (1) can be calculated by adjusting those of the original OLS estimate δ_h. For that we transform the original variance-covariance matrix following Zanchi (1998):

$$\mathbf{var\text{-}cov}(\delta^*) = (\mathbf{K} - \mathbf{es}')(\mathbf{var\text{-}cov}(\delta))(\mathbf{K} - \mathbf{es}')'$$

where *K* is a ((*H*+1) x H) matrix constructed as the stack of an (*H*x*H*) identity matrix and a (1x*K*) row of zeros, *e* is a ((*H*+1)x1) vector of ones, *s* is the vector of employment shares of the *H* first industries, and $\mathbf{var\text{-}cov}(\delta)$ is the original variance-covariance matrix of the

[12] Appendix Table A5 lists all conditioning variables.

industry dummy coefficients. The standard errors of *d* are simply the square roots of the diagonal elements of this transformed variance-covariance matrix.

To transform the differentials from log points to 100 percentage points and also to take into account the fact that these are sample and population parameters we transform coefficient estimates according to:

$$\tilde{d} = \exp\left(d - 0.5 * \sigma_d^2\right) - 1$$

where *d* is the industry wage differential in log-points and $0.5 * \sigma_d^2$ half the variance of the industry wage differential (see Reilly and Zanchi, 2003).

Appendix Tables A3 and A4 report conditional wage premia for the eight EU countries, according to equation (2), using the coefficients on sector dummies estimated by equation (1).[13] The first point to note from Tables A3 and A4 is that inter-industry wage differences remain significant even after controlling for a comprehensive set of worker, job and firm characteristics. A large number of these differentials are significant at the 1% level and all of them are significant at the 5% level. Nevertheless, as expected, conditional wage differentials tend to be smaller in size than the observed ones. In fact, the differential explained through these characteristics can be substantial; as an example, note that in 2002 the highly positive observed wage differential for a worker in the *Coke, Petroleum Production and Nuclear Fuel* industry in Greece of 56.3%, and for a worker in the *Electricity, Gas and Water supply* in Ireland of 57.1% are reduced to conditional wage premia of 15.3% and 21.0% respectively (see tables A2 and A4). In the low-paying industries, wage penalties in 2002for workers in the Hungarian clothing industry of -35.7% and in the Dutch retail trade of -36.0% are reduced to differentials of -16.2% and -12.3% after conditioning.

The reduction in magnitude of the differentials once the conditioning factors are taken into account in general does not alter the ranking of sectors within each country. The Spearman correlation coefficients between observed and conditional wage differentials in 1995 and 2002, reported in Table 5, are all statistically significant different from zero and lie between 0.732 in Hungary in 1995 and 0.925 in Ireland in 1995.

[13] Estimates of the conditional inter-industry wage differentials for Greece and Spain have been borrowed from Izquierdo and Lamo (2008) and Nicolitsas (2008) respectively, that are also WDN research papers, follow the same methodology and use same data as in this paper. SES estimations for Italy, Ireland and Spain were done at the Safe Center in Eurostat and those for Germany via remote access at DEstat (Germany). The data for The Netherlands was accessible from Statistics Netherlands through remote access at De Nederlandsche Bank.

Table 5: Spearman rank correlation between observed and conditional wage differentials

	BE	DE	ES	GR	HU	IE	IT	NL
1995[1]	0.799	0.745	0.820	0.881	0.732	0.925	0.860	0.835
2002[2]	0.772	0.901	0.854	0.848	0.830	0.827	0.876	0.820

[1] Belgium: 1999 instead of 1995. 2002, Hungary: 1996 instead of 1995.[2] Germany: 2001. All correlations are significant at the 1% level.

Furthermore, the ranking of sectors in terms of conditional wage premia, as was the case with the observed wage premia, is very similar across countries. Spearman correlation coefficients of the rankings between countries, presented in Table 6, are mostly significant at the 5% level. High-wage jobs are still to be found in the *Extraction and Oil and Chemical* industries, as well as in *Financial Intermediation*. Conditional differentials are mostly negative in Clothing and Leather industries and in *Retail Trade* and *Hotels and Restaurants*.

Table 6: Spearman rank correlation between conditional wage differentials in countries in 2002

	BE	DE[1]	ES	GR	HU	IE	IT	NL
BE	1							
DE[1]	0.712*	1						
ES	0.924*	0.748*	1					
GR	0.616*	0.414*	0.723*	1				
HU	0.740*	0.616*	0.761*	0.456*	1			
IE	0.540*	0.370	0.405*	0.277	0.320	1		
IT	0.901*	0.511*	0.839*	0.660*	0.655*	0.471*	1	
NL	0.806*	0.526*	0.741*	0.474*	0.711*	0.424*	0.753*	1

[1] Germany: 2001 instead of 2002. * Significant at the 5% level.

Similarly to what was the case for observed wage differentials, the ranking of conditional industry wage premia has remained rather stable between 1995 and 2002. Table 7 shows highly significant (at the 1% level) rank correlation coefficients between the conditional wage differentials in 1995 and 2002 in each country, ranging from 0.735 in Hungary to 0.944 in Germany.

Table 7: Spearman rank correlation between conditional wage premia in 1995 and 2002

BE[1]	DE[2]	ES	GR	HU[3]	IE	IT	NL
0.772	0.944	0.865	0.788	0.735	0.765	0.738	0.813

1 Belgium: 1999 instead of 1995. 2 Germany: 2001 instead of 2002. 3 Hungary: 1996 instead of 1995. All correlations are significant at the 1% level.

Again, despite these similarities, we observe that differences across countries in terms of dispersion of these conditional wage differentials exist. The standard deviations of

conditional wage premia in the selected countries in 1995 and 2002, reported in Table 8, are, as expected, smaller than those of the observed wage differentials (Table 3). They are relatively high in Hungary, Spain, and Ireland and relatively low in Belgium and Germany. Between 1995 and 2002, the dispersion of conditional differentials decreased in Belgium, Greece, Hungary and Ireland; while it increased in Italy, Spain and The Netherlands, and remained more or less stable in Germany.[14]

Table 8: Standard deviations of conditional wage premia in 1995 and 2002

	1995	2002	Change
BE[1]	0.084	0.072	-0.012
DE[2]	0.089	0.090	0.001
ES	0.134	0.171	0.037
GR	0.123	0.104	-0.019
HU[3]	0.196	0.156	-0.040
IE	0.166	0.136	-0.030
IT	0.098	0.114	0.016
NL	0.086	0.102	0.016

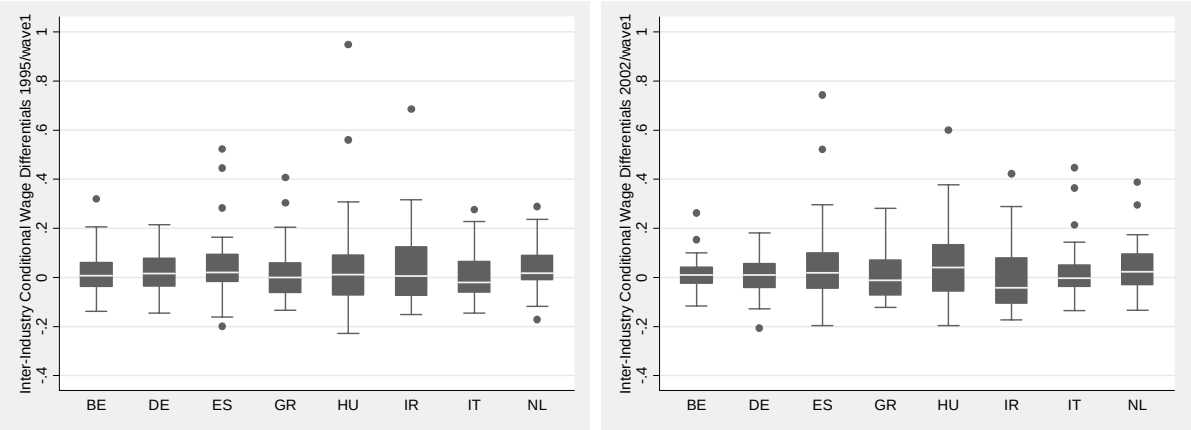
[1] Belgium: 1999 instead of 1995.
[2] Germany: 2001 instead of 2002.
[3] Hungary: 1996 instead of 1995.

An alternative way of presenting this information is Figure 2 which shows box plots of the conditional inter-industry wage differentials in each of the eight countries for both SES waves, thus providing an overview of the within country distribution of these wage differentials. The solid box comprises the observations from the 25th to the 75th decile; the horizontal line within the box represents the median, the upper and lower horizontal lines indicate the largest and smallest non-outlier observations, and the dots denote outliers. The spread is highest for Spain, Hungary and Ireland, and is lowest for Belgium and Germany.

It is the level of these remaining conditional differentials that we seek to explain in Section 7 after first having had a look at the role of unobserved personal effects in explaining industry wage differentials at each point in time.

[14] Comparing two points in time does not allow one to draw conclusions about trends in the movement of wage differentials. Du Caju *et al*. (2010) show that inter-industry wage differentials have decreased in Belgium between 1999 and 2002 and have risen after that and until 2005, more or less in phase with the economic cycle.

Figure 2: Distribution of conditional wage differentials in 1995 and 2002



6. What role for unobservable employee characteristics?

Having established that for the countries in our sample wage differentials across industries are not fully explained by worker, job and firms' characteristics, i.e. conditional wage differentials are still significant and show similar patterns to the observed ones, we now try to gather some evidence on whether unobserved quality of workers could be a factor behind these differentials. For that we follow Martins (2004) who argues that if conditional wage differentials reflect compensation for unobservable labour quality one would expect the wage premia to be higher at the top end of the distribution. Our results do not lend support to this hypothesis.

We first test, for each industry, whether workers at the 90th percentile of the wage distribution receive on average higher wage premia than those at the 10th percentile. Appendix Tables A8 show the difference between the conditional differentials for each country and year, resulting from the estimation of extended Mincer regressions at the 10th and the 90th percentiles. It also shows the p-value from an F-test of the hypothesis that the differentials at the 10th and the 90th percentiles are equal. Industries are ordered in ascending order of the size of the premium arising from estimation over the whole distribution (i.e. following the estimates presented in Tables A3 and A4). The evidence reveals that while in most countries and industries, the differences between 90th and 10th percentile are significant, in most instances the wage differentials are *higher* at the lower end of the distribution (10th) than at the top end of the distribution (90th), which goes against the unobserved quality hypothesis. Furthermore, Table A8 which summarises this information and presents the average difference in the differentials separately for low-wage industries and for high-wage industries, shows that in a number of instance the differential is

not more positive for the highest paying industries. We therefore do not find evidence to support the unobservable quality hypothesis as an explanation of industry wage differentials.

7. What role for industry structure, performance and labour market institutions?

So far we have concluded that in contrast with the predictions of competitive labour market models, identical workers performing comparable jobs but working in different industries are paid different wages. We next turn to explore the role of industry specific characteristics and labour market institutions in explaining the conditional wage differentials across industries, with the aim of investigating rent sharing theories.[15] In terms of the equations presented in Section 5 the object of interest in this section (the dependent variable) is variable $\hat{d}_k$ from equation 2.

The estimated specification is the following:

$$\hat{d}_{kt} = \gamma_0 + \theta_j + \mu_t + \sum_{i=1} \gamma_i * Q_{ikt} + \sum_{i=1} \lambda_i * V_{jt} + \varepsilon_{kt} \qquad (3)$$

where θ_j are country dummies, μ_t are wave dummies, Q_{ikt} are a set of industry-level variables (gross operating surplus per employee, share of small firms in the industry) and V_{jt} represent country-level institutional variables capturing for example the extent of collective agreement coverage in the industry.

We first confront the wage differentials with several measures of industry rents. Table 9 (columns 1-5) shows that industry rents are positively correlated with industry wage differentials supporting the view that industries share rents with their workers. Rents are proxied here by the average real gross operating surplus per employee in the industry; similar results arise, however, with other proxies (e.g. real value added per employee). There is also some evidence that the importance of rent sharing differs across industries; interacting the rents variable with dummies for eight standard groups of industries, the results (not shown) suggest that the elasticity of the wage differential with respect to rents is higher in mining-refining, utilities and financial intermediation.[16]

Next, we look at measures of product market competition, the understanding being that more intense product market competition implies lower rents to be shared. Table 9 shows that there is a negative relationship between sector-level competition and industry wage

[15] Support for rent sharing in one of the countries in our sample, namely Belgium, is also well documented in Du Caju *et al.* (forthcoming) who use firm-level rents data and show that wage differentials decrease substantially when controlling for firms profits.

[16] The non-homogeneity of this elasticity across sectors is also found by Gibbons *et al.* (2005).

differentials (columns 2 and 3). Product market competition is proxied by the share of firms with less than 20 employees, the results however are robust to other proxies such as, for example, the industry price cost mark-ups estimated by Christopoulou and Vermeulen (2008).

Table 9: Rent sharing and institutions as explanations of wage differentials

	(1)	(2)	(3)	(4)	(5)	(6)
	Levels					Change
Rents						
Real gross operating surplus per worker (GOS)	0.049***		0.038***	0.074***	0.045***	0.026*
	(0.014)		(0.011)	(0.020)	(0.016)	(0.015)
PM competition						
% of small firms in the industry		-0.347***	-0.295***			
		(0.057)	(0.076)			
Bargaining structures						
% firms with firm-level collective agreement *GOS				0.030*		
				(0.016)		
Collective agreement coverage* GOS					0.062***	
					(0.020)	
Observations	526	517	423	229	206	260
R^2	0.18	0.24	0.37	0.51	0.60	0.08

Notes: 1. OLS regressions weighted by the average sample size of the regression used to calculate the wage differentials. Robust s.e. in brackets. *** p<0.01, ** p<0.05, * p<0.1. All regressions include country dummies and where appropriate also wave fixed effects. 2. In column (6) GOS is measured as the change between the two waves. 3. GOS is not available for Ireland; information on the share of small firms per industry is missing for Greece. The sample in columns (4) and (5) include only the second wave since the bargaining structures data are only available at one point in time.

Delving a little deeper, we also investigate whether differences in the degree of rent sharing are related to union clout. To this effect we investigate the role of two variables describing bargaining structures: the percentage of firms in the industry with a firm-level collective agreement, and the extent of collective agreement coverage in the industry.[17] The results (as shown in the interaction terms in columns 4 and 5) suggest that rent sharing is more intense, the higher the percentage of firms with a firm-level collective agreement in the industry and the higher the collective agreement coverage. Of course, the former result by no means establishes a causal relationship since high rent sharing could impact bargaining structures.

It must further be noted that despite being small, the changes in wage differentials from the first to the second wave in our sample are significantly correlated with the change in industries' rents (see column 6 Table 9).

[17] The data on the percentage of firms with a collective agreement and collective agreement coverage are drawn from the WDN firm-level survey (see Druant *et al.*, 2009 for details), and do not vary over time. Country-level information gathered by the WDN (see Du Caju *et al.*, 2008) shows that these variables have remained rather stable in the countries under review between the two reference points in time.

Although we cannot with the available data formally exclude other non-competitive explanations of the conditional differentials (e.g. efficiency wages), we can conclude from the above that inter-industry wage differentials are consistent with rent sharing.

Finally, in an attempt to find out which factors are associated with wider dispersion of the inter-industry wage differential we correlate the standard deviations of the conditional wage premia (presented in Table 8) with a number of institutional variables (Product Market Regulation, Barriers to Competition, Barriers to Entrepreneurship; Employment Protection Legislation, Trade Union Density, Degree of Co-ordination in wage bargaining, Bargaining centralization). These correlations, presented in Table 10, are in most instances not statistically significant. One which comes out quite significant, however, is the correlation between the standard deviation of the conditional wage premia and the degree of bargaining co-ordination. in line with the general finding in the literature (see, for example, Freeman, 2007) that wage bargaining co-ordination is associated with less wage inequality; the higher is the level of co-ordination the lower is the standard deviation of the inter-industry wage differentials.

Table 10: Correlation coefficients between the dispersion of differentials and a number of variables capturing institutional product and labour market characteristics

	PMR	BTC	BTE	EPL	TUD	CO	CE
SDCWP	0.13	0.09	-0.35	-0.42*	0.033	-0.70***	-0.29

Notes: Total number of observations used is 16 (8 countries * 2 waves). SDCWP: Standard deviation of the conditional wage premia (see Table 8), PMR: Product market regulation index from the OECD PMR Database (www.oecd.org/eco/pmr); the higher the value of the index the more regulation exist; BTC and BTE: Barriers to Competition and Entrepreneurship respectively from the OECD PMR database (www.oecd.org/eco/pmr); EPL: Employment Protection Legislation Index (version 2) from the OECD database (OECD (2004) Table A2.4, p.117 (the higher the value of the index the more employment protection exists); TUD: trade union density figures from OECD Statistics database; CO: index of bargaining coordination from OECD Statistics database; CE: index of bargaining centralization from OECD Statistics database. Significance at the 10%, 5% and 1% levels denoted by *, ** and *** respectively.

8. Conclusions

Using the European SES for eight countries and two points in time this paper shows that inter-industry wage differentials are significant and persist over time. Summarizing, we find that:

(i) The ranking of sectors in terms of observed wage differentials, in the EU countries we study is persistent over time and similar across countries;

(ii) A rich set of observable workforce and job characteristics explain less than half of the raw inter-industry wage differentials;

(iii) The ranking of sectors in terms of conditional differentials is similar to that in terms of observed wage differentials and exhibits stability over time and great similarity across countries;

(iv) The dispersion of observed and conditional wage differentials differs across countries and time. Dispersion is relatively high in Hungary, Spain and Ireland and relatively low in Belgium and Germany;

(v) There is no evidence to support the unobserved quality hypothesis as an explanation of these conditional differentials;

(vi) Confronting the conditional wage differentials with industry-level measures of profits and of product market competition, we find that inter-industry wage differentials may reflect inter industry variation in rents and industry structure. Rent-sharing is enhanced by collective bargaining coverage in general and by firm-level agreements in particular.

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Appendix

Table A1. Observed wage differentials in 1995

	BE[1]	ES	DE	GR	HU[2]	IE	IT	NL
10 Mining of coal and lignite, extraction of peat	.	0.567	-0.009	.	0.024	0.276	.	.
11 Extraction of petroleum and gas	.	0.452	0.372	.	0.371	.	0.179	0.374
13 Mining of metal ores	.	0.266	0.225	.	0.276	1.105	.	.
14 Other mining and quarrying	0.047	-0.046	-0.133	0.033	0.087	-0.137	-0.111	0.069
15 Food products and beverages	-0.063	-0.041	-0.170	0.080	-0.032	-0.043	-0.014	0.013
16 Tobacco products	0.021	0.270	0.041	0.302	0.798	.	-0.023	0.219
17 Textiles	-0.140	-0.202	-0.191	-0.165	-0.247	-0.139	-0.191	-0.095
18 Clothing	-0.191	-0.356	-0.253	-0.291	-0.307	-0.291	-0.290	-0.130
19 Leather	-0.210	-0.261	-0.251	-0.118	-0.295	-0.261	-0.262	-0.166
20 Wood and cork	-0.156	-0.278	-0.113	-0.126	-0.257	-0.148	-0.226	-0.083
21 Paper	0.041	0.079	-0.040	-0.075	0.080	0.055	0.021	0.093
22 Printing and publishing	0.117	0.078	0.128	0.149	0.000	0.243	0.108	0.056
23 Coke, petrol. prod. and nuclear fuel	0.412	0.877	0.230	0.519	0.537	.	0.237	0.516
24 Chemical and chemical products	0.193	0.213	0.127	0.192	0.274	0.250	0.059	0.222
25 Rubber and plastic products	0.005	-0.065	-0.075	-0.084	-0.022	-0.095	-0.100	-0.008
26 Other non-metallic mineral products	-0.009	0.004	-0.098	0.068	0.018	-0.017	-0.070	0.025
27 Basic metals	0.064	0.227	0.057	-0.001	0.094	0.185	0.059	0.123
28 Fabricated metal products	-0.087	-0.054	-0.023	-0.092	-0.055	-0.078	-0.109	-0.040
29 Machinery and equipment	-0.015	0.083	0.121	-0.028	-0.059	-0.032	-0.055	0.003
30 Office machinery and computers	0.124	.	0.189	.	0.039	0.065	0.254	0.091
31 Electrical machinery and apparatus	0.000	0.015	0.043	0.057	0.077	-0.074	-0.095	0.024
32 Radio, television and communication equipment	0.130	0.141	0.081	0.014	-0.043	0.025	0.002	0.124
33 Medical, precision and optical instruments, watches and clocks	0.004	0.078	0.048	-0.171	0.025	0.031	-0.105	0.022
34 Motor vehicles and trailers -trailers	-0.022	0.062	0.173	-0.160	0.136	-0.107	-0.091	-0.027
35 Other transport equipment	0.067	0.162	0.045	0.302	0.222	0.126	-0.018	0.042
36 Furniture, manufacturing	-0.165	-0.207	-0.108	-0.204	-0.232	-0.103	-0.180	-0.213
37 Recycling	-0.166	-0.025	-0.179	.	-0.160	-0.035	-0.214	-0.022
40 Electricity, gas and water supply	0.477	0.516	0.095	.	0.240	0.642	0.418	0.244
41 Collection, purification and distribution of water	0.078	0.114	-0.108	.	-0.004	.	0.182	0.341
45 Construction	-0.084	-0.092	-0.211	.	-0.147	.	0.007	0.006
50 Sale, maintenance and repair of motor vehicles and motorcycles	-0.020	-0.071	-0.061	-0.049	-0.176	-0.112	-0.129	-0.109
51 Wholesale trade	0.053	-0.109	-0.081	0.036	0.072	0.108	-0.029	0.025
52 Retail trade	-0.158	-0.244	-0.202	-0.233	-0.239	-0.287	-0.123	-0.279
55 Hotels and restaurants	-0.279	-0.217	.	-0.079	-0.246	-0.319	-0.188	-0.125
60 Land transport and pipelines	-0.180	-0.058	.	-0.045	0.018	.	0.239	-0.051
61 Water transport	.	.	.	0.413	-0.004	.	0.231	0.247
62 Air transport	0.119	0.286	.	.	0.548	.	.	0.096
63 Transport activities	-0.020	0.020	.	-0.041	0.002	.	0.001	0.039
64 Post and telecommunications	0.022	0.328	.	0.268	0.119	.	.	-0.030
65 Financial intermediation	0.372	0.451	0.040	0.352	0.433	0.582	0.538	0.166
66 Insurance and pension funding	0.256	0.155	0.164	.	0.283	0.541	0.301	0.223
67 Activities auxiliary to fin. intermed.	0.164	0.284	.	0.293	0.105	.	0.359	0.137
70 Real estate activities	0.000	-0.055	.	.	-0.006	.	0.223	0.174
71 Renting of machinery	-0.020	-0.185	.	.	-0.088	.	-0.236	-0.056
72 Computer and related activities	0.213	0.177	.	.	0.004	.	0.199	0.295
73 Research and development	0.456	.	.	.	0.202	.	0.212	0.356
74 Other businesses activities	0.016	-0.078	.	.	-0.018	.	-0.115	0.007

[1] 1999 for Belgium, [2] 1996 for Hungary

Table A2. Observed wage differentials in 2002

	BE	ES	DE[1]	GR	HU	IE	IT	NL
10 Mining of coal and lignite, extraction of peat	.	0.759	-0.047	.	0.061	0.106	.	.
11 Extraction of petroleum and gas	.	0.610	0.385	.	0.297	.	0.364	0.692
13 Mining of metal ores	.	0.416	0.296	.	0.118	0.607	.	.
14 Other mining and quarrying	0.035	-0.001	-0.047	0.012	-0.009	-0.127	-0.099	0.126
15 Food products and beverages	-0.053	-0.064	-0.236	-0.109	-0.022	-0.003	-0.042	0.150
16 Tobacco products	-0.014	0.195	0.131	0.065	0.705	.	-0.042	0.182
17 Textiles	-0.118	-0.207	-0.218	-0.213	-0.220	-0.243	-0.133	-0.055
18 Clothing	-0.161	-0.344	-0.158	-0.295	-0.357	-0.246	-0.242	-0.127
19 Leather	-0.171	-0.268	-0.199	-0.259	-0.314	-0.158	-0.236	-0.257
20 Wood and cork	-0.135	-0.220	-0.144	-0.152	-0.303	-0.201	-0.253	-0.058
21 Paper	0.053	0.139	-0.043	-0.109	0.126	-0.091	-0.050	0.172
22 Printing and publishing	0.108	0.105	0.168	-0.002	-0.011	0.255	0.072	0.254
23 Coke, petrol. prod. and nuclear fuel	0.335	1.039	0.338	0.563	0.923	.	0.154	0.586
24 Chemical and chemical products	0.180	0.272	0.133	0.093	0.505	0.230	0.134	0.297
25 Rubber and plastic products	-0.013	-0.015	-0.072	-0.162	0.017	-0.106	-0.092	0.026
26 Other non-metallic mineral products	0.012	0.014	-0.076	0.114	0.084	-0.073	-0.015	0.047
27 Basic metals	0.064	0.287	0.071	-0.031	0.179	0.101	-0.016	0.201
28 Fabricated metal products	-0.052	-0.047	-0.062	-0.195	-0.116	-0.139	-0.077	-0.012
29 Machinery and equipment	0.013	0.080	0.091	-0.139	0.044	-0.064	0.000	0.121
30 Office machinery and computers	-0.030	.	0.210	.	-0.110	0.134	-0.028	0.184
31 Electrical machinery and apparatus	0.012	0.050	0.040	-0.176	0.037	-0.171	-0.075	0.158
32 Radio, television and communication equipment	0.147	0.102	0.181	0.053	0.080	0.104	-0.025	0.206
33 Medical, precision and optical instruments, watches and clocks	0.010	0.078	0.069	-0.008	-0.048	-0.009	-0.001	0.059
34 Motor vehicles and trailers -trailers	0.016	0.094	0.155	-0.040	0.329	-0.135	-0.030	0.097
35 Other transport equipment	0.042	0.146	0.161	0.056	0.162	0.157	-0.055	0.161
36 Furniture, manufacturing	-0.147	-0.203	-0.090	-0.245	-0.234	0.085	-0.222	-0.248
37 Recycling	-0.158	-0.186	-0.156	.	0.029	-0.046	-0.177	-0.181
40 Electricity, gas and water supply	0.404	0.711	0.175	.	0.419	0.571	0.222	0.315
41 Collection, purification and distribution of water	0.111	0.113	0.052	.	-0.077	.	0.145	0.294
45 Construction	-0.056	-0.077	-0.123	.	-0.191	.	-0.015	0.065
50 Sale, maintenance and repair of motor vehicles and motorcycles	-0.024	-0.076	-0.137	-0.096	-0.229	-0.111	-0.045	-0.121
51 Wholesale trade	0.031	-0.065	-0.021	-0.071	-0.001	0.020	0.023	0.055
52 Retail trade	-0.171	-0.164	-0.200	-0.262	-0.253	-0.228	-0.160	-0.360
55 Hotels and restaurants	-0.261	-0.225	.	-0.204	-0.282	-0.283	-0.208	-0.244
60 Land transport and pipelines	-0.180	-0.025	.	-0.015	-0.013	.	-0.013	-0.007
61 Water transport	.	.	.	0.153	-0.131	.	0.269	0.176
62 Air transport	0.075	0.371	.	.	0.888	.	.	0.121
63 Transport activities	-0.030	0.030	.	-0.063	0.072	.	0.043	0.122
64 Post and telecommunications	-0.018	0.307	.	0.633	0.287	.	.	-0.059
65 Financial intermediation	0.250	0.624	0.100	0.382	0.584	0.272	0.566	0.242
66 Insurance and pension funding	0.271	0.489	0.228	.	0.548	0.436	0.326	0.250
67 Activities auxiliary to fin. intermed.	0.139	0.189	.	0.482	0.401	.	0.042	0.074
70 Real estate activities	0.012	0.009	.	.	-0.007	.	0.015	0.233
71 Renting of machinery	-0.044	-0.173	.	.	0.024	.	-0.044	-0.107
72 Computer and related activities	0.206	0.116	.	.	0.483	.	0.167	0.265
73 Research and development	0.215	.	.	.	0.255	.	0.099	0.357
74 Other businesses activities	0.000	-0.179	.	.	0.015	.	-0.084	-0.096

[1] 2001 for Germany

Table A3. Conditional wage premia in 1995

	BE[1]	ES	DE	GR	HU[2]	IE	IT	NL
10 Mining of coal and lignite, extraction of peat	.	0.522	-0.115	.	0.091	0.058	.	.
11 Extraction of crude petroleum and natural gas	.	0.164	0.180	.	0.228	.	0.065	0.236
13 Mining of metal ores	.	0.109	0.214	.	0.561	0.685	.	.
14 Other mining and quarrying	0.079	0.088	-0.013	0.107	0.224	-0.152	-0.031	0.108
15 Food products and beverages	-0.004	-0.007	-0.083	0.031	0.054	-0.039	0.033	0.058
16 Tobacco products	0.061	0.132	0.085	0.100	0.948	.	0.023	0.167
17 Textiles	-0.043	-0.161	-0.119	-0.062	-0.113	-0.077	-0.097	-0.026
18 Clothing	-0.115	-0.199	-0.141	-0.126	-0.131	-0.076	-0.145	-0.011
19 Leather	-0.079	-0.106	-0.146	0.006	-0.128	-0.113	-0.118	-0.039
20 Wood and cork	-0.050	-0.126	-0.020	-0.062	-0.083	-0.061	-0.113	-0.005
21 Paper	0.069	0.024	-0.005	-0.031	0.111	0.128	0.065	0.094
22 Printing and publishing	0.092	0.039	0.145	0.054	-0.012	0.161	0.074	0.018
23 Coke, petrol. prod. and nuclear fuel	0.205	0.446	0.118	0.156	0.283	.	0.121	0.289
24 Chemical and chemical products	0.102	0.061	0.043	0.059	0.143	0.142	0.014	0.111
25 Rubber and plastic products	0.029	-0.016	-0.033	-0.003	0.011	0.007	-0.039	-0.003
26 Other non-metallic mineral products	0.032	0.042	-0.037	0.060	0.088	0.005	-0.024	0.027
27 Basic metals	0.055	0.093	0.043	0.002	0.113	0.099	0.038	0.050
28 Fabricated metal products	-0.011	0.013	0.009	-0.057	0.007	-0.015	-0.032	-0.028
29 Machinery and equipment	-0.014	0.025	0.041	-0.066	-0.030	-0.009	-0.039	-0.022
30 Office machinery and computers	0.043	.	0.057	.	0.035	0.020	0.003	-0.012
31 Electrical machinery and apparatus	0.006	-0.009	0.016	-0.003	0.043	-0.012	-0.060	-0.009
32 Radio, television and communication equipment	0.023	0.006	0.020	-0.089	-0.057	0.029	-0.030	-0.001
33 Medical, precision and optical instruments, watches and clocks	-0.022	-0.040	0.016	-0.134	-0.044	0.023	-0.056	-0.027
34 Motor vehicles and trailers -trailers	-0.003	0.016	0.103	-0.092	0.061	-0.074	-0.058	-0.040
35 Other transport equipment	0.027	0.052	0.020	0.041	0.047	-0.009	-0.071	-0.005
36 Furniture, manufacturing	-0.089	-0.115	-0.036	-0.101	-0.095	-0.032	-0.098	-0.171
37 Recycling	-0.047	0.074	-0.029	.	0.005	0.125	-0.081	0.006
40 Electricity, gas and water supply	0.319	0.283	0.090	.	0.151	0.316	0.228	0.133
41 Collection, purification and distribution of water	-0.038	0.124	0.109	.	0.018	.	0.121	0.185
45 Construction	0.019	0.032	0.078	.	-0.072	.	0.054	0.030
50 Sale, maintenance and repair of motor vehicles and motorcycles	0.008	0.012	-0.038	-0.045	-0.086	-0.076	-0.018	-0.070
51 Wholesale trade	0.005	-0.061	-0.094	0.036	0.061	0.068	-0.020	0.011
52 Retail trade	-0.064	-0.098	-0.111	-0.100	-0.157	-0.146	-0.041	-0.117
55 Hotels and restaurants	-0.138	-0.011	.	-0.026	-0.144	-0.137	-0.065	0.022
60 Land transport and pipelines	-0.092	0.006	.	-0.016	-0.010	.	0.146	-0.006
61 Water transport	.	.	.	0.406	-0.162	.	0.038	0.126
62 Air transport	0.102	0.120	.	.	0.307	.	.	0.018
63 Transport activities	-0.027	0.012	.	0.002	-0.008	.	0.053	0.041
64 Post and telecommunications	-0.049	0.114	.	0.204	0.029	.	.	-0.043
65 Financial intermediation	0.131	0.095	0.050	0.191	0.237	0.243	0.276	0.090
66 Insurance and pension funding	0.074	-0.028	0.011	.	-0.056	0.213	0.130	0.076
67 Activities auxiliary to fin. intermed.	0.052	0.148	.	0.304	-0.044	.	0.154	0.099
70 Real estate activities	0.015	0.066	.	.	0.065	.	0.215	0.130
71 Renting of machinery	0.007	-0.018	.	.	0.012	.	-0.108	0.017
72 Computer and related activities	-0.028	-0.017	.	.	-0.228	.	0.014	0.074
73 Research and development	0.117	.	.	.	-0.096	.	-0.067	0.083
74 Other businesses activities	-0.014	-0.079	.	.	-0.047	.	-0.057	-0.008

[1] 1999 for Belgium
[2] 1996 for Hungary

Table A4. Conditional wage premia in 2002

	BE	ES	DE[1]	GR	HU	IE	IT	NL
10 Mining of coal and lignite, extraction of peat	.	0.742	-0.207	.	0.206	-0.057	.	.
11 Extraction of crude petroleum and natural gas	.	0.280	0.182	.	0.295	.	0.447	0.387
13 Mining of metal ores	.	0.226	0.172	.	0.047	0.422	.	.
14 Other mining and quarrying	0.057	0.132	-0.007	0.097	0.158	-0.108	0.032	0.098
15 Food products and beverages	-0.001	-0.048	-0.128	-0.048	0.037	-0.015	-0.004	0.107
16 Tobacco products	0.044	0.040	0.074	0.053	0.600	.	-0.052	0.095
17 Textiles	-0.032	-0.187	-0.121	-0.122	-0.086	-0.147	-0.080	-0.038
18 Clothing	-0.100	-0.196	-0.091	-0.093	-0.162	-0.145	-0.112	-0.057
19 Leather	-0.084	-0.145	-0.111	-0.059	-0.133	-0.130	-0.101	-0.030
20 Wood and cork	-0.051	-0.115	-0.039	-0.081	-0.084	-0.044	-0.135	-0.035
21 Paper	0.067	0.027	0.004	-0.087	0.126	0.081	0.014	0.131
22 Printing and publishing	0.079	0.036	0.133	0.030	-0.056	0.081	0.082	0.120
23 Coke, petrol. prod. and nuclear fuel	0.154	0.521	0.166	0.153	0.378	.	0.135	0.294
24 Chemical and chemical products	0.089	0.101	0.048	-0.006	0.225	0.075	0.053	0.152
25 Rubber and plastic products	-0.002	-0.028	-0.025	-0.068	0.133	-0.027	-0.024	0.016
26 Other non-metallic mineral products	0.041	0.036	-0.028	0.108	0.128	-0.070	0.012	0.022
27 Basic metals	0.042	0.105	0.053	0.048	0.117	0.079	0.026	0.045
28 Fabricated metal products	0.006	0.001	-0.008	-0.065	0.040	-0.052	-0.013	-0.018
29 Machinery and equipment	0.010	0.014	0.033	-0.036	0.074	-0.046	-0.010	0.023
30 Office machinery and computers	-0.084	.	0.048	.	-0.094	-0.017	0.001	-0.039
31 Electrical machinery and apparatus	-0.004	-0.015	0.010	-0.082	0.077	-0.132	-0.038	0.000
32 Radio, television and communication equipment	0.039	-0.016	0.057	-0.095	0.070	0.027	-0.011	-0.007
33 Medical, precision and optical instruments, watches and clocks	-0.004	-0.024	0.010	0.045	-0.025	-0.071	-0.008	-0.062
34 Motor vehicles and trailers -trailers	0.029	0.018	0.088	-0.029	0.225	-0.107	-0.004	0.025
35 Other transport equipment	0.028	0.034	0.055	0.089	0.027	-0.043	-0.042	0.043
36 Furniture, manufacturing	-0.077	-0.118	-0.042	-0.077	-0.067	0.088	-0.122	-0.134
37 Recycling	-0.019	-0.059	-0.078	.	0.283	-0.105	-0.011	-0.115
40 Electricity, gas and water supply	0.263	0.296	0.105	.	0.221	0.210	0.083	0.173
41 Collection, purification and distribution of water	0.100	0.060	0.081	.	-0.018	.	0.122	0.159
45 Construction	0.029	0.068	-0.014	.	-0.069	.	0.034	0.063
50 Sale, maintenance and repair of motor vehicles and motorcycles	0.023	-0.011	-0.063	-0.016	-0.098	-0.034	-0.002	-0.060
51 Wholesale trade	0.002	-0.042	-0.041	-0.005	-0.002	0.069	-0.005	0.005
52 Retail trade	-0.086	-0.065	-0.086	-0.122	-0.116	-0.094	-0.095	-0.123
55 Hotels and restaurants	-0.116	-0.050	.	-0.061	-0.120	-0.174	-0.114	-0.104
60 Land transport and pipelines	-0.099	0.021	.	0.046	-0.047	.	-0.031	0.013
61 Water transport	.	.	.	0.157	-0.196	.	0.214	0.099
62 Air transport	0.033	0.179	.	.	0.206	.	.	0.043
63 Transport activities	0.009	0.005	.	0.040	0.026	.	0.047	0.079
64 Post and telecommunications	-0.072	0.045	.	0.255	-0.036	.	.	-0.014
65 Financial intermediation	0.090	0.203	0.055	0.099	0.295	0.193	0.364	0.093
66 Insurance and pension funding	0.094	0.195	0.035	.	0.057	0.289	0.144	0.070
67 Activities auxiliary to fin. intermed.	0.025	0.085	.	0.281	0.130	.	0.050	0.023
70 Real estate activities	0.023	0.098	.	.	0.007	.	0.019	0.138
71 Renting of machinery	-0.009	-0.030	.	.	0.002	.	0.027	-0.068
72 Computer and related activities	-0.009	-0.079	.	.	0.068	.	0.054	0.004
73 Research and development	-0.024	.	.	.	0.048	.	0.042	0.063
74 Other businesses activities	-0.012	-0.065	.	.	-0.046	.	-0.112	-0.015

[2] 2001 for Germany

Table A5

nemonic	Label	Definition	Country details[18]
Tenu	Tenure	Years of service with the enterprise (rounded downwards to full years)	NL 1995: missing.
Age	Employee age in years		BE: grouped; EL 2002: grouped.
PayP	Total gross earnings in pay period	Monthly earnings	
PayY	Total gross annual earnings (incl. all regular & irregular pay components)	Annual earnings	DE 2002: only for employees who were on the payroll for the full year; AT 2002 also includes payments in kind
PayHb	Basic hourly wage, net of overtime and irregular bonuses	= (payP-payOv)/hoursN	
payH	average hourly earning includes overtime, regular bonuses and full rate paid absences	= payP/hoursT	HU 1996: not avaliable
payHi	average hourly earnings including irregular bonuses	= payH+ Ibonus/hoursY	
payOV	Overtime earnings in pay period		
hoursN	Total (net of overtime) paid hours in pay period		
hoursT	Log of hours paid in the ref. period includes overtime and absence hours paid at full rate	= hoursN + hoursOv	HU 1996: not avaliable
hoursOv	overtime hours in pay period		HU 1996: not avaliable
hoursY	hours worked per year[19]	= months*hoursT	HU 1996: not avaliable
Ibonus	Annual paid irregular bonuses[20]		
months	Number of months worked	= (payY- Ibonus)/payP, with a maximum of 12	
Exp	Years of potential experience outside the company	age - yedu - 6 -tenu	NL 1995 and HU: exp=age- yedu – 6 because tenu is missing
yedu	Years of education	Corresponding to the ISCED-97 classification	Country specific
Voc	0,1 dummy	=1 if educ equals an ISCED level with vocational training	
Educ	Highest completed level of education and training	ISCED classification	
d_edu	Set of dummies	For each of the ISCED levels available	
d_nace	Set of dummies	For each of the 2-digit NACE classifications available	
d_occone	Set of dummies	For each of the ISCO single-digit occupations	
d_priv	0,1 dummy	Privately owned enterprise (>50% privately owned)	NL: almost all firms fall outside this category and in 'other'; EL: only private sector firms
d_reg	Set of dummies	Based on the NUTS 1 regions of each country	
d_size	Set of dummies	For each of seven size categories in number of employees in the	EL: size for 2002 in four groups (10-19, 20-49, 50-99, >100)

[18] NL = Netherlands, DE = Germany, BE = Belgium, ES = Spain, EL = Greece, IE = Ireland, IT = Italy, HU = Hungary, AT = Austria, CZ = Czech Republic.

[19] We checked that the number of months worked (payY-Ibonus)/PayP equals 12 for those not affected by absence before calculating annual hours worked.

[20] We performed checks that Ibonus did not include regular bonuses. In that case Ibonus should equal payY-12*payP for those not affected by absence.

		local unit (or firm). (<=25, 25-50, 50-150, 150-250, 250-500, 500-1000, >1000)	
d_mark*	Set of dummies	For each of the four categories of the principle market for enterprise's products (local or regional, national, EU, World)	NL and HU: missing
d_female	0,1 dummy	=1 if gender is female	
d_indef	0,1 dummy	=1 if contract if of indefinite duration	HU: missing
d_full	0,1 dummy	=1 if full-time employee	EL: only full-time employees used since part-time employment is very limited.
d_agr*	0,1 dummy	For each of the types of collective agreements (national or interconfederal, industry, enterprise, single, other)	NL 1995: industry and enterprise are considered as one type; NL 2002: missing. HU: missing
d_ctz	0,1 dummy	= 1 if employee is a national citizen	NL, IR and HU: missing
d_man	0,1 dummy	=1 if employee holds management or supervisory position	

Table A6: Sample size and sectors covered by country

Country	**Sample size 1995**	**Sample size 2002**	**Sectors covered**
Belgium (1999 for first wave)	101,302	102,941	14,15-37, 40-41,45, 50-55,60,62-67,70-74
Germany (2001 for first wave)	652,676	467,932	10-11,13-14,15-37,40-41,50-52,65-66
Greece	20,761	23,863	14,15-29,31-36,50-55,60-61,63-65,67
Hungary (1996 for first wave)	91,578	119,019	10-11,13-14,15-37,40-41,45,50-55,60-74
Ireland	36,727	16,359	10, 15-17, 20-22, 24-26, 28-31, 33, 35, 36, 50-55, 65-66
Italy	79,501	73,692	11,14,15-37,40-41,45,50-55,60,61,63,65-67,70-74
The Netherlands	66,196	37,860	11,14-37,40-41,45,50-55,60-67,70-74
Spain	170,697	173,487	10-11,13-14,15-29, 31-37,40-41,45, 50-55,60,62-67,70-72, 74

Table A7

NACE 1-digit	NACE 2-digit	Sector
C	R10	Mining of coal and lignite; extraction of peat
C	R11	Extraction of crude petroleum and natural gas; service activities incidental to oil and gas extraction, excluding surveying
C	R12	Mining of uranium and thorium ores
C	R13	Mining of metal ores
C	R14	Other mining and quarrying
D	R15	Manufacture of food products and beverages
D	R16	Manufacture of tobacco products
D	R17	Manufacture of textiles
D	R18	Manufacture of wearing apparel; dressing and dyeing of fur
D	R19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear
D	R20	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
D	R21	Manufacture of pulp, paper and paper products
D	R22	Publishing, printing and reproduction of recordefd media
D	R23	Manufacture of coke, refined petroleum products and nuclear fuel
D	R24	Manufacture of chemicals and chemical products
D	R25	Manufacture of rubber and plastic products
D	R26	Manufacture of other non-metallic mineral products
D	R27	Manufacture of basic metals
D	R28	Manufacture of fabricated metal products, except machinery and equipment
D	R29	Manufacture of machinery and equipment not elsewhere classified (n.e.c)
D	R30	Manufacture of office machinery and computers
D	R31	Manufacture of electrical machinery and apparatus n.e.c.
D	R32	Manufacture of radio, television and communication equipment and apparatus
D	R33	Manufacture of medical, precision and optical instruments, watches and clocks
D	R34	Manufacture of motor vehicles, trailers and semi-trailers
D	R35	Manufacture of other transport equipment
D	R36	Manufacture of furniture; manufacturing n.e.c.
D	R37	Recycling
E	R40	Electricity, gas, steam and hot water supply
E	R41	Collection, purification and distribution of water
F	R45	Construction
G	R50	Sale, maintenance and repair of motor vehicles and motorcycles; retail sale of automotive fuel
G	R51	Wholesale trade and commission trade, except of motor vehicles and motorcycles
G	R52	Retail tradef, except of motor vehicles and motorcycles; repair of personal and household goods
H	R55	Hotels and restaurants
I	R60	Land transport; transport via pipelines
I	R61	Water transport
I	R62	Air transport
I	R63	Supporting and auxiliary transport activities; activities of travel agencies
I	R64	Post and telecommunications
J	R65	Financial intermediation, except insurance and pension funding
J	R66	Insurance and pension funding, except compulsory social security
J	R67	Activities auxiliary to financial intermediation
K	R70	Real estate activities
K	R71	Renting of machinery and equipment without operator and of personal and household goods
K	R72	Computer and related activities
K	R73	Research and development
K	R74	Other business activities

TABLE A8: Average wage differentials gaps between the top and bottom of the distribution

	Wave 1		Wave 2	
	In higher paying industries	In lower paying industries	In higher paying industries	In lower paying industries
Belgium	0.0023	-0.0374	-0.0035	-0.0692
Germany	0.0921	0.0967	0.0446	0.0821
Greece	-0.0412	-0.1440	-0.1740	-0.1920
Hungary	-0.1750	-0.1340	-0.0420	-0.1800
Ireland	0.0021	0.0257	0.0089	-0.1550
Italy	-0.0454	-0.0830	-0.0207	-0.0838
Netherlands	-0.2120	-0.2390	-0.1140	-0.0607
Spain	-0.0176	-0.0961	0.1210	-0.0838

Note: The average is calculated over the 25% of the highest (lowest) paying industries in each country.

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