Bargaining Structure and Within Establishment Wage Inequality in four European Countries: Evidence from Matched Employer-Employee Data [(*)]

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Abstract

This paper investigates the patterns of within establishment wage inequality in four European countries (Belgium, Ireland, Italy and Spain). Using matched employer-employee data (ESES) we analyse the effects of work organization practices, pay policies, bargaining procedures and industrial relations arrangements on the pattern of wage differentials in the firm. The main findings suggest that both employees characteristics, firm size and work organisation practices are important determinants of within establishments wage dispersion. Decentralised bargaining is shown to be associated to higher (unconditional) intra-firm wage dispersion; however, when a large set of controls for employee and employer characteristics are included the association turns negative or non (statistically) significant. Finally, when we account for the endogeneity of the bargaining structure, we detect no causal effect of decentralised bargaining on within establishments inequality for all the countries, except Spain where this level of bargaining remains relevant in decreasing wage dispersion.

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1 Introduction

Within firm wage inequality is an important feature of the organisational and productive strategies that characterise the ways firms behave in the market. The structure of wage differentials, between the various hierarchical levels, is relevant to attract, select, motivate and retain workers of different skills and therefore to operate efficiently. Firms devote considerable efforts in designing internal pay policies in the attempt to allocate workers to jobs and to remunerate their performance. Efficiency arguments, however, also have to be complemented with equity or fairness considerations in order to promote co-operation among workers – both within and between hierarchical levels – and maintain a good climate of employment relations in the firm. While the structure of wage differentials and overall wage inequality within the firm is clearly influenced by technological and organizational features, pay policies and firm discretion in setting pay is also significantly influenced by institutional factors, such as: union presence, the structure of collective bargaining, employment regulations (i.e., hiring and firing restrictions), as well as other provisions concerning job attributes. In other words, the optimal structure of wage differentials within a firm is the results of a composite picture in which firms try to pursue various (and sometime conflicting) objectives compatible with productive efficiency, while workers (individually or collectively) try to maximise their well being. In this context, wage setting takes place through collective bargaining either (both) at the central level (i.e. nation or industry) or (and) at the decentralised level (i.e. area, firm or establishment).

This paper intends to shed light on the structure of within establishment wage inequality in four European Countries (Belgium, Ireland, Italy and Spain) using matched employer-employee data drawn from the European Structure of Earnings Survey (ESES)[1]. The main contribution of the paper is twofold. First, it uses for the first time cross-country comparable establishment level micro data to investigate wage patterns inside the firm, and by matching workers and establishments it allows to investigate the net effect of the different factors affecting pay levels and dispersion controlling for both individual and firm heterogeneity. Second, the role of the different levels of collective bargaining on (within establishment) wage inequality is analysed paying particular attention to institutional differences across countries; furthermore, in order to evaluate the causal effect of decentralised bargaining, the (endogenous) decision of establishment to engage in local bargaining is explicitly modelled. Moreover, by focussing exclusively on the within inequality component and explicitly modelling the effect of firm level collective bargaining and the country's

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[1] The choice of countries has been forced by data availability. European countries excluded from the present study have either denied access to their micro data, or the information made available was not sufficiently disaggregated .

institutional setting, we are able to overcome several problems encountered by previous studies and reconcile our results with the available evidence. The main findings suggest that employees characteristics, firm size and work organisation practices are important determinants of within establishments wage dispersion. Decentralised bargaining is shown to be associated to higher (unconditional) intra-firm wage dispersion, in all countries, but when a large set of controls for employee and employer characteristics are included the association turns negative or non (statistically) significant. Finally, when we account for the endogeneity of the bargaining structure, we detect no causal effect of decentralised bargaining on within establishments inequality, except for Spain where this level of bargaining results to have a relevant impact in reducing wage dispersion. The paper is organised as follows. Section 2 presents a review of the empirical literature on collective bargaining and wage dispersion. In Section 3, we compare the institutional setting and the bargaining features across countries. The main features of the data used (ESES) and some descriptive evidence are shown in section 4. Section 5, present the empirical model and discusses the main results. The last section contains some concluding remarks.

2   Within firm Wage Inequality, Unions and Collective Bargaining

While much of the empirical research has investigated the effect of bargaining structure and unionisation patterns on wage differentials either by union–nonunion workers or by covered-noncovered establishments (Stewart, 1983; Blanchflower, 1984; Lewis, 1986; Hirsch and Addison, 1986), union presence and collective bargaining procedures can have more extensive effects on the overall distribution of wages as well as on within firm wage inequality (Freeman, 1980a; Hibbs, 1990; Gosling and Machin, 1994). The magnitude and direction of the impact of collective bargaining on wage dispersion depends on several factors ranging from work organisation practices, wage regulations, firms' pay policies and management attitudes. In particular, there are a number of routes through which trade unions may seek to obtain greater equality of pay in the organised sector.

Unions aim at reducing differentials among workers with similar skills and job tasks within establishments through two types of pay policies: single rate of pay for each occupational group and seniority–based progression. First, trade union wage policies pursuit "egalitarian criteria" in setting rates of pay, so as to decrease differentials based on specific characteristics of the individual (ability, merit, etc.) rather than on job tasks and responsibilities. In particular, collective bargaining arrangements seek to fix both the number of job categories and the rate of pay for each job, thus limiting the ability of the management to remunerate individual worker differently. Conversely, in

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non-union establishments managers generally have greater discretion in setting pay levels. Second, in establishments covered by collective agreements, greater relevance is usually assigned to factors like seniority rather than to the evaluation of individual productivity. The standardisation of pay setting mechanisms, with one level of pay applied to all workers in a specified job category, is likely to decrease wage differentials both across and within establishments. Unions, besides standardised wage policies, may also influence wage dispersion *via* additional influence over both the range of rates, within single job categories, and by rising the number of job skills included in each category. Union preferences for reduced differentials within establishments stem from unions' desire for objective standards, organisational considerations and worker solidarity. Concerns about the distortion caused by favouritism, discrimination and measurement error in performance indicators may favour the introduction of impartial standards where pay is linked to the job rather than to the merit of the individual[2]. Also, considering the union as a political organisation whose consensus depends on median worker preference, whenever median pay is less than the mean, the majority of workers will favour redistribution towards the lower paid thus reducing pay inequality. Finally, workers' solidarity and organisational strength is likely to be greater when workers receive the same pay rather than when they are paid very differently, as the perception of marked differences in pay may reduce consensus among workers and the strength of the unions' collective voice (Freeman, 1980b).

Union wage policies also attempt to equalise pay among (otherwise) comparable workers across establishments, so as to "take labour out of competition" (Freeman, 1980a; Freeman and Medoff, 1984). When firms compete in the same market, standard rates are likely to be favoured by both employer and worker. On the one hand, the firm is willing to have labour costs close to its competitors; on the other hand, the worker sees a single rate of pay as a necessary requisite to prevent intra-union competition[3] . When firms operate in separate markets, so that union can charge different rates without risking potentially undesirable rate-cutting, standardisation of rates will be weaker. Minimum wage regulations and mandatory extension provisions can also have pervasive effects in reducing wage differentials among workers, irrespective of their union affiliation. Where such regulations exist, the effect of negotiated (or minimum) wages are automatically (*de facto*) extended to all workers, granting a high coverage to union bargaining activity. Trade union activity may also have an impact on wages outside the organised sector through threat effects. In this

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[2] In a world of Rawlsian "veil of ignorance" where workers will not know whether they benefit or lose from (apparently) discretional supervisory decisions, simple maxi-min behaviour will dictate preference for narrow range of rates (Freeman, 1982).
[3] The union (monopolistic) wage would come under severe pressures in economic downturns as some union members might seek to preserve their jobs by undercutting the rates of other workers (Freeman, 1980a; Freeman and Medoff, 1984: Hirsch and Addison, 1986).

context, the influence of unions on wage dispersion may be overestimated, since wages of uncovered workers may also respond to union activity. In particular, trade unions might be able to alter wage levels both inside and outside the bargaining unit through strategic effect – i.e. by merely threatening employers to demand a collective negotiation over wage issues. This strategic effect is called "union threat effect" (Rosen, 1969)[4].

2.1   A Review of the Empirical Literature

The impact of trade unions on wage inequality is analysed in various studies for different countries (Freeman, 1980a, 1982; Gosling and Machin, 1994; Dell'Aringa and Lucifora, 1994; Di Nardo, Fortin and Lemieux, 1996; Hibbs, 1990, 1991; Hibbs and Locking, 1996). The empirical evidence across different countries -- though some care is required when comparing results -- suggests that on average unions and collective bargaining have a negative impact on wage dispersion.

Considering the US experience, Freeman (1980a) reports a lower pay dispersion in the union sector. Using both CPS (Current Population Survey) and EEC (Expenditures for Employee Compensation) data -- estimating both union and non-union log earnings functions and controlling for a large set of observable characteristics -- Freeman finds that differences in estimated parameters and in the distribution of the residuals, between the union and non-union sector, contribute to lower union wage dispersion. The effect of unionism on pay dispersion is also assessed looking at the white-blue collar wage differential within establishments which is found to be significantly reduced where unions are stronger. In a companion paper (Freeman, 1982), using data from the BLS Industry Wage Surveys, the focus is placed on within establishments wage dispersion, measured by the standard deviation of log wages, and the effects of union wage policies are estimated. Main findings suggest that organized establishments have lower dispersion in wages than otherwise comparable establishments in the same industry, both before and after controlling for establishment size, region and detailed occupational structure. Henceforth, much of the lower dispersion appears to be attributable, rather than to differing attributes, to existing wage practices in organized establishments (i.e. single rate, automatic progression and other standardised modes of payment). Hirsch (1982) reports that unions significantly reduce intra-industry (three-digit Census) wage dispersion -- measured as variance of log or Gini coefficient – and shows that collective bargaining mainly works by shifting workers up in the earnings distribution. In a different context, Dickens (1986) shows that the threat posed by union presence generally leads nonunion firms to

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pay higher than competitive wages, while Newmark and Watcher (1992) test the threat hypothesis on a sample of US workers and find evidence of a positive effect of unions on non-union wages. In a more recent paper, Di Nardo et al. (1996) using non-parametric methods estimate the impact of unionism – among other labour market institutions – on overall wage inequality. Although their focus is more on the factors contributing to the evolution of wage inequality, rather than to union-nonunion differences, their results support previous findings suggesting that unions do reduce inequalities in pay.

The UK experience is described in Gosling and Machin (1994) who analyse the relationship between unions and earnings dispersion using establishment level data (Workplace Industrial Relation Surveys). In their study, they call "sword of justice" the role of trade unions in reducing earnings dispersion, both across and within establishments. Estimates of the (un)conditional standard deviation of log earnings, for the union and non-union sector, show that earnings dispersion of skilled and semi-skilled workers is lower in plants where unions are recognised for collective bargaining.

Hibbs (1990, 1991) investigates union's pay practices in Sweden and finds strong evidence on wage compression due to the egalitarian effects of centralised wage agreements. Cardoso (1999), using matched employer-employee data, investigates the link between changes in firm pay policies and the sharp rise in overall wage inequality occurred in Portugal. The main findings suggest a reduced role for the equalising effects of seniority on wage distribution and a more significant role for flexible and performance related pay components[5].

A number of papers have also looked at the experience of the countries analysed in this study. Erickson and Ichino (1995) analyse the evolution of wage differentials across skill and occupation levels in Italy. They show that unions were able to push for labour market reforms that compressed wage differentials in the 1970s and that were only partially, if at all, reversed in the 1980s; thus suggesting that egalitarian wage-setting institutions have significantly affected Italian wage outcomes. Dell'Aringa and Lucifora (1994), using two different micro-data sets, estimate the impact of unionism on wage dispersion both across and within establishments in Italy. Several indicators of wage dispersion are computed, using both industry and establishment level data, in the attempt to ascertain the different routes through which union presence affects the structure of

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[5] Katz and Darbishire (2002) look at recent changes in wage and employment practices in seven industrialised countries (Australia, Britain, Germany, Italy, Japan, Sweden, the United Kingdom, and the United States), with a special focus on the automobile and telecommunications industries. Their findings suggest that the patterns of workplace practices and labour-management interactions are increasingly similar across countries, whilst within the union and non-union sectors the extent of variation in wages, work practices, and other employment conditions have increased, such that no convergence to a new international employment relations setting can be detected.

wages. The empirical evidence shows that Italian trade unions have pursued "egalitarian" objectives and have succeeded in shaping pay policies which, through central and local negotiations, raise low wages and reduce wage differentials both among skill categories and across establishments.Corneo and Lucifora (1997) empirically investigate the strategic effects of collective bargaining decisions and union density on union and non union wages. A quasi monotonic relationship between union power and wages is found both in the covered and in the non-covered sector. Checchi and Pagani (2005), and Dell'Aringa and Pagani (2004) use ESES data to investigate the effects of collective bargaining (both national and local) on overall wage inequality. Their main finding suggest a positive impact of between sector inequality of national contracts; while no (statistically) significant differences in wage dispersion are found between establishment covered by national collective bargaining only and those also covered by (additional) firm level bargaining. In countries where the different levels of bargaining are mutually exclusive (Spain and UK) results show mixed effects. Dolado et al. (1997) provide an empirical evaluation of the effects of industry collective bargaining on wages for Spain and find evidence in favour of a "sword of justice" effect of unions. Unions are found to reduce wage dispersion both between and within firms (see also, Dominguez and Gutierrez, 2004). Conversely, Card and De la Rica (2004) analysing the effects of decentralised bargaining (ie. firm-level collective contracts) on the wage structure in Spain, find that employees covered by firm-specific contracts earn about 10 percent more than those covered by industry contracts only thus contributing to the overall (between) variance[6].

Concerning the Irish experience, Callan and Reilly (1993) examine the impact of trade unions on wages and wage dispersion among male employees, using data from the ESRI household survey carried out in 1987. The union membership mark-up is estimated to be over 20 per cent, and a smaller variance in wages is also observed for union members. Only a small part of the differentials in the mean and variance of the wage between union and non-union members is explained by differences in worker characteristics. The larger unexplained component is interpreted as reflecting, among other things, the role played by structural differences in the wage determining processes between the union and non-union sectors.

The Belgian experience is analysed in Plasman and Rycx (2004), using ESES data they find that the dispersion industry wage differentials is lower where wages are the subject of collective (re)negotiation at the establishment. Moreover, all other things being equal, workers covered by a firm collective agreement earn around 5 percent more than firms where collective (re)negotiation doesn't occur. In a companion paper, Lallemand, Plasman and Rycx (2004) show that in Belgium there is a positive and significant relationship between intra-firm wage dispersion and profits per

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[6] They find that firm level agreements lead to a more flexible wage structure, at least for women.

capita, even when controlling for individual and firm characteristics. They also report that the strength of this relationship is stronger for blue-collar workers and within firms with a high monitoring intensity.

Thus, the main set of results on the effect of collective bargaining on overall wage dispersion, drawn from existing empirical research, appear rather mixed. Trade unions and collective bargaining are found either to increase or decrease wage dispersion (within and between establishments) depending on the approach chosen, the country considered and the data used. One explanation may reside in the fact that unions and collective bargaining – as previously described -- can have pervasive effects on the distribution of wages, affecting both between and within differentials (not necessarily in the same direction), such that the overall effect can be positive, negative or non-significant depending on the prevailing effect (ie. between or within). In this paper, by using a matched employer-employees data set covering a number of European countries, we are able to overcome several problems encountered by the previous literature. Moreover, by focussing exclusively on the within inequality component and explicitly modelling the effect of firm level collective bargaining and the country's institutional setting, we are able to reconcile our results with the above evidence. Of course our results have nothing to say with respect to the effects that collective bargaining has on between establishment dispersion and on overall wage inequality.

3 The institutional setting in Belgium, Ireland, Italy and Spain: Some stylised facts

Collective bargaining, as documented in the previous section, has a central role in wage determination in all the countries analysed in this study. National systems, however, differ significantly in terms of the levels, coverage, content and nature of bargaining procedures. Main differences concern the degree of centralisation and the co-ordination of bargaining at various levels, including the national (or inter-industry), industry and enterprise level. There are also important differences across countries in the coverage rates of collective bargaining (i.e. the proportion of workers that have their pay and working conditions set, at least to some extent, by collective agreements), not least because of differences in provisions for extending these agreements to other firms or industries. The frequency of wage bargaining also varies, normally between annual and multi-annual bargaining. All the four countries considered have a multi-level wage bargaining structure, with usually centralised bargaining at the national, industry or regional level in the first stage and bargaining at the enterprise or plant level, in the second stage. The main features of collective bargaining in the four countries considered are reported in Table 1.

In Ireland, for example, wage formation is highly centralised, with the inter-industry level being the main bargaining level, and national agreements have established framework agreements on pay and a number of other issues since 1987. Most enterprises are formally covered by a national agreement, exceptions being firms that are not members of the employers' organisations that signed the agreement; still even those firms generally take the national agreement as benchmark or baseline in their wage setting. Bargaining may also occur at industry or local level, indicating that there is an industry, enterprise or other agreement in place in addition to the national one. The average duration of collective agreements in Ireland is two years.

In Belgium and in Italy, wage bargaining takes place primarily at the industry level. In Belgium (private sector) wage bargaining is structured along three levels: national (inter-professional) level, industry level and company level, which occur sequentially every two years. In practice, the national collective agreement defines a minimum wage level, which can be improved at the sector of activity and/or at the company level[7]. The Italian industrial relations system is characterised by nation-wide collective bargaining arrangements, which set wage levels for different grades of manual and non-manual workers and take place at the industry level every two years (four years for the non-wage issues). Further to this, decentralised collective bargaining (usually at firm level) may grant all workers, in that firm, additional pay premia -- i.e. wage premia bargained at the firm level add up to national levels. In many firms, where unions are not present locally or are not strong enough, collective bargaining does not take place, even if some of the workers are members of the national unions. In other terms, while (almost) all workers in an industry will be covered by a national agreement, only some of them will be covered by both national and local agreements. Coverage rates suggest that in the countries considered over two thirds of employees are covered by collective agreements. A statutory minimum wage legislation, to protect and regulate low pay, is in force in all countries but Italy.

The structure of the collective bargaining in Spain is quite different from that of the other countries. One basic feature of the Spanish system of industrial relations is that various bargaining levels coexist. Collective agreements can be negotiated either at the decentralised company level or at the more centralised industry level in different geographical areas: local, provincial, regional or national. Collective bargaining mainly takes place at the industry and provincial level, the next most popular bargaining level (in terms of number of workers) is the nation-wide industry level, whereas regional (Autonomous Community) industry agreements and company level, only cover a lower percentage of workers. Collective agreements in Spain usually last more than two years.

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[7] Industry collective agreements may be renegotiated except when there is a so-called imperative clause.

Despite national differences, it can be argued that the countries analysed in this study still have relatively centralised systems of wage determination. Provisions for extending collectively agreed bargaining results to other firms, industries or regions are quite common in all the countries taken into account: collective agreements are binding not just on the bargaining parties but also on all employees and employers within the particular industry or region concerned[8]. The systems of national and or industry / occupational bargaining, coupled with the extension of agreements to non-signatories, ensure that the overwhelming majority of employees are covered by collective bargaining agreements, although, national systems differ widely in terms of levels, content and nature of bargaining. A recent trend towards more decentralisation concerns a larger share of pay set at local or company levels, and variable pay schemes – including performance related pay and bonuses – becoming more important[9].

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[8] In Ireland and Italy, legal provisions on public procurement further require contractors to comply with the terms of any relevant collective agreements. Furthermore, in Italy, collectively agreed, minimum wages are also used by courts as a point of reference when assessing whether wages conform with constitutional requirements for fair pay.

[9] In Italy, for example, while national contractual wage agreements have to be in line with targeted inflation rates, company level negotiations have often determined increases in average earnings above inflation. In Belgium, the trend towards decentralisation has only recently been slowed down due to macroeconomic constraints. In Ireland, conversely a trend towards increasing centralisation has been observed.

Table 1 - Collective Bargaining in Belgium, Ireland, Italy and Spain

			Belgium	Ireland	Italy	Spain[1]
Bargaining power		*Union Density (2000)*	69	45	35	15
		Collective bargaining Coverage (2000)	96	66	82[2]	83
Bargaining Regimes	*Bargaining Structure*	*Centralised Bargaining (Main Level)*	National (interprofessional) and/or industry	National (Inter-industry)	Industry	Industry or Regional
		Decentralised Bargaining (Second Level)	Firm	Industry/Firm/ Local	Firm	Firm/Establishment
		Other types of Bargaining	Miscellanea of other agreements (except Ireland)[3]			
	Bargaining co-ordination		Medium	Medium Strong	Medium	Medium Weak
	Contract extension practice		High/Industry	High/National	High/Industry	Medium/Industry/ Region
	Duration of collective contract		2 years	2 years	Varying	3 years

Note:
(1) Spain is a particular case being the only country where the second level of bargaining is not additional but mutual exclusive
(2) Refers to 1995
(3) We treat these other types of bargaing as a resisdual category. More specifically, in Belgium, they are alternative to the main and second levels (establishments not covered by these agreements, i.e. public utilities)

4 Measuring Inequality within Establishments: data and stylised facts

4.1 The data

In this paper, we use microdata from a large matched employer-employee data set drawn from the European Structure of Earnings Survey (ESES) for the year 1995[10]. ESES data contain detailed information on both establishment characteristics, in the private sector, as well as workers attributes within each workplace for a number of European countries[11]. The main set of variables available at

[10] Access to the micro data has been made possible through a remote connection with Eurostat where the data are physically stored.
[11] Sample design is done on the basis of establishment representativeness, while individual workers are randomly drown within the pool of employees working in the establishment. In order to preserve representativeness also at the employee level, there is some proportionality between the number of draws and establishment size. This may also mean that in some establishment we are left with one or two employees.

the establishment level are: industry (NACE, 2 digit), region (NUTS, 2 digit)[12], size (N. employees), type of collective contract and other features of the product market in which the firm is operating (i.e. ownership, degree of competition, etc.). At the individual worker level information covers: gender, age, occupation, educational level, tenure, job contract type (i.e. temporary, special scheme, etc.), supervision, hours worked (and hours paid), gross earnings (including payments for overtime and all bonuses and gratuities). In the empirical analysis we use sampling weights. The definition used for wages is hourly gross wage inclusive of annual bonuses (i.e. not paid on a regular basis)[13]. The main features of the data, variables definitions and descriptive statistics are reported in the appendix (Table A1).

4.2   *Measures of within establishment wage inequality*

Within establishment wage dispersion can be measured in different ways, and given the reduced number of observations available within each establishment some of the measures may be more sensitive than others to extreme values or measurement error. In order to assess the sensitivity of our measures, we compute and compare three different indicators of within establishment wage dispersion: coefficient of variation (CV), standard deviation of logs (SDL) and a max-min ratio (MMR)[14]. Given the relatively small average number of employees per establishment in some countries, we are confronted with the problem of dropping establishments with too few observation per establishment -- which is likely to distort the sample by excluding in a non random way some establishments (i.e. smaller for example) -- or introducing some measurement error in wage dispersion indicators but preserve the original sample design. Confronted with the two different options and after some experimentation[15], we decided to keep all establishments with two or more employees in the sample. In particular, the number of establishments and employees per country in the original sample and in the one used in the empirical analysis -- after dropping establishments with less than two employees, missing information on wages or hours of work -- is reported in the appendix (Table A2). With the only exception of Belgium, where a lot of missing data on hourly wages are present, the reduction in sample size is very modest.

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[12] Except for Ireland.

[13] We experimented the analysis also excluding bonuses and gratuities not paid on a regular basis, that is annual bonuses and discretionary payments. The main set of results is essentially unchanged if the definition of pay is changed, although the level of dispersion is higher and the role of establishment level bargaining reinforced. Results based on systematic component of pay only are not reported, but are available upon request.

[14] The precise definition used is as follows: $CV(w)=$Standard deviation$(w)/$Mean(w); $SDL(w)=\sigma[\ln(w)]$; $MMR(w)=[\max(w)/\min(w)]$.

[15] In order to guarantee robustness and efficiency in the estimates, we prefer to have some measurement error in the dependent variable rather than introducing non random attrition and selection effects (for example establishment size or location) in the data.

Using the three definitions of dispersion (CV, SDL, MMR), in the rest of the section we first compare wage dispersion within establishment by country, industry, size and type of collective agreement[16], and then briefly discuss the validity of these different measures of within establishment wage inequality. In Table 2, we compare the three indicators by country. Ireland shows the highest average within establishment wage dispersion (as well as standard deviation across workplaces); whilst the opposite is true for Italy.

Table 2 - Average within establishment wage dispersion, by country (various measures)

DISPERSION INDICATOR	Belgium		Ireland		Italy		Spain	
	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.	Mean	St. Dev.
Coefficent of Variation	0.266	0.171	0.421	0.258	0.242	0.173	0.293	0.214
Standard Deviation of Log	0.250	0.151	0.371	0.179	0.227	0.136	0.277	0.186
Max – Min Ratio	2.895	2.636	4.538	5.801	2.261	1.381	2.538	2.105
N. Obs.	4,160		2,691		7,680		17,835	

Note: number of observations refer to establishment in the national samples.

In order to compare the coherence of the different indicators, we compute simple bivariate correlations between them by both industry and size. The correlations are very high and statistically significant, and the ranking by industry and size is essentially unchanged using any of the three measures (although the MMR indicator appears to be more sensitive to extreme values) [17].

4.3 Descriptive Evidence

In this section we present some descriptive evidence on within wage dispersion by industry, size and type of collective agreement[18]. In Figure 1, we plot average within dispersion by industry for each country. When the industry structure of (within establishment) wage dispersion is similar across countries (taken two-by-two) the plotted coefficients should lie along the 45° line[19].

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[16] For each industry, establishment's size interval or type of collective agreement, we report the mean coefficient of variation computed on all establishments belonging to that group classification.

[17] The simple bivariate correlations between CV (mean) and SDL (mean), by industry, is around 0.96 for Belgium and for Ireland, 0.97 for Italy and 0.99 for Spain. Correlations between CV (mean) and MMR (mean) are 0.81 (Belgium), 0.89 (Ireland), 0.96 (Italy) and 0.93 (Spain). Finally, correlations between SDL (mean) and MMR (mean) are 0.88 (Belgium), 0.88 (Ireland), 0.92 (Italy) and 0.94 (Spain).

[18] In order to assess how wage dispersion is related to establishments characteristics, we considered several (average) establishments' attributes. The full set of descriptive statistics is contained in the statistical appendix available upon request from the authors.

[19] The codes associated to each industry are the following: RC=Mining and quarrying; RDA = Manufacturing of food products, beverages and tobacco; RDB = Manufacturing of textiles and text tile products; RDC = Manufacturing of leather and leather products; RDD = Manufacturing of wood and wood products; RDE = Manufacture of pulp, paper and paper products; publishing and printing; RDF = Manufacture of coke, refined petroleum products and nuclear fuel; RDG = Manufacture of chemicals, chemical products and man-made fibres; RDH = Manufacture of rubber and plastic products; RDI = Manufacture of other non-metallic mineral products; RDJ = Manufacture of basic metals and fabricated metal products; RDK = Manufacture of machinery and equipment n.e.c.; RDL = Manufacture of electrical and optical equipment; RDM = Manufacture of transport equipment; RDN = Manufacturing n.e.c.; RE = Electricity, gas

Although it is quite difficult to find a clear cut pattern analysing the unconditional variance in wages, the correlations show that some countries have more similar industry structure (such as, Italy and Spain) than others (Ireland). We also find that establishments in industries characterised by higher wage dispersion -- the highest dispersed industry being "financial intermediation" (RJ)[20] – pay higher wages, have both a more educated and a larger proportion of non-manual workers, and are larger in size; conversely, more traditional industries, with a large share of manual workers, less females and smaller in terms of employees, exhibit less wage inequality[21].

Figure 2 reports (within establishment) wage dispersion by establishment size. In Spain, Belgium and Italy dispersion increases almost monotonically with size -- up to medium-large establishment (less pronounced for Belgium) --, then flattens up to decline when the largest size bracket is considered (over 1,000 employees). This evidence seems to suggest that the complexity of the organisation has a role in widening within establishment wage differentials, since more differentiated tasks and a higher role for incentive pay schemes determine a more dispersed wage structure. However, in very large establishments, where workers are more likely to be unionised and cooperation and fairness considerations play a larger role, wage dispersion seem to be lower. In Ireland, average wage dispersion (within establishments) is much higher, as compared with the other countries, and shows an increasing trend with size (i.e. establishments with 1,000 employees and over are those with the highest dispersion)[22].

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and water supply; RF = Construction; RG = Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods; RH = Hotels and restaurants; RI = Transport, storage and communication; RJ = Financial intermediation; RK = Real estate, renting and business activity.

[20] Marked differences may also be influenced by the very high (within establishment) wage inequality of the "financial intermediation" industry which shows a coefficient of variation three times higher than the average. If we exclude this industry from the calculations, the correlations exhibit a much more homogeneous structure.

[21] The industry with the lowest average pay inequality within establishments differs from country to country: "manufacturing n.e.c." in Belgium; "mining and quarrying" in Ireland; "manufacturing of wood and wood products" in Italy and "manufacturing of leather and leather products" in Spain". Note that for Ireland we do not have information on the following industries: "construction" (RF), "transport, storage and communication" (RI) and "real estate, renting and business activity" (RK), which might partially explain the differing results.

[22] It should be noted however, that this result may be influenced by the small sample size in the bigger firm intervals.

Figure 1 - Structure of within establishment wage dispersion by industries (Coefficient of Variation)

Figure 2 - Average within establishment wage dispersion (coefficient of variation) by size bracket in each country
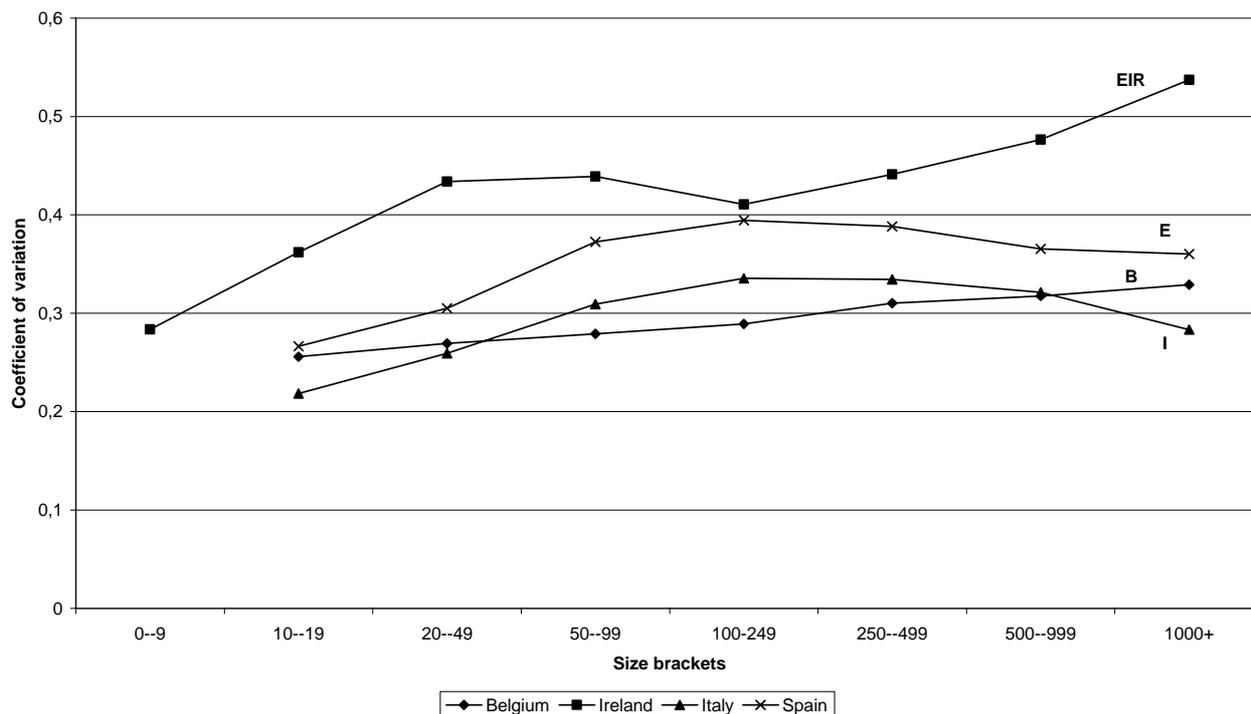
Finally, in Table 3, we analyse the coefficient of variation according to the prevailing bargaining structure in the establishment. As discussed in section 3, all the countries considered have a multi-level wage bargaining structure, with centralised bargaining at the national, industry or regional level, in the first stage, and (or) bargaining at the enterprise or plant level, in the second stage. In each country we distinguish establishments covered by centralised bargaining only, from those also covered by decentralised bargaining. Other types of bargaining, which may also exist, are to be considered as residual and will not be the focus of our analysis. One caveat applies for Spain, for the different levels of bargaining are not necessarily additive: that is an establishment may be covered by a plant or firm collective agreement (i.e. decentralised), and yet not being covered by a national or regional one (i.e. centralised). This implies that the results for Spain, all along this study, should be interpreted differently. The proportion of establishments covered by a decentralised agreement (as well as centralised) is 48.5 percent in Ireland, 21.5 percent in Italy and 16.7 percent in Belgium, while in Spain 18.9 percent of the establishments is covered by a decentralised agreement only.

What is the effect of the structure of collective bargaining on the within establishment wage dispersion? Are wage relativities set at the centralised level altered by decentralised bargaining? Since between 20 to 50 percent of establishments have some type of (additional) bargaining taking place at the establishment level, the above questions are relevant for assessing the efficiency and the

performance of the unit of production. Table 3 also reports the average within establishment (unconditional) wage inequality by type of collective agreements in each country. In particular, we report only the coefficient of variation for centralised and decentralised bargaining levels and their difference[23]. Results show that establishments only covered by a centralised agreement are characterised by a lower (within) wage inequality, as opposed to where bargaining also takes place at the establishment level, as also shown by the negative and statistically significant difference reported for each country. Particular care should be used in interpreting the effects of decentralised bargaining on (unconditional) wage inequality, since the effects of unions in the establishment are pervasive and can influence both workers composition and productivity besides wage differentials. With these caveats in mind, however, it should be noted that while it is maintained that centralised collective bargaining reduces (within establishment) wage inequality, further levels of negotiations seem to contribute to a widening of wage differentials among (heterogeneous) workers in the firm. How much of this greater dispersion is due to (observed and unobserved) workers' characteristics, sorting effects, productivity or establishment attributes is of course, at this stage, still an open question. Moreover, this evidence does not say anything concerning between establishment dispersion and on the effect of bargaining on overall wage inequality, the latter being outside the scope of the present paper.

Table 3 - Distribution of establishments (in percentage) and average within establishment wage dispersion (coefficient of variation) by type of collective agreement in each country

DISTRIBUTION OF ESTABLISHMENTS				
	Belgium	*Ireland*	*Italy*	*Spain*
Centralised Bargaining	52.4	51.6	75.1	78.8
Centralised and Decentralised Bargaining	16.7	48.4	21.5	18.9 [(1)]
Other types of Bargaining	30.9	--	3.4	2.4
Total	100	100	100	100
N. Obs.	4,160	2,691	7,680	17,835
AVERAGE WITHIN ESTABLISHMENT WAGE INEQUALITY [(2)]				
	Belgium	*Ireland*	*Italy*	*Spain*
Centralised Bargaining (1)	0.262	0.399	0.235	0.286
Centralised and Decentralised Bargaining (2)	0.287	0.440	0.312	0.338
Difference (1) - (2)	- 0.025[**]	- 0.041[**]	- 0.077[**]	-0.053[**]

Note:
(1) Covered by a decentralised agreement only.
(2) Here we report only the national/industry and the local bargaining levels. Evidence on all bargaining levels.is contained in a statistical appendix which is available upon request from the authors
** Difference is statistically significant at 1% level

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[23] In case of Spain, we consider as "centralised" either the national/industry or regional agreements and as "decentralised" firm or establishment agreements.

5   Econometric analysis

As discussed in the previous section, in each country, there are significant differences in (average) wage inequality within establishment both across industries and firm size, as well as by type of collective contract. Evidence based on simple averages, however, can be misleading since several attributes of workplaces may be correlated with the structure of wage differentials thus confounding the overall picture. In this section, we pay particular care in the analysis of the main determinants of within firm wage inequality and try to identify – ceteris paribus -- the (causal) effect of decentralised bargaining on wage dispersion (within the firm).

5.1   The empirical specification and estimation methods

We use the employer-employee matched structure of the ESES data to investigate the role of workers' personal characteristics, establishment attributes and levels of bargaining on (within establishment) wage inequality, in Belgium, Ireland, Italy and Spain. Building on previous sections, we measure wage inequality using the (within establishment) coefficient of variation and specify an empirical model as follows:

$$CV_i = a_0 + a_1 X_{Ei} + a_2 X_{Fi} + a_3 C_i + e_i \qquad [1]$$

where CV_i is the coefficient of variation of hourly gross wages within the *i-th* establishment (either 'gross' or 'net' of individual characteristics, as discussed below), X_{Ei} is a vector of "average" employees characteristics in the establishment (age, gender, occupation, education, tenure, type of contract, supervision, etc.), X_{Fi} is a vector of establishment attributes (region, industry, size, market structure, etc.) while C_i defines the type of collective agreement in force at the establishment. The vectors of parameters a_1 - a_3 has to be estimated while e_i is the error term.

There are a number of econometric caveats that concerns the estimation of equation [1] which we will discuss as we go along, we start with some simple estimates and progressively refine the estimation to account for measurement error and problems of endogeneity. Equation [1] is first estimated by OLS following two different methods, then we address the issue of endogeneity and use IV methods. In the first case, we average out employee (individual) characteristics within the establishment and plug the resulting vector of variables (at the establishment level) on the right hand side with other establishment level controls. In other terms, in this way we analyse the determinants of within establishment wage inequality estimating the correlations with establishment-level (observable) characteristics, type of collective agreement, as well as conditioning on various (average) composition effects. In the alternative approach, we use a two-

stage approach, where standard human capital earnings regressions (in levels) are run first on the employee data (i.e. individual workers) and the regression residuals retrieved to compute a "net" measure of wage dispersion (i.e. coefficient of variation) by establishment. Next, this measure of within establishment inequality - residual of individual productivity - is used in a second stage regression both with (average) employees characteristics, establishment attributes as well as type of collective agreement[24]. We do this since when measuring and analysing inequality both observable and unobservable attributes may be important in shaping the wage distribution within the workplace: conditional on observable characteristics, two workers may differ in terms of their talent, motivation, attitude to collaborate, propensity to quit, and so forth, which in turn may affect both the internal wage structure and firm's pay policies. For example, more educated workers, conditional on their personal attributes, may be more incline to apply and stay in a firm where a large number of educated workers are employed, and the firm too will probably value more having educated workers. Similarly, workers who like stable jobs, would benefit more in places where tenure is valued and worker turnover is low. In other words, is there any evidence that firms tend to remunerate some worker characteristics over and above the (average) return for that characteristics set in the market? In our empirical analysis, we try to capture this idea in a rather simple way by using the two stage method described above: first computing a residual measure of wage variation and then by augmenting the second stage regression with the average characteristics of the employees – which have already been controlled for in the first stage -- as well as other establishment attributes. We return the discussion of IV methods to a specific section.

5.2   *Main results*

Different specifications of equation [1] are estimated by OLS, for each country (Table 4)[25]. We first report the estimates obtained averaging out individual workers characteristics by establishment: that is coefficient estimates should be interpreted as the returns to average workforce and establishment attributes. In all countries, average age in the establishment shows a convex structure suggesting that within establishment wage inequality decreases with average age but less than proportionally: as a consequence, an additional year of age decreases wage inequality, and the effect progressively decreases with age. Evidence on the impact of the proportion of females in the establishment is mixed. In Ireland and in Italy the share of female workforce has a negative effect on inequality (i.e. a greater proportion of women decreases within wage dispersion), while the

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[24] The rationale for introducing (average establishment) employees characteristics back in the regression, after having already controlled for them in the first stage is discussed below.

[25] For the whole set of results see the appendix.

effect in Spain is positive or not statistically significant[26], and in Belgium the coefficient is never statistically significant. These results should account – *ceteris paribus* -- for the different effects of female intensity in the firm. On the one hand, if women are discriminated or segregated, with respect to men, wage dispersion in the establishment may increase; on the other hand, if there are spillover effects also the male wage distribution may be affected and inequality may decrease[27]. The share of workers with higher education or placed in non-manual and managerial occupations should increase inequality in the firm, both due to higher returns to educational levels as well as (conditional on education) to occupational wage differentials. In Belgium and Spain, more educated employees increase wage inequality, while the effects are less robust in Ireland and Italy; conversely, in all countries, a larger share of non-manual workers (in particular, managers) and supervisors (less robust for Ireland) is conducive to a higher dispersion. These results support the idea that employers -- in presence of costly monitoring of individual productivity and effort -- use occupational wage differentials and incentive pay to motivate workers and enhance economic performance (i.e. in this context a positive relationship between wage dispersion and productivity should be expected). The share part-timers seem to contribute to increase wage dispersion in the firm, for part-time workers usually receive a lower hourly wage, this result is common to all countries (except Spain). Within establishment wage inequality is found to decrease with average seniority (except Italy, where the effect is not statistically significant), especially in those establishments covered by collective agreements, where employees prefer more objective rules rather than pay for performance schemes. Other controls are included in the specifications. Regions, industry and size dummies are determinant in shaping pay inequality within establishments[28]. Generally, wage inequality, *ceteris paribus*, shows an increasing trend with firm size confirming the earlier evidence from unconditional wage dispersion (in Italy and Spain the relationship between wage dispersion and size is hump shaped).

Finally, considering the "gross" effects of the bargaining structure (with no other controls included), we find that the existence of a decentralised agreement (enterprise or establishment) increases dispersion – ie. which confirms evidence from descriptive analysis. When additional workers and workplace characteristics are added, the impact of decentralised bargaining is still positive (except for Belgium where is negative) but not always statistically significant. As already discussed, Spain deserves a separate treatment, for workplaces may be covered by either centralised

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[26] According to the different specifications taking into consideration.
[27] In establishments where many women are present -- over and above potential (individual) wage discrimination -- a more compressed wage structure is found.
[28] In all countries the highest within establishments wage dispersion is found in the capital region (i.e. Madrid, Brussels and Milan) while there are no regional controls in Ireland.

or decentralised agreements[29]: in the latter case, wage dispersion is found out to be larger (even when controlling for average personal and establishment characteristics).

In other words, when conditioning on a large set of control variables, results show that the presence of a local union and decentralised agreements affect both (observed) workforce composition (ie. sorting of higher quality and productivity workers) as well as the structure of within establishment wage differentials. However, are these features common to all establishments or are there differences according to some specific features of the establishment? Two features that are commonly related to union presence and collective bargaining are establishment's size and (average) workers' seniority. In order to identify better the different role played by decentralised bargaining in heterogeneous workplaces and in different countries, we introduce interaction terms[30]. Results show that the positive effect of decentralised bargaining on within establishment wage inequality is reduced by higher (average) seniority in the workforce ($-0,2 \bullet 10^{-3}$ B; $-0,4 \bullet 10^{-3}$ I; $-0.3 \bullet 10^{-3}$ E) (except Ireland, $0.1 \bullet 10^{-4}$ n.s.); conversely, the decentralised bargaining effect on inequality is larger in bigger workplaces ($0,2 \bullet 10^{-4}$ B; $0,1 \bullet 10^{-3}$ I) (except Ireland, $-0,1 \bullet 10^{-4}$ n.s., and Spain, $-0,2 \bullet 10^{-4}$).

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[29] In Spain, as previously discussed, bargaining levels are substitute and not complementary. The various level of bargaining (i.e. national, provincial, enterprise, establishment and other) have been redefined as 'centralised' (national and regional) and 'decentralised' (enterprise and establishment).
[30] Detailed results regarding the interaction terms are reported in appendix.

Table 4 - Estimates of within establishment wage inequality

VARIABLES	OLS estimates [1]							
	Belgium		Ireland		Italy		Spain	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Centralised Bargaining [2]	Ref: National/Industry		Ref: National (Inter-industry)		Ref: Industry		Ref: Industry/Regional	
Centralised and Decentralised Bargaining [2]	-0.008	-0.014	0.002	0.016	0.038	0.011	0.012	-0.005
	(-0.92)	(-1.60)	(0.19)	(1.34)	(3.24)	(1.04)	(1.90)	(-0.72)
Other types of Bargaining [4]	-0.005	-0.004	--	--	0.011	0.015	0.046	0.039
	(-0.64)	(-0.49)	--	--	(0.48)	(0.72)	(2.47)	(2.04)
Personal characteristics (est. averages) [5]	yes	yes	yes	yes	yes	yes	yes	yes
Size dummies [6]	no	yes	no	yes	no	yes	no	yes
Region dummies [7]	no	yes	no	no	no	yes	no	yes
Industry dummies [8]	no	yes	no	yes	no	yes	no	yes
Constant	1.502	1.448	1.106	0.951	0.469	0.450	1.006	0.935
	(4.37)	(3.82)	(7.98)	(6.71)	(4.59)	(4.24)	(8.97)	(8.34)
F-test	38.92	27.80	12.96	13.05	26.89	20.80	94.19	70.05
R^2	0.3284	0.3647	0.1457	0.1962	0.3363	0.3717	0.2773	0.3188
N. Obs.	4,147	4,147	2,691	2,691	7,680	7,680	17,835	17,835

Note: Sampling weights used in estimations. Robust t-statistics in parentheses
(1) Dependent variable is the coefficient of variation of hourly gross wages within the *i-th* establishment ("gross" of individual characteristics)
(2) Omitted variable is the main level of bargaining in each country, as described in the previous Table 1
(3) Decentralise bargaining is the second level of bargaining in each country , as described in the previous Table 1
(4) Other types of bargaining is a miscellanea of other agreements we treat as residual
(5) Personal characteristics include: age, age squared, share of females, 4 educational dummies (ref. Primary school), 8 occupational dummies (ref. Service workers), share of supervisors (except for Spain), share of part-timers, 4 type of contract dummies (ref. Apprentice contract) for Belgium, Ireland and Italy; 3 type of contract dummies (ref. Apprentice contract) for Spain
(6) 7 establishment's size dummies (ref. 10-19 employees for Belgium, Italy and Spain; ref. 5-19 employees for Ireland)
(7) Region dummies: 3 dummies for Belgium (ref: Wallonia), no dummies for Ireland, 11 dummies for Italy (ref: Abruzzo-Molise), 7 dummies for Spain (ref. Centre)
(8) Industry dummies: 22 dummies for Belgium (ref. Manufacturing n.e.c.), Italy (ref. Manufacturing of woods and wood products) and Spain (ref: Transport, storage and communication); 19 dummies for Ireland (ref: Mining and Quarrying)

In the above analysis, the effect of the bargaining structure on establishment inequality was simply modelled as a shift dummy or by means of interaction terms, which might be overly restrictive as bargaining practices at the establishment level may affect the whole internal structure of wages. In other words, it might be interesting to investigate how much of the increasing (decreasing) effect of decentralised bargaining on within establishment wage inequality is attributable to differences in the characteristics -- between establishments with and without decentralised agreements -- and how much is instead due to differing returns to those characteristics. We define the difference in the coefficient of variation of wages ($\sigma(\overline{w})$) between establishments covered by decentralized bargaining (*dec*) and those that are not covered (*nodec*) as $\Delta\sigma(\overline{w}) = \sigma(\overline{w})^{nodec} - \sigma(\overline{w})^{dec}$ and using an Oaxaca type approach we proceed decomposing the inequality differential (Oaxaca, 1973; Reimers, 1983)[31]. Results are reported in Table 5. The first

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[31] We decompose the inequality differential in the following way:
$$\Delta\sigma(\overline{w}) = \Delta x \left[D\beta^{nodec} + (I-D)\beta^{dec} \right] + \Delta\beta \left[x^{nodec}(I-D)) + x^{dec}D \right]$$

22

three columns report, respectively, the mean values of the coefficient of variation of wages for the two regimes and the raw differential, while the remaining columns show the contribution (in absolute and percentage terms) of observed characteristics and returns to the wage inequality differential[32]. On average, the largest part of the (raw) inequality differential seems to be accounted for by the (observed) different personal characteristics and establishment attributes across the two bargaining regimes (around 65 percent in Ireland, 66 percent in Italy and 96 percent in Spain), while the residual variation appears to be imputable to different returns to the characteristics. In Belgium, the (raw) differential is completely explained by the (observed) different personal characteristics and establishment attributes.

Table 5 - Wage inequality decomposition

COUNTRY	Average within establishment wage dispersion ——— Centralised bargaining (1)	Average within establishment wage dispersion ——— Centralised and Decentralised bargaining (2)	Raw differential (2) - (1)	Unexplained (3)	Explained (4)	Unexplained (in %) (5)	Explained (in %) (6)
Belgium	0,264	0,287	0,023	-0,002	0,025	-8,2	108,2
Ireland	0,399	0,440	0,041	0,014	0,027	34,7	65,3
Italy	0,235	0,312	0,077	0,026	0,051	33,6	66,4
Spain	0,287	0,338[(1)]	0,051	0,02	0,049	4,2	95,8

Note: (1) Decentrilesed bargaining only.

Controlling only for the average characteristics of the workforce, however, is likely to hide a significant part of the individual (observed and unobserved) contribution to wage dispersion, so in the reminder of this section we focus on the two stage method and compare results to those previously obtained. We compute within establishment wage dispersion -- for each country --using the residuals from a first stage regression. In practice, we first run a standard human capital wage equation regressing workers' personal characteristics (i.e. *age*, *age^2, gender and education*) on individual wages and retrieve the residuals. Next, we compute from the first stage residuals the

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where the *x*'s are vectors of explanatory variables evaluated at the means for the decentralized and no-decentralised bargaining regimes, I is an identity matrix and D is a matrix of weights.

[32] In practice, we estimated separate equations for the two regimes -- for all the four countries -- using the same specification reported in Table 4 (column 2).

within establishment coefficient of variation and we regress it on workplace characteristics and average workers characteristics. The main results are reported in Table 6.

In general, most of the coefficient estimates of personal characteristics and establishment attributes, for all countries, maintain their previous sign and magnitude whilst they appear to be (statistically) less robust. In particular, educational dummies (tertiary education, in particular) show a positive sign and are statistically significant both in Italy and Spain (ie. a higher share of highly educated workers in the establishment further contributes to increase wage dispersion over and above the market returns). Tenure reduces residual wage inequality, suggesting that earnings profiles flatten progressively with additional years of service within the firm (except for Belgium, where the impact of seniority is not statistically significant). Contrasting the effects of education and tenure, it seems that employers reward better (unobserved) features associated to education (maybe talent) rather than those related to seniority (maybe propensity to stay). The impact of establishment's size on (residual) inequality – *ceteris paribus* -- shows a declining pattern (i.e. inequality is lower in large sized firms with respect to smaller ones) in Italy, Ireland and Spain (although less robust in the last two countries), while has no effect in Belgium.

The impact of decentralised agreements on within-establishment wage (residual) inequality is now negative in all countries, but not always statistically significant[33].

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[33] The interaction terms do not show up consistently as before.

Table 6 - Estimates of residual within inequality

VARIABLES	OLS on first stage regression's residuals							
	Belgium		**Ireland**		**Italy**		**Spain**	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Centralised Bargaining	Ref: National/Industry		Ref: National (Inter-industry)		Ref: Industry		Ref: Industry/Regional	
Centralised and Decentralised Bargaining	-0.033	-0.029	-0.204	-0.277	-0.043	-0.026	-0.034	-0.031
	(-1.08)	(-1.12)	(-0.83)	(-0.93)	(-3.96)	(-2.55)	(-2.33)	(-2.05)
Other types of Bargaining	-0.106	-0.101	--	--	0.041	0.051	0.134	0.129
	(-1.13)	(-1.12)	--	--	(2.07)	(2.43)	(1.91)	(1.85)
Average establishment personal characteristics	yes	yes	yes	yes	yes	yes	yes	yes
Size dummies	no	yes	no	yes	no	yes	no	yes
Region dummies	no	yes	no	no	no	yes	no	yes
Industry dummies	no	yes	no	yes	no	yes	no	yes
Constant	2.879	2.779	-0.470	-0.277	0.272	0.307	0.372	0.450
	(0.84)	(0.81)	(-0.60)	(-0.93)	(1.71)	(2.13)	(2.57)	(3.00)
F-test	3.88	3.30	5.82	3.13	6.68	6.52	17.61	12.58
R^2	0.0220	0.0239	0.0157	0.0213	0.1807	0.2112	0.0215	0.0295
N. Obs.	4,149	4,149	2,696	2,696	7,703	7,703	17,899	17,899

Note: Sampling weights used in estimations. Robust t-statistics in parentheses
(1) Dependent variable is the coefficient of variation of hourly gross wages within the *i-th* establishment ("net" of individual characteristics)
(2) Omitted variable is the main level of bargaining in each country, as described in the previous Table 1
(3) Decentralise bargaining is the second level of bargaining in each country , as described in the previous Table 1
(4) Other types of bargaining is a miscellanea of other agreements we treat as residual
(5) Personal characteristics include: age, age squared, share of females, 4 educational dummies (ref. Primary school), 8 occupational dummies (ref. Service workers), share of supervisors (except for Spain), share of part-timers, 4 type of contract dummies (ref. Apprentice contract) for Belgium, Ireland and Italy; 3 type of contract dummies (ref. Apprentice contract) for Spain
(6) 7 establishment's size dummies (ref. 10-19 employees for Belgium, Italy and Spain; ref. 5-19 employees for Ireland)
(7) Region dummies: 3 dummies for Belgium (ref: Wallonia), no dummies for Ireland, 11 dummies for Italy (ref: Abruzzo-Molise), 7 dummies for Spain (ref. Centre)
(8) Industry dummies: 22 dummies for Belgium (ref: Manufacturing n.e.c.), Italy (ref. Manufacturing of woods and wood products) and Spain (ref: Transport, storage and communication); 19 dummies for Ireland (ref: Mining and Quarrying)

One problem still to consider is related to the potential non-randomness of the distribution of establishments to the decentralised bargaining-nobargaining regimes; for there might be (unobserved) characteristics that influence the decision of the establishment to bargain or not with unions. The latter is a typical endogeneity problem, which can lead to biased estimates. To address this, we use a 'treatment effect' model *à la* Heckman that considers the effect of an endogenous chosen binary treatment on another endogenously continuous variable, conditional on two sets of independent variables, and is parametrically identified assuming normality[34].

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[34] In practice we estimate the following model:

$$CV_i = \alpha D_i + X_i'\beta + u_i \qquad (2)$$

where CV is the coefficient of variation of hourly gross wages within the *i-th* establishment, X is a vector of establishment and individual characteristics, α is the effect of decentralised bargaining (i.e. the treatment) and u is the error term normally distributed. Since the decision to bargain is endogenous we also estimate a treatment equation:

$$T_i^* = Z_i'\gamma + \eta_i \qquad (3)$$

where T^* is the (latent) propensity to bargain in the establishment and $D=1$ when $T^*>0$ and $D=0$ otherwise, Z is a vector of individual and establishment characteristics, while η is the error term.

We re-estimated the model following the approaches previously discussed. Since here we are mainly interested in the causal effect of decentralised bargaining on within establishment wage inequality, we restrict attention to the estimates of the effect of decentralised bargaining (i.e. the treatment). The results are reported in Table 7. The impact of decentralised bargaining in the "one-stage treatment model" is still negative in all countries, except Ireland, and statistically significant in Belgium and in Spain (while not significant elsewhere). Conversely, when residual wage inequality is considered the estimated effect of decentralised bargaining turns non (statistically) significant for most of the countries (except Spain, where decentralised bargaining decreases wage dispersion within establishments). This evidence provides additional support to the idea that both establishment and workers characteristics are very relevant when trying to assess the (causal) effect of decentralised bargaining on internal wage differentials, and that when the endogenous sorting of establishments and workers is adequately modelled no additional effect is found. In all those cases in which the second level of bargaining (i.e. the decentralised one) is additional to the main level (i.e. the centralised one), there is no effect on within establishment wage inequality. Note that one interpretation may be that employers are able to anticipate the effects of the main level of bargaining when further negotiations at the firm take place. Conversely, in Spain, where the two levels are mutually exclusive, decentralised bargaining is still effective in reducing (within establishment) wage inequality.

This result should cast some doubts on previous results that, using inadequate data and overlooking selectivity effects, have reported a (causal) compressing effect of decentralised bargaining on within establishment wage inequality.

Table 7 - Treatment effect model estimates

Establishment characteristics	Estimates of within –establishment wage inequality				Estimates of residual within inequality			
	Belgium	**Ireland**	**Italy**	**Spain**	**Belgium**	**Ireland**	**Italy**	**Spain**
Centralised and Decentralized Bargaining	-0.161	0.227	-0.039	-0.295	0.0003	1.501	-0.021	-0.242
	(-4.29)	(1.65)	(-1.28)	(-13.67)	(0.00)	(1.06)	(-0.33)	(-3.63)
Other types of Bargaining	-0.017	--	0.014	0.018	-0.045	--	0.007	0.069
	(-3.23)	--	(1.39)	(2.01)	(-1.84)	--	(0.35)	(2.56)
Constant	1.048	0.675	0.262	0.829	2.851	-2.989	-0.079	0.297
	(5.84)	(2.72)	(5.06)	(15.43)	(5.13)	(-1.20)	(-0.73)	(2.04)
Wald-chi	2388.32	1055.60	6696.12	8404.20	628.55	475.57	2052.32	3434.45
N. Obs.	4,147	2,691	7,680	17,835	4,149	2,696	7,703	17,899
Note: other variables included are the same as in Tabeles 4 and 6								

We also assume that η and *u* are independent of *X* and *Z* such that E(*u*|X,D,Z)=E(*u*|X,D).

6 Concluding Remarks

This paper has analysed the theoretical implications and the empirical determinants of within firm wage inequality. The economic models reviewed suggest that (large) within establishment wage differentials are important to attract, select, motivate and retain workers of different skills and hence very relevant for the productive and organisational efficiency of the firm. Alternative approaches, however, have suggested that when cooperation (rather than competition) among workers is important, and the institutional setting is framed so as to protect workers from market failures and employers discretion in pay determination, then a rather compressed internal wage structure might be desirable.

In this context, empirical evidence from previous studies has shown that wage dispersion is influenced by firm characeristics, as well as by institutional factors such as union presence and collective bargaining. In order to asses the evidence, for a number of European countries (Belgium, Ireland, Italy and Spain), we have used a matched employer-employee microdata – drawn from the European Structure of Earnings Survey (ESES) – to investigate the factors affecting wage dispersion within the establishment. The main empirical findings suggest that employees characteristics, employers attributes and work organisation practices are important determinants of within establishments wage dispersion. Also, when the effect of collective bargaining -- at the central level and (or) at the decentralised level -- on the (unconditional) intra-firm wage dispersion is considered, the empirical evidence suggests that wage inequality is higher in covered establishments as opposed to non-covered. However, when a larger set of controls are included (i.e. employee and employer characteristics) the association turns negative or becomes non (statistically) significant. Summing up some of the findings, we can note that the initial results showing that decentralised bargaining led to an increase in within-establishment (unconditional) wage dispersion is not robust to the inclusion of both workers (individual) characteristics as well as establishment attributes, suggesting that there is a lot of heterogeneity between establishments across regimes and that inadequate controls may produce spurious correlations. Furthermore, there is evidence that firms and workers respond to (wage) incentives and sort themselves where pecuniary and non-pecuniary attributes are more favourable.

Finally, when we accounted for the endogeneity of the bargaining structure and the self-selection of establishment according to the bargaining structure, we found no causal effect of decentralised bargaining on within establishments inequality, with the exception of Spain which deserves a separate treatment, for workplaces are covered by either centralised or decentralised agreements and not both. In Spain, in fact, decentralised levels of bargaining decrease within establishment wage

dispersion also accounting for the endogeneity of the bargaining structure and the self-selection of establishment according to the bargaining structure.

This evidence provides additional support to the idea that both establishment and workers characteristics are very relevant when trying to assess the (causal) effect of decentralised bargaining on internal wage differentials, and that when the endogenous sorting of establishments and workers is adequately modelled no additional effect is found. Notably, no effect on within establishment wage inequality is detected in all those cases in which the second level of bargaining (i.e. the decentralised one) is additional to the main level (i.e. the centralised one). Note that one interpretation may be that employers are able to anticipate the effects of the main level of bargaining when further negotiations at the firm take place. Conversely, in Spain, where the two levels are mutually exclusive, decentralised bargaining is still effective in reducing (within establishment) wage inequality.

In other words, in general, the empirical evidence presented here seems to suggest that results from previous studies showing a (positive/negative) correlation between (decentralised) plant-level bargaining and within establishment wage inequality, might be biased due to both lack of adequate data and appropriate empirical methodology.

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Table A1 _ Variables used in the analyses (Mean) - ESES Matched Employer-Employee Data, 1995 (Weighted samples)

ESTABLISHMENT LEVEL DATA				
Variables	**Belgium**	**Ireland**	**Italy**	**Spain**
Age	36.283	33.393	35.650	37.618
Age2	1417.907	1244.070	1384.246	1539.884
Female	0.332	0.371	0.332	0.231
Primary school	0.114	0.079	0.150	0.345
Lower secondary school	0.220	0.249	0.510	0.343
Upper secondary school	0.442	0.513	0.314	0.156
Tertiary education	0.224	0.159	0.027	0.156
Years of education	11.264	12.564	9.338	8.736
Managers	0.062	0.069	0.012	0.042
Professionals	0.058	0.037	0.017	0.037
Associate professionals	0.123	0.052	0.064	0.100
Clerks	0.246	0.135	0.226	0.154
Service workers	0.106	0.192	0.114	0.104
Craft and related trades workers	0.182	0.167	0.355	0.236
Plant-machine operators	0.106	0.227	0.144	0.195
Elementary occupations	0.118	0.122	0.068	0.133
Manual workers	0.405	0.516	0.567	0.564
Non manual workers	0.595	0.484	0.433	0.436
Supervisors	0.168	0.094	0.118	
Tenure (in months)	94.296	91.238	94.288	97.522
Part-time	0.144	0.137	0.094	0.042
Indefinite duration contract	0.976	0.926	0.928	0.667
Fixed term contract	0.019	0.036	0.024	0.328
Apprentice contract	0.001	0.022	0.047	0.005
Other contract	0.003	0.016	0.001	--
Region Bruxelles-Cap/ Brussels HFDST. Gew	0.136	--	--	--
Vlaams Gewest	0.653	--	--	--
Region Wallonne	0.210	--	--	--
North-West	--	--	0.096	--
Lombardia	--	--	0.193	--
North-East	--	--	0.208	--
Emila-Romagna	--	--	0.106	--
Centre	--	--	0.145	--
Lazio	--	--	0.067	--
Abruzzo – Molise	--	--	0.023	--
Campania	--	--	0.048	--
South	--	--	0.054	--
Sicily	--	--	0.039	--
Sardinia	--	--	0.021	--
Noroeste	--	--	--	0.088
Noreste	--	--	--	0.119
Madrid	--	--	--	0.154
Centro (E)	--	--	--	0.104
Este	--	--	--	0.353
Sur	--	--	--	0.139
Canarias	--	--	--	0.043

ESTABLISHMENT LEVEL DATA

Variables	Belgium	Ireland	Italy	Spain
Mining and quarrying	0.003	0.008	0.007	0.006
Manufacturing of food products, beverages and tobacco	0.045	0.102	0.032	0.054
Manufacturing of textiles and textile products	0.039	0.054	0.083	0.039
Manufacturing of leather and leather products	0.001	0.005	0.028	0.014
Manufacturing of wood and wood products	0.016	0.022	0.020	0.016
Manufacture of pulp, paper and paper products; publishing and printing	0.022	0.070	0.025	0.028
Manufacture of coke, refined petroleum	0.001	0.000	0.001	0.001
Manufacture of chemicals, chemical products and man-made fibres	0.018	0.036	0.013	0.018
Manufacture of rubber and plastic products	0.012	0.035	0.032	0.013
Manufacture of other non-metallic mineral products	0.018	0.028	0.018	0.027
Manufacture of basic metals and fabricated metal products	0.042	0.062	0.097	0.049
Manufacture of machinery and equipment n.e.c.	0.016	0.043	0.063	0.024
Manufacture of electrical and optical equipment	0.012	0.065	0.028	0.021
Manufacture of transport equipment	0.011	0.017	0.005	0.011
Manufacturing n.e.c.	0.029	0.037	0.034	0.028
Electricity, gas and water supply	0.004	0.009	0.013	0.007
Construction	0.096	--	0.083	0.174
Wholesale and retail trade; repair of motor vehicles, motorcycles and personal and household goods	0.256	0.223	0.132	0.244
Hotels and restaurants	0.042	0.169	0.051	0.070
Transport, storage and communication	0.100	--	0.079	0.057
Financial intermediation	0.070	0.016	0.052	0.029
Real estate, renting and business activity	0.146	--	0.102	0.070
Number of employees in local unit	53.568	82.011	38.397	38.518
10 to 19 employees (5-19 employees for Ireland)	0.498	0.178	0.602	0.563
20 to 49 employees	0.307	0.505	0.278	0.312
50 to 99 employees	0.094	0.164	0.071	0.072
100 to 249 employees	0.068	0.100	0.034	0.037
250 to 499 employees	0.022	0.035	0.010	0.011
500 to 999 employees	0.008	0.013	0.004	0.004
1000 or more employees	0.004	0.006	0.002	0.002
Centralised Bargaining	0.606	0.477	0.871	0.871
Centralised and Decentralised Bargaining (Decentralised Bargaining for Spain)	0.101	0.523	0.086	0.105
Other types of Bargaining	0.293	--	0.043	0.024
Hourly wage including share of annual bonus	485.874	6.897	15.300	1171.268
Coefficient of variation	0.266	0.421	0.242	0.277
Standard deviation of logs	0.250	0.371	0.227	0.293
Max-Min Ratio	2.895	4.538	2.261	2.538
N. Obs.	4,160	2,691	7,680	17,835

EMPLOYEE LEVEL DATA

Variables	Belgium	Ireland	Italy	Spain
Age	37.265	34.220	37.616	38.517
Age^2	1485.580	1295.144	1527.618	1604.434
Female	0.292	0.407	0.295	0.246
Primary school	0.121	0.065	0.147	0.317
Lower secondary school	0.224	0.227	0.469	0.303
Upper secondary school	0.405	0.504	0.334	0.187
Tertiary education	0.250	0.205	0.049	0.193
Years of education	11.314	12.783	9.659	9.113
Managers	0.070	0.059	0.017	0.040
Professionals	0.071	0.055	0.036	0.054

EMPLOYEE LEVEL DATA				
Variables	**Belgium**	**Ireland**	**Italy**	**Spain**
Associate professionals	0.168	0.076	0.109	0.111
Clerks	0.242	0.169	0.226	0.165
Service workers	0.063	0.155	0.080	0.091
Craft and related trades workers	0.169	0.121	0.271	0.206
Plant-machine operators	0.115	0.276	0.190	0.210
Elementary occupations	0.100	0.089	0.071	0.122
Manual workers	0.385	0.486	0.532	0.538
Non Manual workers	0.615	0.514	0.468	0.462
Supervisors	0.164	0.090	0.144	--
Tenure	124.471	109.523	121.653	126.682
Part-time workers	0.113	0.111	0.076	0.038
Indefinite duration contract	0.965	0.936	0.939	0.732
Fixed term contract	0.029	0.042	0.025	0.260
Apprentice contract	0.001	0.011	0.034	0.007
Other contract	0.005	0.011	0.002	--
Hourly wage including annual bonus	566.671	8.963	18.250	1433.696
N. Obs.	81,905	38,156	95,511	175,110

Table A2 - Sample size by country (establishment and employees)

	Original sample		Final sample	
COUNTRY	**N. establishments and (employees)**	**Avg. N. empl. per establ.**	**N. establishments and (employees)**	**% reduction in sample size**
(1)	(2)	(3)	(4)	(2) - (4) (in %)
Belgium	6,019 (145,107)	24	4,160* (81,905)*	-30.9* (-43,6)*
Ireland	2,701 (39,105)	14	2,691 (38,156)	-0,4 (-2,4)
Italy	7,778 (96,267)	12	7,680 (95,511)	-1,3 (-0,8)
Spain	17,946 (177,139)	10	17,835 (175,110)	-0,6 (-1,1)

Note: * the drop in sample size is due to missing data on hourly wages

Table A3 - Estimates of within establishment pay inequality (Belgium)

VARIABLES	OLS estimates *Dependent Variable: Coefficient of variation of hourly gross wages within the i-th establishment ("gross" of individual characteristics)*					OLS on first stage regression's residuals *Dependent Variable: Coefficient of variation of hourly gross wages within the i-th establishment ("net" of individual characteristics)*				
	(1)	(2)	(3)	(4)	(5)	(a)	(b)	(c)	(d)	(e)
Personal characteristics (establishment averages)										
Age		-0.026		-0.024	-0.025		0.034		0.033	0.033
		(-3.62)		(-3.52)	(-3.52)		(-0.29)		(0.57)	(0.57)
Age2		0.0004		0.0003	0.0004		-0.0004		-0.0004	-0.0004
		(4.04)		(3.96)	(3.96)		(-0.49)		(-0.44)	(-0.44)
Female		0.017		0.004	0.005		0.211		0.221	0.224
		(1.08)		(0.22)	(0.29)		(0.70)		(0.75)	(0.75)
Lower secondary		-0.017		-0.028	-0.026		-0.034		-0.028	-0.025
		(-0.94)		(-1.50)	(-1.43)		(-0.51)		(-0.35)	(-0.33)
Upper secondary		0.004		-0.015	-0.014		-0.056		-0.061	-0.060
		(0.28)		(-0.95)	(-0.91)		(-0.51)		(-0.42)	(-0.42)
Ttertiary		0.085		0.056	0.056		-0.059		-0.068	-0.068
		(3.70)		(2.36)	(2.34)		(-0.32)		(-0.30)	(-0.30)
Managers		0.481		0.495	0.497		0.125		0.106	0.111
		(10.09)		(10.66)	(10.71)		(0.56)		(0.74)	(0.76)
Professionals		0.104		0.144	0.145		0.055		0.050	0.053
		(3.24)		(4.10)	(4.12)		(0.28)		(0.35)	(0.37)
Associate professionals		0.125		0.155	0.158		0.111		0.104	0.111
		(5.03)		(6.18)	(6.29)		(0.46)		(0.77)	(0.80)
Clerks		0.092		0.130	0.131		0.193		0.185	0.187
		(4.83)		(6.56)	(6.60)		(0.75)		(1.17)	(1.17)
Craft and related trades workers		-0.023		0.038	0.040		0.184		0.191	0.195
		(-1.02)		(1.65)	(1.73)		(0.66)		(0.97)	(0.98)
Plant-machine operators		0.004		0.045	0.047		0.132		0.163	0.167
		(0.18)		(1.87)	(1.96)		(0.42)		(0.68)	(0.69)
Elementary occupations		0.053		0.089	0.091		0.344		0.354	0.359
		(1.85)		(3.12)	(3.19)		(1.10)		(1.55)	(1.55)
Supervisors		0.061		0.070	0.069		0.109		0.116	0.117
		(2.82)		(3.25)	(3.24)		(0.77)		(0.72)	(0.72)
Tenure		-0.0002		-0.0002	-0.0001		-0.001		-0.001	-0.001
		(-2.47)		(-2.39)	(-1.89)		(-1.32)		(-0.91)	(-0.83)
Part-time		0.037		0.047	0.046		-0.319		-0.327	-0.328
		(1.53)		(2.04)	(2.01)		(-0.64)		(-0.67)	(-0.67)
Indefinite duration contract		-0.922		-0.986	-0.985		-3.405		-3.299	-3.301
		(-2.69)		(-2.60)	(-2.60)		(-0.99)		(-0.96)	(-0.96)
Fixed term contract		-0.987		-1.064	-1.062		-3.197		-3.092	-3.092
		(-2.86)		(-2.80)	(-2.79)		(-0.93)		(-0.90)	(-0.90)
Other contract		-0.877		-0.962	-0.961		-3.381		-3.230	-3.232
		(-2.53)		(-2.52)	(-2.51)		(-0.99)		(-0.95)	(-0.95)

Table A3 (ctd.) - Estimates of within establishment pay inequality (Belgium)

VARIABLES	OLS estimates *Dependent Variable: Coefficient of variation of hourly gross wages within the i-th establishment ("gross" of individual characteristics)*					OLS on first stage regression's residuals *Dependent Variable: Coefficient of variation of hourly gross wages within the i-th establishment ("net" of individual characteristics)*				
	(1)	(2)	(3)	(4)	(5)	(a)	(b)	(c)	(d)	(e)
Establishment characteristics										
Size dummies (ref. 10-19 employees)										
20-49			0.024	0.019	0.018			0.004	0.004	0.004
			(2.80)	(2.32)	(2.37)			(0.10)	(0.08)	(0.07)
50-99			0.026	0.028	0.027			-0.014	-0.010	-0.010
			(2.87)	(3.46)	(3.45)			(-0.47)	(-0.28)	(-0.28)
100-249			0.025	0.022	0.022			-0.024	-0.025	-0.026
			(2.68)	(2.48)	(2.42)			(-0.83)	(-0.75)	(-0.74)
250-499			0.052	0.057	0.056			-0.011	0.011	0.013
			(4.60)	(5.94)	(5.83)			(-0.41)	(0.23)	(0.26)
500-499			0.058	0.067	0.063			-0.016	0.003	0.008
			(3.92)	(4.96)	(4.73)			(-0.60)	(0.06)	(0.13)
1000 and over			0.065	0.073	0.057			-0.015	0.013	0.024
			(3.59)	(4.43)	(3.40)			(-0.49)	(0.22)	(0.30)
Collective bargaining (ref:Centralised -- National/Industry -- Bargaining)										
Centralised + Decentralised Bargaining	0.025	-0.008	-0.017	-0.014	0.009	-0.070	-0.033	-0.070	-0.029	0.021
	(2.64)	(-0.92)	(-1.67)	(-1.60)	(0.50)	(-5.55)	(-1.08)	(-2.26)	(-1.12)	(0.31)
Other types of Bargaining	0.005	-0.005	0.001	-0.004	-0.005	-0.090	-0.106	-0.083	-0.101	-0.103
	(0.55)	(-0.64)	(0.009)	(-0.49)	(-0.61)	(-1.08)	(-1.13)	(-0.96)	(-1.12)	(-1.11)
*Decentralised Bargaining*Tenure*					-0.0002					-0.0004
					(-1.75)					(-0.72)
*Decentralised Bargaining*Size (n.° of employees)*					0.00002					-0.00001
					(2.89)					(-0.46)
Region and Industry controls										
Regions (3 dummies; ref: Wallonia)	no	no	yes	yes	yes	no	no	yes	yes	yes
Industries (22 dummies; ref: Manufacturing n.e.c.)	no	no	yes	yes	yes	no	no	yes	yes	yes
Constant	0.262	1.502	0.117	1.448	1.444	0.289	2.879	0.288	2.779	2.772
	(49.81)	(4.37)	(7.17)	(3.82)	(3.80)	(27.98)	(0.84)	(4.44)	(0.81)	(0.81)
F-test	3.54	38.92	18.58	27.80	26.95	15.52	3.88	5.70	3.30	3.66
R^2	0.0019	0.3284	0.1688	0.3647	0.3655	0.0017	0.0220	0.0058	0.0239	0.0239
N. Obs.	4,160	4,147	4,160	4,147	4,147	4,162	4,149	4,162	4,149	4,149

Note:
Sampling weights used in estimations. Robust t-statistics in parentheses.
Reference variables: Service workers; Primary school; Apprentice (contract); Wallonia; Manufacturing n.e.c.; 10-19 employees; National/Industry bargaining.

Table A4 - Estimates of within establishment pay inequality (Ireland)

VARIABLES	OLS estimates *Dependent Variable: Coefficient of variation of hourly gross wages within the i-th establishment ("gross" of individual characteristics)*					OLS on first stage regression's residuals *Dependent Variable: Coefficient of variation of hourly gross wages within the i-th establishment ("net" of individual characteristics)*				
	(1)	(2)	(3)	(4)	(5)	(a)	(b)	(c)	(d)	(e)
Personal characteristics (establishment averages)										
Age		-0.023		-0.024	-0.024		0.053		0.070	0.061
		(-3.21)		(-3.47)	(-3.46)		(1.70)		(1.54)	(1.62)
Age2		0.0003		0.0003	0.0003		-0.001		-0.001	-0.001
		(3.42)		(3.79)	(3.78)		(-1.10)		(-1.13)	(-1.12)
Female		-0.041		-0.066	-0.066		0.325		0.317	0.296
		(-1.49)		(-1.94)	(-1.96)		(1.26)		(1.15)	(1.16)
Lower secondary		0.024		-0.006	-0.006		-0.058		-0.044	-0.037
		(0.68)		(-0.18)	(-0.18)		(-0.51)		(-0.38)	(-0.32)
Upper secondary		0.062		0.012	0.012		0.154		0.191	0.229
		(1.77)		(0.32)	(0.33)		(1.33)		(1.74)	(1.69)
Tertiary		0.043		-0.018	-0.018		1.848		1.859	1.910
		(0.75)		(-0.32)	(-0.31)		(1.19)		(1.26)	(1.25)
Managers		0.699		0.768	0.768		-1.457		-1.271	-1.351
		(6.88)		(7.54)	(7.59)		(-1.16)		(-1.24)	(-1.23)
Professionals		0.196		0.208	0.208		-2.253		-1.592	-1.612
		(2.26)		(2.57)	(2.57)		(-1.22)		(-1.25)	(-1.25)
Associate professionals		0.202		0.182	0.181		-1.614		-1.008	-1.053
		(3.32)		(3.05)	(3.05)		(-1.32)		(-1.45)	(-1.43)
Clerks		0.149		0.082	0.082		-1.057		-0.694	-0.705
		(3.16)		(1.74)	(1.75)		(-1.20)		(-1.25)	(-1.25)
Craft and related trades workers		-0.066		0.022	0.022		0.038		0.543	0.515
		(-2.18)		(0.58)	(0.58)		(0.49)		(1.08)	(1.08)
Plant-machine operators		-0.045		0.028	0.028		-0.601		0.022	0.014
		(-1.53)		(0.78)	(0.79)		(-1.30)		(0.15)	(0.10)
Elementary occupations		0.017		0.056	0.056		-0.145		0.087	0.076
		(0.44)		(1.42)	(1.42)		(-0.38)		(0.47)	(0.39)
Supervisors		0.086		0.077	0.077		0.573		0.458	0.470
		(1.55)		(1.39)	(1.39)		(0.78)		(0.73)	(0.73)
Tenure		-0.0002		-0.0003	-0.0003		-0.002		-0.001	-0.002
		(-1.17)		(-2.01)	(-1.85)		(-3.54)		(-2.57)	(-1.98)
Part-time		0.151		0.139	0.139		-0.202		-0.548	-0.540
		(3.65)		(3.32)	(3.32)		(-0.45)		(-0.71)	(-0.70)
Indefinite duration contract		-0.433		-0.440	-0.440		0.161		0.300	0.300
		(-4.82)		(-4.82)	(-4.81)		(0.23)		(0.38)	(0.38)
Fixed term contract		-0.455		-0.452	-0.452		0.069		0.243	0.251
		(-4.82)		(-4.72)	(-4.72)		(0.12)		(0.34)	(0.35)
Other contract		-0.509		-0.500	-0.500		0.027		0.035	-0.040
		(-4.83)		(-4.81)	(-4.78)		(0.05)		(0.06)	(-0.08)

Table A4 (ctd) - Estimates of within establishment pay inequality (Ireland)

VARIABLES	OLS estimates Dependent Variable: Coefficient of variation of hourly gross wages within the i-th establishment ("gross" of individual characteristics)					OLS on first stage regression's residuals Dependent Variable: Coefficient of variation of hourly gross wages within the i-th establishment ("net" of individual characteristics)				
	(1)	(2)	(3)	(4)	(5)	(a)	(b)	(c)	(d)	(e)
Establishment characteristics										
Size dummies (ref. 5-19 employees)										
20-49			0.026	0.049	0.049			0.003	-0.037	-0.035
			(1.32)	(2.66)	(2.67)			(0.05)	(-0.61)	(-0.57)
50-99			0.047	0.080	0.080			-0.218	-0.256	-0.246
			(2.30)	(4.12)	(4.12)			(-1.63)	(-1.42)	(-1.44)
100-249			0.025	0.077	0.077			-0.243	-0.283	-0.278
			(1.26)	(3.96)	(3.97)			(-1.88)	(-1.47)	(-1.47)
250-499			0.040	0.091	0.092			-0.248	-0.311	-0.311
			(1.70)	(3.90)	(3.93)			(-2.14)	(-1.66)	(-1.65)
500-499			0.050	0.120	0.121			-0.258	-0.339	-0.336
			(1.55)	(3.77)	(3.79)			(-2.22)	(-1.64)	(-1.63)
1000 and over			0.108	0.146	0.155			-0.314	-0.385	-0.449
			(2.85)	(4.15)	(4.03)			(-1.71)	(-1.31)	(-1.24)
Collective bargaining (ref: Centralised -- Nationa/Inter-industry -- Bargaining)										
Centralised + Decentralised Bargaining	0.041	0.002	0.037	0.016	0.015	-0.115	-0.204	-0.250	-0.277	-0.594
	(3.59)	(0.19)	(3.22)	(1.34)	(0.72)	(-0.64)	(-0.83)	(-0.92)	(-0.93)	(-1.00)
*Decentralised Bargaining*Tenure*					0.00001					0.004
					(0.08)					(1.05)
*Decentralised Bargaining*Size (n.° of employees)*					-0.00001					0.00003
					(-0.60)					(0.62)
Region and Industry controls										
Regions	no	no	no	no	no	no	no	no	no	no
Industries (19 dummies; ref: Mining and Quarrying)	no	no	yes	yes	yes	no	no	yes	yes	yes
Constant	0.399	1.106	0.195	0.951	0.951	0.594	-0.470	0.568	-1.095	-0.781
	(55.06)	(7.98)	(5.57)	(6.71)	(6.62)	(3.30)	(-0.60)	(3.14)	(-0.90)	(-0.82)
F-test	18.86	12.96	11.70	13.05	12.54	0.40	5.82	6.70	3.13	2.81
R^2	0.0064	0.1457	0.0904	0.1962	0.1962	0.0003	0.0157	0.0096	0.0213	0.0222
N. Obs.	2,691	2,691	2,691	2,691	2,691	2,696	2,696	2,696	2,696	2,696

Note:
Sampling weights used in estimations. Robust t-statistics in parentheses
Reference variables: Service workers; Primary school; Apprentice (contract); Mining and Quarrying; 5-19 employees; National (Inter-industry) bargaining.

Table A5 - Estimates of within establishment pay inequality (Italy)

VARIABLES	OLS estimates Dependent Variable: Coefficient of variation of hourly gross wages within the i-th establishment ("gross" of individual characteristics)					OLS on first stage regression's residuals Dependent Variable: Coefficient of variation of hourly gross wages within the i-th establishment ("net" of individual characteristics)				
	(1)	(2)	(3)	(4)	(5)	(a)	(b)	(c)	(d)	(e)
Personal characteristics (establishment averages)										
Age		-0.015		-0.014	-0.015		-0.00004		-0.001	-0.002
		(-2.70)		(-2.57)	(-2.74)		(0.00)		(-0.14)	(-0.17)
Age2		0.0002		0.0002	0.0002		0.0001		0.0001	0.0001
		(2.65)		(2.67)	(2.84)		(0.73)		(0.96)	(0.99)
Female		-0.030		-0.047	-0.047		0.009		-0.018	-0.018
		(-1.93)		(-2.53)	(-2.56)		(0.32)		(-0.79)	(-0.80)
Lower secondary		0.019		0.007	0.009		0.073		0.090	0.091
		(0.84)		(0.31)	(0.38)		(2.54)		(3.13)	(3.14)
Upper secondary		-0.004		-0.020	-0.018		0.153		0.177	0.177
		(-0.15)		(-0.76)	(-0.69)		(3.92)		(4.55)	(4.56)
Tertiary education		-0.016		-0.054	-0.057		0.428		0.482	0.482
		(-0.16)		(-0.59)	(-0.62)		(3.34)		(3.88)	(3.88)
Managers		2.025		1.938	1.941		0.061		0.090	0.090
		(12.78)		(12.85)	(12.87)		(0.45)		(0.71)	(0.72)
Professionals		0.116		0.117	0.118		0.073		0.066	0.066
		(1.05)		(1.21)	(1.22)		(0.45)		(0.45)	(0.45)
Associate professionals		0.163		0.146	0.146		-0.054		-0.046	-0.047
		(3.96)		(3.38)	(3.38)		(-1.14)		(-0.91)	(-0.92)
Clerks		0.097		0.088	0.090		-0.105		-0.082	-0.081
		(4.45)		(3.19)	(3.27)		(-3.50)		(-2.14)	(-2.12)
Craft and related trades workers		0.006		-0.020	-0.019		0.034		-0.009	-0.009
		(0.34)		(-0.65)	(-0.60)		(1.34)		(-0.21)	(-0.20)
Plant-machine operators		0.028		-0.019	-0.018		-0.0004		-0.026	-0.026
		(1.34)		(-0.59)	(-0.55)		(-0.01)		(-0.67)	(-0.67)
Elementary occupations		0.018		-0.001	0.0003		0.031		0.033	0.034
		(0.62)		(-0.03)	(0.01)		(0.48)		(0.56)	(0.57)
Supervisors		0.075		0.071	0.071		0.023		0.020	0.020
		(2.52)		(2.47)	(2.49)		(0.63)		(0.60)	(0.60)
Tenure		0.00002		-0.0002	-0.0001		-0.0003		-0.0002	-0.0002
		(0.17)		(-1.29)	(-0.77)		(-2.87)		(-1.91)	(-1.62)
Part-time		0.140		0.157	0.157		0.384		0.364	0.364
		(4.10)		(4.89)	(4.91)		(5.48)		(5.38)	(5.38)
Indefinite duration (contract)		-0.050		-0.062	-0.063		-0.235		-0.237	-0.237
		(-1.14)		(-1.46)	(-1.49)		(-1.15)		(-1.26)	(-1.27)
Fixed term (contract)		-0.066		-0.090	-0.090		-0.269		-0.258	-0.257
		(-1.27)		(-1.72)	(-1.73)		(-1.34)		(-1.43)	(-1.43)
Other contract		-0.096		-0.099	-0.105		-0.273		-0.273	-0.275
		(-1.07)		(-1.18)	(-1.24)		(-1.08)		(-1.16)	(-1.17)

Table A5 (ctd.) - Estimates of within-establishment pay inequality (Italy)

VARIABLES	OLS estimates *Dependent Variable: Coefficient of variation of hourly gross wages within the i-th establishment ("gross" of individual characteristics)*					OLS on first stage regression's residuals *Dependent Variable: Coefficient of variation of hourly gross wages within the i-th establishment ("net" of individual characteristics)*				
	(1)	(2)	(3)	(4)	(5)	(a)	(b)	(c)	(d)	(e)
Establishment characteristics										
Size dummies (ref. 10-19 employees)										
20-49			0.040	0.023	0.023			-0.022	-0.019	-0.019
			(3.75)	(2.64)	(2.68)			(-1.71)	(-1.92)	(-1.91)
50-99			0.079	0.054	0.054			-0.026	-0.039	-0.039
			(4.85)	(3.42)	(3.42)			(-2.10)	(-2.75)	(-2.76)
100-249			0.103	0.064	0.062			-0.015	-0.040	-0.041
			(8.15)	(5.44)	(5.27)			(-1.33)	(-2.79)	(-2.85)
250-499			0.099	0.077	0.070			-0.003	-0.027	-0.032
			(6.01)	(5.35)	(4.81)			(-0.12)	(-0.90)	(-1.04)
500-999			0.083	0.064	0.054			-0.039	-0.073	-0.081
			(4.79)	(3.79)	(3.11)			(-3.22)	(-3.27)	(-3.55)
1000+			0.058	0.044	0.012			-0.054	-0.080	-0.103
			(3.62)	(2.59)	(0.60)			(-4.59)	(-3.96)	(-4.40)
Collective bargaining dummies (ref. Centralised -- Industry -- Bargaining)										
Centralised + Decentralised Bargaining	0.077	0.038	0.013	0.011	0.067	-0.058	-0.043	-0.029	-0.026	-0.008
	(4.78)	(3.24)	(0.85)	(1.04)	(2.85)	(-5.31)	(-3.96)	(-2.54)	(-2.55)	(-0.36)
Other types of Bargaining	0.011	0.011	0.010	0.015	0.016	0.055	0.041	0.057	0.051	0.051
	(0.37)	(0.48)	(0.37)	(0.72)	(0.75)	(2.45)	(2.07)	(2.44)	(2.43)	(2.44)
*Decentralised Bargaining*Tenure*					-0.0004					-0.0002
					(-2.75)					(-1.00)
*Decentralised Bargaining*Size(n.° of employees)*					0.0001					0.00004
					(3.35)					(2.65)
Constant	0.235	0.469	0.130	0.450	0.460	0.278	0.272	0.263	0.307	0.310
	(45.42)	(4.59)	(6.86)	(4.24)	(4.33)	(34.29)	(1.71)	(7.92)	(2.13)	(2.13)
Region and Industry controls										
Regions (11 dummies; ref: Abruzzo-Molise)	no	no	yes	yes	yes	no	no	yes	yes	yes
Industries (22 dummies; ref. Manufacturing of woods and wood products)	no	no	yes	yes	yes	no	no	yes	yes	yes
F-test	11.42	26.89	11.3	20.8	20.63	22.17	6.68	5.86	6.52	6.63
R^2	0.0157	0.3363	0.1023	0.3717	0.3739	0.0092	0.1807	0.0564	0.2112	0.2115
N. Obs.	7,680	7,680	7,680	7,680	7,680	7,703	7,703	7,703	7,703	7,703

Note:
Sampling weights used in estimations. Robust t-statistics in parentheses
Reference variables: Service workers; Primary school; Apprentice (contract); Abruzzo-Molise; Manufacturing of woods and wood products; 10-19 employees; Industry Bargaining.

Table A6 - Estimates of within establishment wage inequality (Spain)

VARIABLES	OLS estimates *Dependent Variable: Coefficient of variation of hourly gross wages within the i-th establishment ("gross" of individual characteristics)*					OLS on first stage regression's residuals *Dependent Variable: Coefficient of variation of hourly gross wages within the i-th establishment ("net" of individual characteristics)*				
	(1)	(2)	(3)	(4)	(5)	(a)	(b)	(c)	(d)	(e)
Personal characteristics (establishment averages)										
Age		-0.018		-0.016	-0.016		0.002		0.005	0.005
		(-5.93)		(-5.29)	(-5.23)		(0.26)		(0.57)	(0.57)
Age2		0.0003		0.0002	0.0002		0.00004		0.00001	0.00001
		(6.53)		(6.08)	(6.03)		(0.36)		(0.12)	(0.12)
Female		0.023		-0.001	-0.001		-0.036		-0.062	-0.062
		(2.39)		(-0.09)	(-0.12)		(-1.62)		(-2.23)	(-2.23)
Lower secondary		0.027		0.025	0.025		0.069		0.068	0.068
		(3.50)		(3.18)	(3.23)		(3.22)		(3.10)	(3.10)
Upper secondary		0.098		0.089	0.089		0.174		0.179	0.179
		(6.37)		(5.76)	(5.75)		(3.97)		(4.08)	(4.09)
Tertiary		0.150		0.139	0.139		0.250		0.259	0.259
		(9.44)		(8.60)	(8.57)		(4.90)		(4.59)	(4.58)
Managers		0.732		0.732	0.730		-0.053		-0.057	-0.056
		(18.94)		(18.35)	(18.27)		(-0.97)		(-0.90)	(-0.90)
Professionals		0.188		0.153	0.153		-0.281		-0.313	-0.313
		(6.75)		(5.04)	(5.01)		(-4.11)		(-3.94)	(-3.94)
Associate professionals		0.172		0.154	0.154		-0.038		-0.044	-0.044
		(9.26)		(7.27)	(7.26)		(-0.71)		(-0.73)	(-0.73)
Clerks		0.096		0.105	0.105		-0.059		-0.062	-0.062
		(5.60)		(5.29)	(5.28)		(-0.98)		(-0.86)	(-0.86)
Craft and related trades workers		0.003		-0.012	-0.012		-0.063		-0.082	-0.082
		(0.25)		(-0.85)	(-0.84)		(-2.19)		(-2.55)	(-2.55)
Plant-machine operators		0.013		-0.011	-0.011		-0.058		-0.090	-0.090
		(1.27)		(-0.75)	(-0.75)		(-2.44)		(-2.82)	(-2.83)
Elementary occupations		0.031		0.005	0.005		-0.007		-0.017	-0.017
		(2.22)		(0.31)	(0.32)		(-0.13)		(-0.33)	(-0.33)
Tenure		-0.0001		-0.0002	-0.0002		-0.001		-0.001	-0.001
		(-2.02)		(-4.14)	(-3.18)		(-5.48)		(-5.45)	(-5.12)
Part-time		-0.004		0.017	0.017		-0.033		-0.025	-0.025
		(-0.21)		(0.96)	(0.94)		(-0.29)		(-0.22)	(-0.22)
Indefinite duration contract		-0.515		-0.539	-0.539		-0.139		-0.167	-0.167
		(-4.98)		(-5.22)	(-5.25)		(-2.22)		(-2.66)	(-2.65)
Fixed term contract		-0.568		-0.587	-0.586		-0.092		-0.100	-0.101
		(-5.52)		(-5.72)	(-5.73)		(-1.39)		(-1.52)	(-1.51)

Table A6 (ctd.) - Estimates of within establishment wage inequality (Spain)

VARIABLES	OLS estimates *Dependent Variable: Coefficient of variation of hourly gross wages within the i-th establishment ("gross" of individual characteristics)*					OLS on first stage regression's residuals *Dependent Variable: Coefficient of variation of hourly gross wages within the i-th establishment ("net" of individual characteristics)*				
	(1)	(2)	(3)	(4)	(5)	(a)	(b)	(c)	(d)	(e)
Establishment characteristics										
Size dummies (ref. 10-19 employees)										
20-49			0.036	0.043	0.043			-0.015	-0.013	-0.013
			(6.21)	(8.70)	(8.70)			(-1.15)	(-1.03)	(-1.03)
50-99			0.091	0.097	0.098			-0.036	-0.023	-0.024
			(12.06)	(14.49)	(14.62)			(-2.97)	(-2.13)	(-2.16)
100-249			0.105	0.116	0.119			-0.038	-0.017	-0.017
			(14.05)	(17.16)	(17.60)			(-3.09)	(-1.44)	(-1.52)
250-499			0.084	0.102	0.109			-0.075	-0.048	-0.048
			(10.22)	(13.14)	(14.02)			(-3.07)	(-1.94)	(-1.99)
500-499			0.053	0.073	0.084			-0.059	-0.026	-0.026
			(4.03)	(5.73)	(6.63)			(-3.88)	(-1.65)	(-1.84)
1000 and over			0.053	0.073	0.106			-0.082	-0.057	-0.056
			(3.09)	(4.19)	(5.27)			(-5.32)	(-3.67)	(-3.78)
Collective bargaining (ref: Centralised -- Industry/Regional -- Bargainings)										
Decentralised (Ent + Est) Bargaining	0.053	0.012	0.017	-0.005	0.028	-0.046	-0.034	-0.039	-0.031	-0.037
	(6.92)	(1.90)	(2.10)	(-0.72)	(2.28)	(-3.31)	(-2.33)	(-2.51)	(-2.05)	(-1.21)
Other types of Bargaining	0.068	0.046	0.041	0.039	0.039	0.142	0.134	0.135	0.129	0.129
	(3.70)	(2.47)	(2.27)	(2.04)	(2.05)	(2.01)	(1.91)	(1.90)	(1.85)	(1.85)
*Decentralised Bargaining*Tenure*					-0.0003					0.00004
					(-3.54)					(0.27)
*Decentralised Bargaining*Size (n.° of employees)*					-0.00002					-0.000002
					(-2.79)					(-0.28)
Region and Industry controls										
Regions (7 dummies; ref: Centre)	no	no	yes	yes	yes	no	no	yes	yes	yes
Industries (22 dummies; ref: Transport, storage and communication)	no	no	yes	yes	yes	no	no	yes	yes	yes
Constant	0.286	1.006	0.130	0.935	0.927	0.344	0.372	0.401	0.450	0.451
	(93.93)	(8.97)	(8.82)	(8.34)	(8.30)	(52.83)	(2.57)	(17.47)	(3.00)	(3.02)
F-test	29.21	94.19	50.62	70.05	67.87	7.81	17.61	9.93	12.58	13.64
R^2	0.0076	0.2773	0.1199	0.3188	0.3198	0.0027	0.0215	0.0105	0.0295	0.0296
N. Obs.	17,835	17,835	17,835	17,835	17,835	17,899	17,899	17,899	17,899	17,899

Notes:
Sampling weights used in estimations. Robust t-statistics in parentheses
Reference variables: Service workers; Primary school; Apprentice (contract); Centre; Manufacturing of leather and leather products; 10-19 employees; Industry/Regional Bargaining.