

Bargaining Structure and Intra-Establishment Pay 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 of 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.

JEL Classification: J 31, J 51, M 50

Keywords: Within Establishment Wage Inequality, Trade Unions, Employer-Employee Linked Data

* This paper is part of the PIEP (Pay Inequality and Economic Performance) Project financed by the EU under the V framework (contract N.HPSE-CT-1999-00040). We are grateful to Eurostat and National Statistical Offices for the collaboration in making the European Structure of Earnings Statistics (ESES) data accessible. In order to fulfil data protection and confidentiality restrictions the data has been accessed through a remote system (LISSY System). We are particularly grateful to T. Desai for excellent technical support with the LISSY remote system, to R. Belfield, D. Checchi and D. Marsden for the discussion and suggestions on an earlier version of this paper. We also thank A. Cristini, L. Cappellari, P. Ghinetti, R. Leoni, F. Origo and PIEP members for comments. All remaining errors are our own.

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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 sectoral) 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. 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

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 .

wage dispersion, in all countries, but when a large set of controls for of 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. The paper is organised as follows. Section 2 discusses the implication of within firm pay inequality and the links with productivity. In section 3, we present a review of the empirical literature on collective bargaining and wage dispersion. Section 4, compares the institutional setting and the bargaining features between countries. The main features of the data used (ESES) and some descriptive evidence are presented in section 5. Section 6, present the empirical model and discusses the main results. The last section contains some concluding remarks.

2. (Firm's) Pay Inequality and Productivity

Within firm wage inequality plays a relevant role in attracting, selecting, motivating and retaining workers and it is central for the firm good performance. Relative wages, between the various hierarchical levels within the firm and within skill groups across firms, besides technological and organizational factors are also of significant concern in wage bargaining (both individually and collectively) as workers and employers compare wages both in the internal labour market (i.e. within the firm), as well as in the outside labour market (i.e. with workers in other firms or industries). Other features such as pay policies and management discretion in setting pay are also relevant. In particular, high performance work organisation (HPWO) arrangements -- characterised by flexible work arrangements, performance related pay schemes and consultation/delegation practices -- are also likely to impact significantly on establishment's pay inequality (Blanchflower and Oswald, 1988; Metcalf, 1993; Marsden and Richardson, 1994; Lindbeck and Snower, 1996; Dell'Aringa, et al., 2002). In other words, it might be reasonable to expect the various arrangements to interact in different ways along the earnings distribution and produce different outcomes --i.e. with a greater impact at the top or at the bottom of the distribution -- depending on the type of arrangement considered². Large within establishment pay inequalities, for example, may as well improve or inhibit economic performance: where employee performance is easily individualised and measured, it may be sensible to offer strong financial incentives for individual performance; conversely, if team work is required, large differentials may actually harm performance because

² It is often argued that collective bargaining being targeted at the "average" worker has the effect of reducing differences across groups, whilst market forces and incentive based pay systems by operating at the "margin" determine a wider dispersion in wage levels (Freeman and Medoff, 1984; Lucifora, 2000). The extent to which one or the other effect prevail is essentially an empirical matter.

they discourage worker cooperation (Marsden, 1999). Large differences in pay, when perceived as 'unfair' may also affect workers morale and thereby their motivation and productivity (Akerlof, 1984).

2.1. Implications from Incentive Theory

According to standard economic theory, high differentials through incentive effects may lead to increased effort and motivate workers to engage in further education and on-the-job training. Tournament theory analyses the effect of wages on incentives in presence of costly monitoring of individual productivity and effort (Lazear and Rosen, 1981)³. In this context, it is efficient to reward workers according to their relative performance, hence wage gaps between different jobs represent the tournament prize. The better (performing) employee when promoted receives a higher wage: the larger the differentials in pay across jobs, the higher the effort to get promoted. This compensation schemes will increase the equilibrium effort and lead to a positive relationship between wage dispersion and productivity. McLaughlin (1998) extends the tournament models to n players, analysing the effect of the number of contestants on the prize structure, effort and incentives. He points out that if the number of contestants n is large, a marginal increase in effort has a small impact on the probability of winning; therefore, a big prize spread is required to induce effort (i.e. the prize spread rises along with the number of contestants).

One argument against using relative wages for fostering productivity is based on the risk for uncooperative behaviour (Lazear, 1989; 1995). Fierce competition between workers may be detrimental to the firm, since individuals may engage in non-cooperative behaviour trying to negatively affect the productivity of the co-workers (i.e. by trying to reduce other workers output through sabotage)⁴. If the this non-cooperative attitude is diffused in a firm, reducing wage inequality can be productivity enhancing. The relevance of unproductive uncooperative behaviour is related to the organisation and composition of the work force: the higher the share of very competitive workers, the higher the positive effects of a flatter wage distribution.

In a similar way, a related literature focuses on the links between wage dispersion and fairness. Wage inequality within the firm may become an important decision variable if workers care about social comparisons. Workers may compare their pay with that of a relevant comparison group and then decide the level of effort. On these lines, Akerlof and Yellen (1988; 1990) present a model, based on a fair-wage hypothesis, which explains why a compressed wage structure can be

³ Lazear and Rosen (1981) consider two identical risk-neutral workers and a risk-neutral firm, with a compensation scheme such as the most productive worker receives a high wage (W_H) and the least productive a low wage (W_L).

⁴ Lazear (1989) distinguishes more aggressive, and thus sabotage-prone, workers (*hawks*) from less aggressive ones (*doves*).

productivity enhancing: when the wage is lower than the perceived “fair” level, employees withdraw effort and become less productive. Finally, Levine (1991) develops a model in which profit maximising firms, optimally reduce internal wage differentials on the basis of efficiency wages consideration: more compressed wage structures (i.e. paying higher wages to those located at the lower end of the wage distribution) by increasing cohesiveness positively affect productivity and output⁵. Another factor associated to firm performance and within wage dispersion is technology and plant size. For instance, due to the use of more standardised technologies larger employers might offer more homogenous jobs leading to less variation in pay (Davis and Haltiwanger, 1996).

3.2. *Some Empirical Evidence*

Empirical evidence on the effects of incentives and co-operation on productive efficiency are rare and results differ significantly according to the type of data (aggregate or micro) and to the specific group of workers considered. Most of the studies due to the lack of data on firm level inequality infer the links between inequality and productivity from economy-wide inequality indicators, or have focussed on compensation of top executives. Leonard (1990) investigated the effects of executive compensation policies on performance (measured by the return on investment) for a sample of large US firms. Results show that pay differentials are not related to returns on investment in the firm. Next, using survey data on top executives pay in US firms, Main et al. (1993) investigate the role of pay dispersion on performance: they show a positive and significant relationship between pay differentials among executives and firm’s return on assets. In line with tournament theory, they also find a positive and significant effect of wage dispersion on average wages. Eriksson (1999), using information on managers for a panel of Danish firms, finds similar results: a (weak) positive impact of the coefficient of variation in wages for managers on firm performance, measured as profits for sales. Furthermore, managers’ average wages are higher the higher is dispersion in executive compensation. Testing predictions of tournament theory also show that wage differentials between managers vary along the upper part of the job hierarchy, Leonard (1990) and Main et al. (1993) find a convex pay structure including substantial increases at the top levels; Eriksson (1999) reports increasing pay differentials but no convexities. Cowherd and Levine (1992), using data on US establishments, investigates the effects of wage equality between lower-level employees and managers on customer-assessed product quality (a different measure of firm performance). Main results show that a reduced dispersion in wages is positively related to product quality, suggesting that within firm wage structure may positively affect effort and cooperation.

⁵ Cohesiveness is intended as the propensity to obey group norms because approval of the group is valued.

While all empirical studies presented above mainly focus on executive pay, a number of other papers have used wage data related to broader groups of workers. Winter-Ebmer and Zweimüller (1999) assess the impact of wage structure on firm performance using a panel of Austrian firms for the period 1975-1991. Firm performance is proxied by standardised wage levels. White-collar exhibit a monotonic relationship: for low levels of wage dispersion more inequality seems to be beneficial for wages (and productivity); however, if dispersion increases significantly wages (and productivity) are lower. Blue-collar show a different pattern, as for the most part of the observed range in wage dispersion, wage levels (and productivity) rise with wage dispersion.

Hibbs and Locking (2000), using Swedish data on individual wages and aggregated (industry level) information on productivity, investigate the relationship between wage dispersion and productive efficiency. A positive effect of within-plant and within-industry wage dispersion on industry productivity is found. The opposite is found for between-plant and between-industry wage dispersion, which are negatively related to productivity. Finally Heyman (2002), using a large matched employer-employee data set for Sweden and controlling for individual characteristics and firm fixed effects (as well as instrumenting the wage dispersion variable), finds that intra-firm wage dispersion has a positive impact on profits and average pay for both white-collar workers and executives.

3. Wage Dispersion, Unions and Collective Bargaining

3.2. *The Economics of Unions and Pay Inequality*

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.

Within-establishment inequality

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 pursue “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 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 individual⁶. 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).

Between-establishment inequality

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

⁶ In a world of Rawlsian “veil of ignorance” where workers will not know whether they benefit or lose from (apparently) discretionary supervisory decisions, simple maxi-min behaviour will dictate preference for narrow range of rates (Freeman, 1982).

competitors; on the other hand, the worker sees a single rate of pay as a necessary requisite to prevent intra-union competition⁷. 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 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)⁸.

3.3. 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. The main features of some selected studies are reviewed in Table 1.

International evidence

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

⁷ 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).

⁸ In a different context, Naylor and Raaum (1993) and Corneo (1995) explicitly model the role of management opposition in the determination of union membership and wages.

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 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.

Table 1 - Studies of the impact of trade unions on wage dispersion

STUDY	COUNTRY	DATA	MAIN CONCLUSIONS
Freeman (1980b)	US	'May Current Population Survey' data on individuals and 'Expenditures for Employee Compensation' data for firms.	Significantly lower dispersion in log hourly earnings for unionised blue-collar workers, compared with non-unionised. Unionism reduces the white-collar/blue-collar wage gap, as well as wage dispersion within establishments.
Freeman (1982)	US	BLS 'Industry Wage Survey' data on individuals working in nine industries.	The major finding is that within-establishment dispersion of wages is significantly narrower in unionised than in non-unionised establishments.
Di Nardo, Fortin and Lemieux (1996)	US	'Current Population Survey' on individuals.	Unions, among other labour market institutions, contribute to decrease wage inequality.
Hirsch (1982)	US	Three digit Census of Population industries in both manufacturing and non manufacturing (Industry level data)	Unionism significantly decreases within industry earnings dispersion both in the manufacturing and nonmanufacturing sectors, even after accounting for their simultaneous determination.
Gosling and Machin (1994)	UK	Establishment level data from 'Workplace Industrial Relations Surveys,	The dispersion of wages "across" and "within" establishments is lower where unions are recognized for collective bargaining, as opposed to non-recognized establishments.
Dell'Aringa and Lucifora (1994)	Italy	Two different micro-data sets: establishment data and more disaggregated job category level data. Both surveys refer to the Italian metal –mechanical engineering industry.	A lower dispersion of wages across establishments, in the local wage bargaining regime, is found, even considering different establishments' characteristics. Within-establishment wage dispersion is lower where labour force is much more unionised.

In a more recent study, Katz and Darbshire (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.

Evidence from Italy, Spain, Ireland and Belgium

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. In particular, they use respectively establishment-level data to investigate inter-establishment wage dispersion and the white collar/blue collar wage gap and more disaggregated job category-level data to examine within establishments wage dispersion. Both surveys refer to the Italian metal-mechanical engineering industry for the year 1990 and contain information on wages, plant characteristics and industrial relations practices. They first estimate separate wage determination functions for the bargaining and no-bargaining regimes, and then use parameter estimates to simulate the difference in standard deviations after correcting for differences in the distribution of characteristics. Alternatively, for a given variance in characteristics, they estimate the impact on standard deviations owing to the differences in parameter estimates across the two wage determination regimes. The routes through which local wage bargaining reduces significantly wage dispersion across establishment have been identified as follows: first, establishments where local wage bargaining occurs have, on average, more homogeneous characteristics; second, union pay policies have the effect of reducing wage differentials for both measured and unmeasured average establishment characteristics. Furthermore, using separate wage equations for white-collar and blue-collar workers and interacting occupational grades with union density -- separately for the bargaining and no-bargaining regimes -- it is shown that within-establishment wage dispersion is lower where workers are more unionised. Corneo and Lucifora (1997) empirically investigated 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.

Dolado et al. (1997) provide an empirical evaluation of the effects of Spanish sectoral collective bargaining on wages. For this purpose, they use a sample of workers from whom bargained wage rates and earnings are available. Using a variant of the Meyer and Wise approach, they estimate wage gains due to minimum bargained wages and their employment effects: the most relevant conclusion is that there is evidence of a “sword of justice” effect by unions, but this is limited by non compliance among unskilled workers and the non-binding nature of bargained wages for skilled workers.

Concerning the Ireland 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 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.

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

Collective bargaining 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-sectoral), sectoral 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 sectors. 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, sectoral 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 2 (a,b).

In Ireland, for example, wage formation is highly centralised, with the inter-sectoral 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 sectoral level. In Belgium (private sector) wage bargaining is structured along three levels: national (inter-professional) level, sectoral 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 level⁹. 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

⁹ Sectoral collective agreements may be renegotiated except when there is a so-called imperative clause.

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.

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, sectors 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 sector or region concerned¹⁰. The systems of national and or sectoral / 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 important¹¹.

¹⁰ 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.

¹¹ 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 2 - Collective Bargaining in Belgium, Ireland, Italy and Spain

(A) Density, Coverage and bargaining institutional features

Country	Union density (2000)	Collective bargaining coverage (2000)	Predominant duration of agreements	Bargaining co-ordination	Extension practice	Low pay regulation mechanism
Belgium	69	96	2 years	Medium	High	National Minimum Wage
Ireland	45	66	2 years	Medium - Strong	High	National Minimum Wage**
Italy	35	82*	Varying	Medium	High	Collective Agreements
Spain	15	83	3 years	Medium - Weak	High	National Minimum Wage

Note:

*refers to 1995

**In 1995 (the year to which are referred the ESES data used in the following empirical analyses) there was no minimum wage in Ireland.

Table 2 (cont.) - Collective Bargaining in Belgium, Ireland, Italy and Spain

(B) Bargaining structure

COUNTRY	BARGAINING STRUCTURE						
	CENTRALISED-NATIONAL		REGIONAL (3)	DECENTRALISED			
	Intersectoral (1)	Sectoral (2)		Industry (4)	Enterprise (5)	Establishment (6)	Others (7)
Belgium		Main level		In addition to (1)	Occasional, in addition to previous levels		In alternative to the other levels (establishments not covered by the precedent agreements, i.e. public utilities)
Ireland	Main level			In addition to (1)	Occasional, in alternative to (4)		In addition to (1)
Italy		Main Level			In addition to (2)		
Spain		Relevant Level*	Relevant Level*		Existing level of wage bargaining*	Existing level of wage bargaining*	Existing level of wage bargaining*

*Note: * In Spain establishments may be covered alternatively by one of these kind of agreements*

5. Measuring Inequality within Establishments: data and stylised facts

5.1 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 1995¹². 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 countries¹³. The main set of variables available at the establishment level are: industry (NACE, 2 digit), region (NUTS, 2 digit)¹⁴, 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)¹⁵. In our empirical analysis, we use the definition of hourly gross wage including share of annual bonuses (i.e. “variable pay” not paid on a regular basis)¹⁶. The main features of the data, variables definitions and descriptive statistics are reported in the appendix.

5.2. Measures of intra-establishment pay inequality

Intra-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 pay dispersion: coefficient of variation (CV), standard deviation of logs (SDL) and a max-min ratio (MMR)¹⁷. Given the relatively small average number of employees per establishment in some

¹² Access to the micro data has been made possible through a remote connection with Eurostat where the data are physically stored.

¹³ Sample design is done on the basis of establishment representativeness, while individual workers are randomly drawn 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.

¹⁴ Except for Ireland.

¹⁵ 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.

¹⁶ We also experimented the definition of hourly gross wage excluding annual bonuses. Results based on systematic component of pay only are not reported, but are available upon request.

¹⁷ The precise definition used is as follows: $CV(w)=\text{Standard deviation}(w)/\text{Mean}(w)$; $SDL(w)=\sigma[\ln(w)]$; $MMR(w)=[\max(w)/\min(w)]$.

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 design¹⁸. Confronted with the two different options and after some experimentation¹⁹, 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 Table 3. 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.

Table 3
Sample size by country (establishment and employees)

COUNTRY	Original sample		Final sample	
	N. establishments and (employees)	Avg. N. empl. per establ.	N. establishments and (employees)	% reduction in sample size
(1)	(2)	(3)	(4)	(2) - (4) (in %)
<i>Belgium</i>	6,019 (145,107)	24	4,160* (81,905)*	-30.9* (-43,6)*
<i>Ireland</i>	2,701 (39,105)	14	2,590 (38,156)	-4,1 (-2,4)
<i>Italy</i>	7,778 (96,267)	12	7,680 (95,511)	-1,3 (-0,8)
<i>Spain</i>	17,946 (177,139)	6	17,835 (175,139)	-0,6 (-1,1)

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

¹⁸ In case of Italy, for example, when we excluded establishment with less than (3) 5 observations, establishment sample size fell to (7,611) 7,351.

¹⁹ 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 pay dispersion within establishment by country, industry, size and type of collective agreement²⁰, and then briefly discuss the validity of these different measures of intra-establishment pay inequality. In Table 4, we compare the three indicators by country. Ireland shows the highest average within establishment pay dispersion (as well as standard deviation across workplaces); whilst the opposite is true for Belgium.

Table 4
Average intra-establishment pay dispersion, by country (various measures)

<i>DISPERSION INDICATOR</i>	<i>Belgium</i>		<i>Ireland</i>		<i>Italy</i>		<i>Spain</i>	
	<i>Mean</i>	<i>St. Dev.</i>	<i>Mean</i>	<i>St. Dev.</i>	<i>Mean</i>	<i>St. Dev.</i>	<i>Mean</i>	<i>St. Dev.</i>
<i>CV</i>	0.278	0.167	0.410	0.241	0.292	0.203	0.305	0.213
<i>SDL</i>	0.253	0.138	0.363	0.171	0.254	0.142	0.280	0.172
<i>MMR</i>	2.901	2.227	4.268	5.720	2.719	1.809	2.813	2.439
<i>N. Obs.</i>	4,160		2,590		7,680		17,835	

In order to compare the coherence of the different indicators, in Table 5, we report 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).

Table 5
**Correlations of different measures of “intra-establishment pay dispersion”
(by industry and by size)**

By Industry				
	<i>Belgium</i>	<i>Ireland</i>	<i>Italy</i>	<i>Spain</i>
<i>Correlation between CV and SDL</i>	0.973	0.959	0.967	0.990
<i>Correlation between CV and MMR</i>	0.850	0.891	0.934	0.933
<i>Correlation between SDL and MMR</i>	0.897	0.876	0.854	0.932
By size				
	<i>Belgium</i>	<i>Ireland</i>	<i>Italy</i>	<i>Spain</i>
<i>Correlation between CV and SDL</i>	0.992	0.953	0.99	0.997
<i>Correlation between CV and MMR</i>	0.873	0.847	0.864	0.949
<i>Correlation between SDL and MMR</i>	0.851	0.937	0.801	0.939

²⁰ 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.

5.3. Descriptive Evidence

In this section we present some descriptive evidence on within wage dispersion by industry, size and type of collective agreement²¹. 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° line²². 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, Belgium 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)²³ -- 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 (see the Tables A3 – A6 in the appendix)²⁴.

Figure 2 reports (within establishment) wage dispersion by establishment size²⁵. 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 seem to suggest that the complexity of the organisation has a role in widening intra-establishment wage differentials, since more differentiated tasks and a higher role for incentive pay schemes determine a more dispersed pay 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)²⁶.

²¹ In order to assess how pay dispersion is related to establishments characteristics, in the appendix we report a number of (average) establishments' attributes.

²² Table A2 in appendix reports the codes associated to each industry.

²³ 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.

²⁴ 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; “transport, storage and communication” 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.

²⁵ Additional (average) establishment's attributes by class size and by country are reported in Tables A7 – A10 in appendix.

²⁶ 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 pay dispersion by industries (Coefficient of Variation)

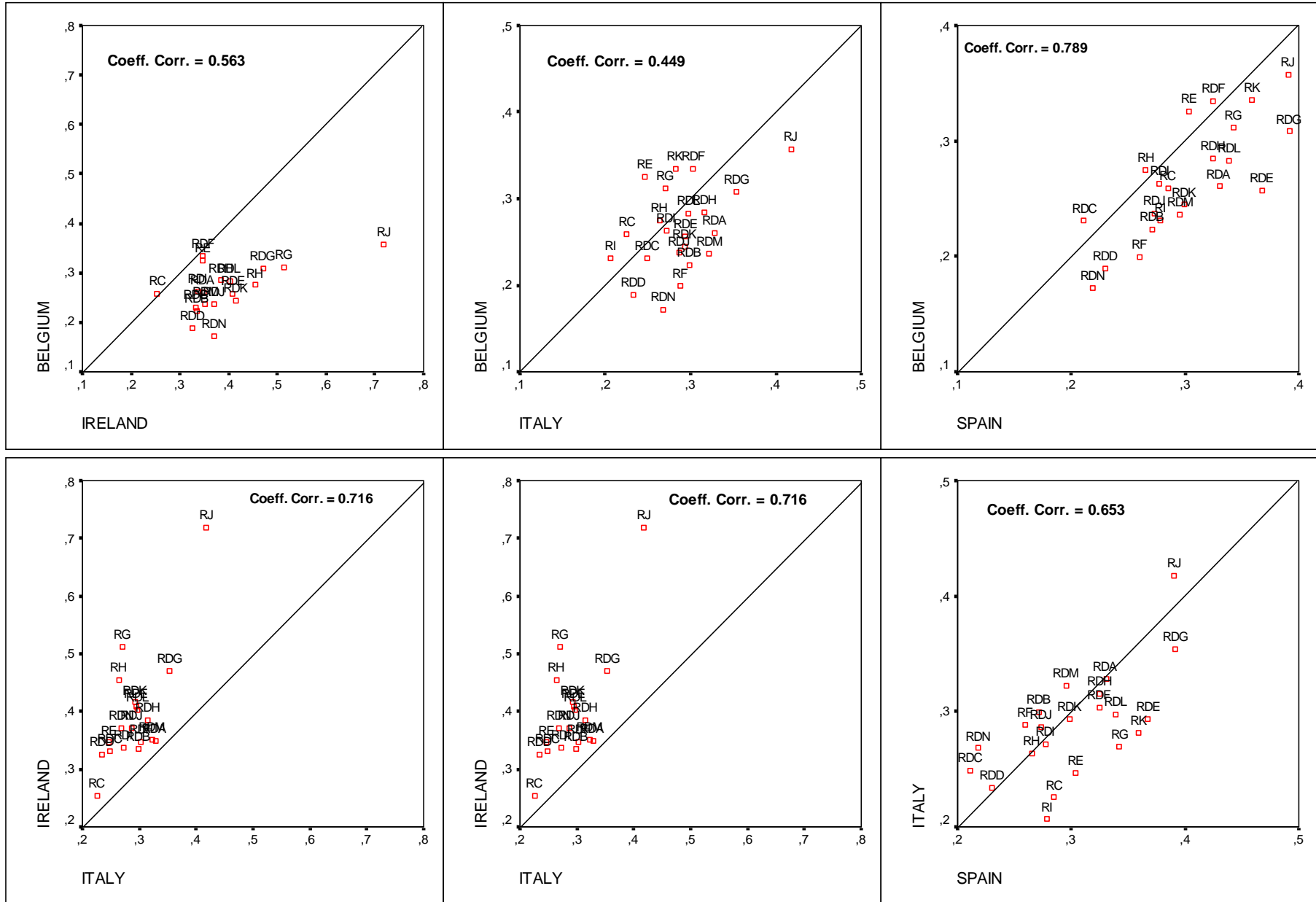
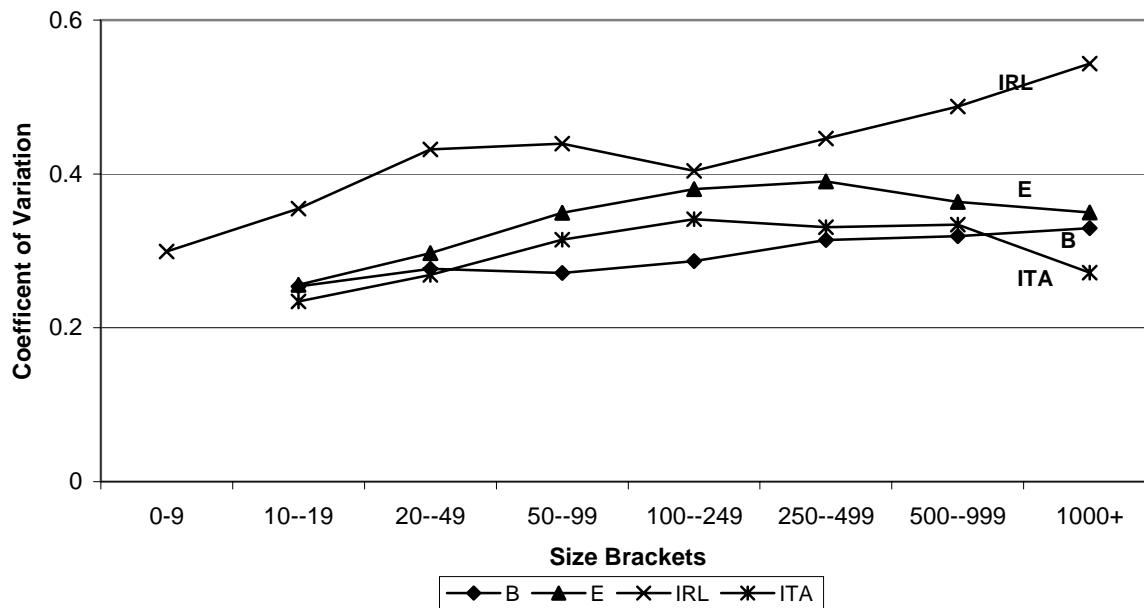


Figure 2

Average intra-establishment pay inequality (coefficient of variation) by size bracket in each country



Finally, in Table 6, we analyse the coefficient of variation according to the prevailing bargaining structure in the establishment. As discussed in section 4, all the countries considered have a multi-level wage bargaining structure, with centralised bargaining at the national, sectoral 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 (with exception of Belgium). 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% in Ireland, 21.5% in Italy and 16.7% in Belgium, while in Spain 18.9% of the establishments is covered by a decentralised agreement only.

Table 6**Distribution of establishments by type of collective bargaining (in percentage)**

	<i>Belgium</i>	<i>Ireland</i>	<i>Italy</i>	<i>Spain</i>
Centralised Bargaining	52.4	51.6	75.1	78.8
Centralised +Decentralised Bargaining	16.7	48.4	21.5	18.9 (*)
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

(*) 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 7 reports the average within establishment (unconditional) wage inequality by type of collective agreements in each country. The table only reports the coefficient of variation for centralised and decentralised bargaining levels and their difference²⁷. 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.

²⁷ In case of Spain, we consider as "centralised" either the national/sectoral or regional agreements and as "decentralised" firm or establishment agreements.

Table 7

Average intra-establishment pay inequality (coefficient of variation) by type of collective agreement in each country

	Centralised Agreements (1)	Centralised and Decentralised Agreements (2)	Difference (1) - (2)
Belgium	0.279	0.296	- 0.017*
Ireland	0.398	0.442	- 0.044*
Italy	0.274	0.353	- 0.078*
Spain	0.297	0.333	-0.036*

Note:

* Statistically significant at 1% level.

Here we report only the national/sectoral and the local bargaining levels. For evidence on all bargaining levels see the tables in the Appendix.

6 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 pay differentials thus confounding the overall picture. In this section, we pay particular care in the analysis of the main determinants of intra-firm wage inequality and try to identify – ceteris paribus -- the (causal) effect of decentralised bargaining on wage dispersion (within the firm).

6.1 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:

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

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 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 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 intra-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 agreement²⁸. When measuring and analysing inequality both observable and unobservable attributes may be important in shaping the wage distribution within the workplace. That is, 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.

²⁸ 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.

6.2 *The main set of results: one stage OLS*

Different specifications of equation [1] are estimated by OLS, for each country, and the main set of results are reported in Table 8 and Table 10 (for the whole set of results see the appendix). 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 pay inequality decreases with average age but less than proportionally (less robust for Italy). Evidence on the impact of the proportion of females in the establishment is mixed. In Italy the share of female workforce has a negative effect on inequality, conversely the effect in Spain is positive, while in Belgium and Ireland 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 decrease²⁹. 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 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). Intra-establishment pay inequality is found to decrease with average seniority, 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 establishments³⁰. Generally, wage inequality, *ceteris paribus*, shows an increasing trend with firm size confirming the

²⁹ In establishments where many women are present -- over and above potential (individual) wage discrimination -- a more compressed wage structure is found.

³⁰ 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.

earlier evidence from unconditional wage dispersion (in Italy and Spain the relationship between wage dispersion and size is hump shaped).

Finally, when considering the effects of the bargaining structure, we find that the existence of a decentralised agreement (enterprise or establishment) increases dispersion when no other controls are included, while it turns negative or not statistically significant when additional workers and workplace characteristics are added -- thus reversing the traditional result obtained from unconditional wage dispersion³¹. As already discussed, Spain deserves a separate treatment, for workplaces may be covered by either centralised or decentralised agreements: in the latter case, when controlling for average personal and establishment characteristics, wage dispersion turns out to be lower. Hence, when conditioning on a large set of control variables, the presence of a local union and decentralised agreements seem to affect both (observed) workforce composition – i.e. sorting of higher quality and productivity workers -- as well as the structure of within establishment wage differentials -- i.e. decreased wage dispersion. However, are these features common to all establishments or are there any differences according to some specific features of the establishment? Two features that are commonly correlated to union presence and collective bargaining are establishment's size and (average) workers' seniority, whose effects are more closely investigated using interaction terms (see Table 8, column 5). In general, the introduction of interaction effects helps identifying better the different role played by decentralised bargaining in heterogeneous workplaces and in different countries. Results show that decentralised bargaining has a negative effect on establishment wage inequality (not always statistically significant) which is reinforced by the higher (average) seniority of the workforce (except Ireland), but it is significantly reduced and sometime reversed in larger sized workplaces (except Ireland and Spain). In other words, decentralised agreements reduce wage differentials in establishments and do so more the higher is seniority, still as plant's size grows – conditional on size dummies and a wide range of other controls – the compressing effect on internal wage differentials is significantly reduced (the reverse is true for Ireland though).

³¹ 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).

Table 8a - Estimates of intra-establishment pay inequality (Belgium)

VARIABLES	Dependent Variable: Coefficient of Variation OLS estimates				
	(1)	(2)	(3)	(4)	(5)
<i>Average establishment personal characteristics*</i>					
<i>Age (in years)</i>		-0.023 (-4.42)		-0.023 (-4.42)	-0.023 (-4.45)
<i>Age2 (in years)</i>		0.0003 (5.21)		0.0004 (5.28)	0.0004 (5.31)
<i>Gender (women)</i>		0.003 (0.24)		0.0003 (0.03)	0.001 (0.06)
<i>Education 1 (lower secondary)</i>		0.019 (1.60)		0.008 (0.67)	0.009 (0.76)
<i>Education 2 (upper secondary)</i>		0.035 (3.45)		0.020 (1.84)	0.022 (1.94)
<i>Education 3 (tertiary)</i>		0.146 (9.40)		0.113 (6.85)	0.113 (6.82)
<i>Occupation 1 (Managers)</i>		0.351 (9.98)		0.371 (10.43)	0.376 (10.52)
<i>Occupation 2 (Professionals)</i>		0.040 (1.85)		0.082 (3.41)	0.083 (3.45)
<i>Occupation 3 (Associate professionals)</i>		0.111 (6.58)		0.118 (6.57)	0.121 (6.69)
<i>Occupation 4 (Clerks)</i>		0.082 (5.70)		0.108 (6.86)	0.108 (6.87)
<i>Occupation 5 (Craft and related trades workers)</i>		-0.030 (-2.02)		-0.008 (-0.47)	-0.007 (-0.41)
<i>Occupation 6 (Plant-machine operators)</i>		-0.002 (-0.10)		0.008 (0.47)	0.010 (0.57)
<i>Occupation 7 (Elementary occupations)</i>		0.038 (2.08)		0.050 (2.62)	0.052 (2.71)
<i>Supervisors</i>		0.060 (3.57)		0.064 (3.81)	0.064 (3.81)
<i>Tenure (in months)</i>		-0.0002 (-3.28)		-0.0003 (-5.05)	-0.0002 (-4.14)
<i>Part-time</i>		0.040 (2.27)		0.048 (2.73)	0.048 (2.73)
<i>Type of contract (indefinite duration)</i>		-0.654 (-2.48)		-0.659 (-2.21)	-0.657 (-2.21)
<i>Type of contract (fixed term)</i>		-0.668 (-2.51)		-0.692 (-2.30)	-0.690 (-2.30)
<i>Type of contract (other)</i>		-0.622 (-2.34)		-0.640 (-2.12)	-0.637 (-2.12)
<i>Establishment characteristics</i>					
<i>Establishment's size 1 (20-49)</i>			0.034 (4.68)	0.029 (4.33)	0.028 (4.31)
<i>Establishment's size 2 (50-99)</i>			0.028 (3.64)	0.031 (4.44)	0.030 (4.38)
<i>Establishment's size 3 (100-249)</i>			0.037 (5.06)	0.038 (5.60)	0.037 (5.47)
<i>Establishment's size 4 (250-499)</i>			0.064 (6.96)	0.067 (7.93)	0.065 (7.74)
<i>Establishment's size 5 (500-999)</i>			0.066 (4.86)	0.076 (6.14)	0.072 (5.85)

Table 8a (ctd.) - Estimates of intra-establishment pay inequality (Belgium)

<i>Establishment's size 6 (1000 and over)</i>			0.074 (4.42)	0.085 (5.48)	0.071 (4.50)
<i>Collective bargaining (ref: National/Sectoral Agreements)</i>					
<i>National/Sectoral + Decentralised Agreements</i>	0.017 (2.52)	0.004 (0.58)	-0.013 (-1.76)	-0.011 (-1.79)	0.006 (0.50)
<i>Other agreements</i>	-0.012 (-2.08)	-0.015 (-2.87)	-0.018 (-3.14)	-0.016 (-2.94)	-0.017 (-3.03)
<i>Decentralised Agreements*Tenure</i>					-0.0002 (-1.98)
<i>Decentralised Agreements*Size (n.° of employees)</i>					0.00002 (3.26)
<i>Region and Industry controls</i>					
<i>Regions (3 dummies; ref: Wallonia)</i>	no	no	yes	yes	yes
<i>Industries (22 dummies; ref: Transport, storage and communication)</i>	no	no	yes	yes	yes
<i>Constant</i>	0.279 (73.03)	1.164 (4.38)	0.196 (20.55)	1.109 (3.68)	1.106 (3.68)
F-test	8.45	72.04	22.85	41.70	40.12
R ²	0.0033	0.3001	0.1334	0.3327	0.3336
N. Obs.	4160	4147	4160	4147	4147
<p>Notes: (Robust) t-test in parentheses. Reference variables: Service workers; Primary school; Apprentice (contract); Wallonia; Transport, storage and communication; 10-19 employees; National/Sectoral Agreements. * "Personal characteristics" variables represent proportions except when indicated differently.</p>					

Table 8b - Estimates of intra-establishment pay inequality (Ireland)

VARIABLES	Dependent Variable: Coefficient of Variation OLS estimates				
	(1)	(2)	(3)	(4)	(5)
<i>Average establishment personal characteristics*</i>					
Age(in years)		-0.026 (-4.36)		-0.028 (-4.65)	-0.028 (-4.65)
Age2 (in years)		0.0004 (4.47)		0.0004 (4.87)	0.0004 (4.86)
Gender (women)		-0.008 (-0.41)		-0.032 (-1.40)	-0.032 (-1.41)
Education 1 (lower secondary)		0.024 (0.75)		-0.009 (-0.29)	-0.009 (-0.28)
Education 2 (upper secondary)		0.058 (1.98)		0.003 (0.10)	0.003 (0.11)
Education 3 (tertiary)		0.073 (1.67)		-0.001 (-0.03)	0.000 (-0.01)
Occupation 1 (Managers)		0.720 (10.32)		0.816 (11.93)	0.816 (11.92)
Occupation 2 (Professionals)		0.182 (2.74)		0.196 (3.06)	0.195 (3.05)
Occupation 3 (Associate professionals)		0.162 (3.45)		0.162 (3.30)	0.161 (3.29)
Occupation 4 (Clerks)		0.171 (4.14)		0.110 (2.73)	0.110 (2.73)
Occupation 5 (Craft and related trades workers)		-0.076 (-3.16)		0.022 (0.71)	0.022 (0.71)
Occupation 6 (Plant-machine operators)		-0.056 (-2.42)		0.023 (0.77)	0.023 (0.77)
Occupation 7 (Elementary occupations)		-0.011 (-0.38)		0.046 (1.54)	0.046 (1.53)
Supervisors		0.070 (1.66)		0.065 (1.53)	0.064 (1.53)
Tenure (in months)		-0.0002 (-1.59)		-0.0003 (-2.47)	-0.0003 (-2.34)
Part-time		0.121 (3.76)		0.105 (3.26)	0.105 (3.26)
Type of contract (indefinite duration)		-0.383 (-4.82)		-0.390 (-4.75)	-0.390 (-4.74)
Type of contract (fixed term)		-0.409 (-4.93)		-0.402 (-4.70)	-0.402 (-4.70)
Type of contract (other)		-0.422 (-4.35)		-0.416 (-4.28)	-0.416 (-4.27)
<i>Establishment characteristics</i>					
Establishment's size 1 (20-49)			0.036 (2.51)	0.063 (4.70)	0.063 (4.71)
Establishment's size 2 (50-99)			0.055 (3.36)	0.093 (6.04)	0.094 (6.04)
Establishment's size 3 (100-249)			0.027 (1.72)	0.085 (5.64)	0.085 (5.65)
Establishment's size 4 (250-499)			0.050 (2.46)	0.107 (5.49)	0.109 (5.53)
Establishment's size 5 (500-999)			0.065 (2.28)	0.135 (5.01)	0.137 (5.03)

Table 8b (ctd.) - Estimates of intra-establishment pay inequality (Ireland)

<i>Establishment's size 6 (1000 and over)</i>			0.120 (3.17)	0.160 (4.45)	0.170 (4.25)
<i>Collective bargaining (ref: National Agreements)</i>					
<i>National + Decentralised Agreements</i>	0.044 (4.58)	-0.001 (-0.07)	0.038 (4.00)	0.014 (1.52)	0.014 (0.87)
<i>Decentralised Agreements*Tenure</i>					0.00001 (0.09)
<i>Decentralised Agreements*Size (n.° of employees)</i>					-0.00001 (-0.65)
<i>Region and Industry controls</i>					
<i>Regions</i>	no	no	no	no	no
<i>Industries (19 dummies; ref: Mining and Quarrying)</i>	no	no	yes	yes	yes
<i>Constant</i>	0.398 (64.97)	1.126 (9.35)	0.205 (6.62)	0.973 (7.84)	0.972 (7.76)
F-test	20.97	20.18	13.07	15.83	15.23
R ²	0.0078	0.1667	0.1109	0.2197	0.2198
N. Obs.	2691	2691	2691	2691	2691
<p>Note: (Robust) t-test in parentheses. Reference variables: Service workers; Primary school; Apprentice (contract); Mining and Quarrying; 5-19 employees; National Agreements Only. *"Personal characteristics" variables represent proportions except when indicated differently.</p>					

Table 8c - Estimates of intra-establishment pay inequality (Italy)

VARIABLES	Dependent Variable: Coefficient of Variation OLS estimates				
	(1)	(2)	(3)	(4)	(5)
<i>Average establishment personal characteristics*</i>					
Age(in years)		-0.007 (-2.14)		-0.006 (-1.66)	-0.007 (-1.74)
Age2 (in years)		0.0001 (1.93)		0.0001 (1.74)	0.0001 (1.80)
Gender (women)		0.011 (1.34)		-0.026 (-2.71)	-0.024 (-2.46)
Education 1 (lower secondary)		0.008 (0.78)		0.005 (0.47)	0.006 (0.55)
Education 2 (upper secondary)		0.023 (1.85)		0.017 (1.34)	0.017 (1.35)
Education 3 (tertiary)		0.048 (1.47)		-0.004 (-0.14)	-0.006 (-0.18)
Occupation 1 (Managers)		2.106 (26.85)		2.028 (26.72)	2.027 (26.84)
Occupation 2 (Professionals)		0.221 (6.73)		0.211 (6.54)	0.213 (6.52)
Occupation 3 (Associate professionals)		0.150 (9.26)		0.141 (8.29)	0.144 (8.45)
Occupation 4 (Clerks)		0.075 (6.16)		0.073 (5.40)	0.074 (5.49)
Occupation 5 (Craft and related trades workers)		0.026 (2.63)		-0.004 (-0.28)	-0.005 (-0.38)
Occupation 6 (Plant-machine operators)		0.044 (4.19)		0.013 (0.97)	0.009 (0.69)
Occupation 7 (Elementary occupations)		0.036 (2.74)		0.029 (2.06)	0.029 (2.06)
Supervisors		0.080 (7.38)		0.081 (7.15)	0.081 (7.18)
Tenure (in months)		-0.0001 (-2.17)		-0.0002 (-5.19)	-0.0002 (-3.55)
Part-time		0.084 (5.10)		0.107 (6.39)	0.106 (6.33)
Type of contract (indefinite duration)		-0.026 (-1.09)		-0.015 (-0.63)	-0.012 (-0.49)
Type of contract (fixed term)		0.028 (0.96)		0.020 (0.69)	0.025 (0.86)
Type of contract (other)		-0.015 (-0.34)		-0.014 (-0.30)	-0.013 (-0.27)
<i>Establishment characteristics</i>					
Establishment's size 1 (20-49)			0.031 (5.24)	0.022 (4.40)	0.022 (4.41)
Establishment's size 2 (50-99)			0.069 (10.29)	0.048 (8.44)	0.048 (8.45)
Establishment's size 3 (100-249)			0.095 (13.43)	0.068 (11.34)	0.067 (11.19)
Establishment's size 4 (250-499)			0.086 (9.21)	0.069 (8.60)	0.064 (7.94)
Establishment's size 5 (500-999)			0.086 (7.96)	0.070 (7.16)	0.061 (6.07)

Table 8c (ctd.) - Estimates of intra-establishment pay inequality (Italy)

<i>Establishment's size 6 (1000 and over)</i>			0.060 (5.31)	0.039 (3.62)	0.010 (0.94)
Collective bargaining (ref: National/Sectoral Agreements)					
<i>National/Sectoral + Decentralised Agreements</i>	0.078 (13.28)	0.037 (7.41)	0.027 (4.27)	0.008 (1.51)	0.035 (2.71)
<i>Other Agreements</i>	0.028 (1.98)	0.014 (1.29)	0.026 (1.92)	0.014 (1.35)	0.014 (1.37)
<i>Decentralised Agreements*Tenure</i>					-0.0003 (-3.28)
<i>Decentralised Agreements*Size(n. ° of employees)</i>					0.00004 (3.33)
Region and Industry controls					
<i>Regions (11 dummies; ref: Abruzzo-Molise)</i>	no	no	yes	yes	yes
<i>Industries (22 dummies; ref: Transport, storage and communication)</i>	no	no	yes	yes	yes
<i>Constant</i>	0.274 (106.89)	0.324 (5.54)	0.118 (10.06)	0.210 (3.13)	0.211 (3.11)
F-test	88.62	87.02	28.25	50.03	49.39
R ²	0.0250	0.3764	0.1158	0.4191	0.4227
N. Obs.	7680	7680	7680	7680	7680
<p>Note: (Robust) t-test in parentheses. Reference variables: Service workers; Primary school; Apprentice (contract); Abruzzo-Molise; Transport, storage and communication; 10-19 employees; National/Sectoral Agreements. *“Personal characteristics” variables represent proportions except when indicated differently.</p>					

Table 8d - Estimates of intra-establishment pay inequality (Spain)

VARIABLES	Dependent Variable: Coefficient of Variation OLS estimates				
	(1)	(2)	(3)	(4)	(5)
<i>Average establishment personal characteristics*</i>					
Age(in years)		-0.017 (-8.30)		-0.015 (-7.41)	-0.015 (-7.45)
Age2 (in years)		0.0002 (8.91)		0.0002 (8.40)	0.0002 (8.47)
Gender (women)		0.042 (6.39)		0.014 (1.96)	0.014 (1.98)
Education 1 (lower secondary)		0.009 (1.84)		0.007 (1.61)	0.009 (1.84)
Education 2 (upper secondary)		0.084 (9.07)		0.079 (8.67)	0.080 (8.81)
Education 3 (tertiary)		0.132 (13.89)		0.117 (12.32)	0.117 (12.47)
Occupation 1 (Managers)		0.688 (27.28)		0.748 (29.30)	0.745 (29.26)
Occupation 2 (Professionals)		0.195 (11.24)		0.175 (9.73)	0.176 (9.78)
Occupation 3 (Associate professionals)		0.137 (11.73)		0.152 (11.87)	0.152 (11.90)
Occupation 4 (Clerks)		0.037 (3.55)		0.085 (7.11)	0.084 (6.98)
Occupation 5 (Craft and related trades workers)		-0.015 (-2.00)		-0.019 (-2.00)	-0.018 (-1.92)
Occupation 6 (Plant-machine operators)		-0.007 (-0.91)		-0.015 (-1.62)	-0.015 (-1.56)
Occupation 7 (Elementary occupations)		0.024 (2.52)		0.006 (0.60)	0.006 (0.60)
Tenure (in months)		-0.0001 (-4.27)		-0.0003 (-8.94)	-0.0002 (-5.84)
Part-time		-0.007 (-0.56)		0.015 (1.11)	0.015 (1.14)
Type of contract (indefinite duration)		-0.564 (-11.96)		-0.546 (-12.00)	-0.548 (-12.09)
Type of contract (fixed term)		-0.598 (-12.77)		-0.583 (-12.88)	-0.579 (-12.85)
<i>Establishment characteristics</i>					
Establishment's size 1 (20-49)			0.041 (11.26)	0.046 (14.33)	0.046 (14.24)
Establishment's size 2 (50-99)			0.085 (16.90)	0.090 (19.69)	0.090 (19.64)
Establishment's size 3 (100-249)			0.103 (18.81)	0.114 (22.02)	0.115 (22.23)
Establishment's size 4 (250-499)			0.093 (12.75)	0.109 (15.54)	0.112 (15.98)
Establishment's size 5 (500-999)			0.062 (5.33)	0.082 (7.33)	0.088 (7.84)
Establishment's size 6 (1000 and over)			0.056 (4.06)	0.079 (5.96)	0.100 (6.57)

Table 8d (ctd.) - Estimates of intra-establishment pay inequality (Spain)

<i>Collective bargaining (ref: National + Provincial Agreements)</i>					
<i>Decentralised (Ent + Est) agreements</i>	0.036 (9.51)	0.010 (2.53)	0.001 (0.20)	-0.013 (-3.38)	0.032 (4.06)
<i>Other agreements</i>	0.052 (4.51)	0.030 (2.74)	0.034 (3.13)	0.017 (1.69)	0.017 (1.65)
<i>Decentralised Agreements*Tenure</i>					-0.0003 (-7.18)
<i>Decentralised Agreements*Size (n.º of employees)</i>					-0.00001 (-2.46)
<i>Region and Industry controls</i>					
<i>Regions (7 dummies; ref: Centre)</i>	no	no	yes	yes	yes
<i>Industries (22 dummies; ref: Transport, storage and communication)</i>	no	no	yes	yes	yes
<i>Constant</i>	0.297 (162.50)	1.078 (19.29)	0.191 (27.17)	0.932 (17.06)	0.924 (16.99)
F-test	52.38	201.98	74.08	115.33	111.82
R ²	0.0053	0.2135	0.1208	0.2818	0.2840
N. Obs.	17835	17835	17835	17835	17835
<p>Note: (Robust) t-test in parentheses. Reference variables: Service workers; Primary school; Apprentice (contract); Centre; Transport, storage and communication; 10-19 employees; National/Sectoral Agreements. **"Personal characteristics" variables represent proportions except when indicated differently.</p>					

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 decreasing (increasing) 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 ($\sigma(\bar{w})$) between establishments covered by decentralized bargaining (*dec*) and those that are not covered (*nodec*) as $\Delta\sigma(\bar{w}) = \sigma(\bar{w})^{nodec} - \sigma(\bar{w})^{dec}$ and using an Oaxaca type approach we proceed decomposing the inequality differential (Oaxaca, 1973; Reimers, 1983)³². Results are reported in Table 9. The first

³² We decompose the inequality differential in the following way,

$$\Delta\sigma(\bar{w}) = \Delta x \left[D\beta^{nodec} + (I - D)\beta^{dec} \right] + \Delta\beta \left[x^{nodec} (I - D) + x^{dec} D \right]$$

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.

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 differential³³. 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 80 percent), while the residual variation appears to be imputable to different returns to the characteristics (less than 20 percent). In Spain, given the different institutional setting, results are slightly different and need some care in the interpretation. According to the contribution of the differences in the characteristics across the two regimes, the sign of the (predicted) raw inequality differential should be reversed (i.e. positive), while the effect of the returns to these characteristics contribute to reduce it. This evidence further confirms that under the different bargaining setting prevailing in Spain, workplaces appear much more heterogeneous across regimes as compared to the other countries. Also in terms of (observed) attributes, establishment only covered by decentralised agreements appear to be characterised by lower (within) wage dispersion, as opposed to those covered only by centralised agreements; while, returns to average personal and establishment characteristics (wages and prices) moderately compensate the above outcome.

Table 9 - Wage inequality decomposition

COUNTRY	Average intra establishment pay inequality — decentralised regime (1)	Average intra establishment pay inequality — no-decentralised regime (2)	Raw differential (2) - (1)	Unexplained (3)	Explained (4)	Unexplained (in %) (5)	Explained (in %) (6)
	<i>Belgium</i>	0,296	0,275	- 0,021	0,002	0,019	7,5
<i>Ireland</i>	0,442	0,398	- 0,044	0,012	0,032	28,0	72,0
<i>Italy</i>	0,353	0,275	- 0,077	0,014	0,063	18,1	81,9
<i>Spain</i>	0,333	0,299	- 0,034	-0,05	0,039	-13,6	113,6

(*) We used decomposition approach suggested by Reimers (1983).

³³ In practice, we estimated separate equations for the two regimes -- for all the four countries -- using the same specification reported in Table 8 (column 4).

6.3 The main set of results: residual two-stage OLS

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 remainder 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 (results are in the appendix). Next, we compute from the first stage residuals the within establishment coefficient of variation and we regress it on workplace characteristics and average workers characteristics. The main set of results is reported in Table 10 (for the whole set of results see the appendix).

Table 10a - Estimates of intra-establishment pay inequality based on first stage residuals (Belgium)

VARIABLES	Dependent Variable: Coefficient of Variation OLS estimates				
	(1)	(2)	(3)	(4)	(5)
<i>Average establishment personal characteristics*</i>					
<i>Age(in years)</i>		-0.004 (-0.29)		-0.003 (-0.20)	-0.003 (-0.19)
<i>Age2 (in years)</i>		0.0002 (0.85)		0.0001 (0.69)	0.0001 (0.68)
<i>Gender (women)</i>		0.020 (0.26)		0.0191 (0.24)	0.019 (0.24)
<i>Education 1 (lower secondary)</i>		-0.002 (-0.06)		0.017 (0.45)	0.016 (0.43)
<i>Education 2 (upper secondary)</i>		0.033 (0.95)		0.052 (1.18)	0.051 (1.18)
<i>Education 3 (tertiary)</i>		0.117 (2.53)		0.138 (2.24)	0.138 (2.23)
<i>Occupation 1 (Managers)</i>		-0.063 (-0.64)		-0.035 (-0.57)	-0.038 (-0.60)
<i>Occupation 2 (Professionals)</i>		-0.122 (-1.28)		-0.093 (-1.47)	-0.093 (-1.48)
<i>Occupation 3 (Associate professionals)</i>		-0.055 (-0.51)		-0.006 (-0.11)	-0.008 (-0.13)
<i>Occupation 4 (Clerks)</i>		0.004 (0.03)		0.029 (0.42)	0.028 (0.41)
<i>Occupation 5 (Craft and related trades workers)</i>		0.016 (0.14)		0.057 (0.79)	0.056 (0.77)
<i>Occupation 6 (Plant-machine operators)</i>		0.053 (0.42)		0.102 (1.14)	0.101 (1.13)
<i>Occupation 7 (Elementary occupations)</i>		0.106 (0.78)		0.150 (1.56)	0.149 (1.54)
<i>Supervisors</i>		0.007 (0.18)		0.002 (0.04)	0.002 (0.04)

Table 10a (ctd.) - Estimates of intra-establishment pay inequality based on first stage residuals (Belgium)

<i>Tenure (in months)</i>		-0.0007 (-3.98)		-0.0006 (-2.66)	-0.0006 (-2.59)
<i>Part-time</i>		0.038 (0.27)		0.032 (0.22)	0.032 (0.22)
<i>Type of contract (indefinite duration)</i>		-3.262 (-1.05)		-3.305 (-1.06)	-3.305 (-1.06)
<i>Type of contract (fixed term)</i>		-3.241 (-1.04)		-3.266 (-1.05)	-3.266 (-1.05)
<i>Type of contract (other)</i>		-3.301 (-1.06)		-3.321 (-1.07)	-3.322 (-1.07)
<i>Establishment characteristics</i>					
<i>Establishment's size 1 (20-49)</i>			0.009 (0.30)	0.012 (0.37)	0.012 (0.38)
<i>Establishment's size 2 (50-99)</i>			-0.035 (-1.61)	-0.025 (-1.23)	-0.025 (-1.23)
<i>Establishment's size 3 (100-249)</i>			-0.037 (-1.76)	-0.025 (-1.18)	-0.024 (-1.17)
<i>Establishment's size 4 (250-499)</i>			-0.027 (-1.31)	-0.009 (-0.36)	-0.009 (-0.35)
<i>Establishment's size 5 (500-999)</i>			-0.035 (-1.70)	-0.021 (-0.76)	-0.021 (-0.76)
<i>Establishment's size 6 (1000 and over)</i>			-0.037 (-1.76)	-0.020 (-0.71)	-0.023 (-0.71)
<i>Collective bargaining (ref: National/Sectoral Agreements)</i>					
<i>National/Sectoral + Decentralised Agreements</i>	-0.061 (-7.12)	-0.030 (-3.61)	-0.038 (-3.47)	-0.019 (-2.02)	-0.032 (-1.95)
<i>Other agreements</i>	-0.044 (-2.13)	-0.026 (-1.12)	-0.034 (-1.42)	-0.024 (-1.04)	-0.023 (-1.00)
<i>Decentralised Agreements*Tenure</i>					0.0001 (0.74)
<i>Decentralised Agreements*Size(n.°of employees)</i>					0.000003 (0.62)
<i>Region and Industry controls</i>					
<i>Regions (3 dummies; ref: Wallonia)</i>	no	no	yes	yes	yes
<i>Industries (22 dummies; ref: Transport, storage and communication)</i>	no	no	yes	yes	yes
<i>Constant</i>	0.281 (35.74)	3.454 (1.13)	0.282 (9.72)	3.439 (1.13)	3.439 (1.13)
<i>F-test</i>	25.45	10.8	8.65	8.77	9.22
<i>R²</i>	0.0030	0.0354	0.0078	0.0385	0.0385
<i>N. Obs.</i>	4162	4149	4162	4149	4149
<p>Notes: (Robust) t-test in parentheses. Reference variables: Service workers; Primary school; Apprentice (contract); Wallonia; Transport, storage and communication; 10-19 employees; National/Sectoral Agreements.</p> <p>* "Personal characteristics" variables represent proportions except when indicated differently.</p>					

Table 10b - Estimates of intra-establishment pay inequality based on first stage residuals (Ireland)

VARIABLES	Dependent Variable: Coefficient of Variation OLS estimates				
	(1)	(2)	(3)	(4)	(5)
<i>Average establishment personal characteristics*</i>					
<i>Age(in years)</i>		-0.004 (-0.42)		-0.001 (-0.12)	-0.002 (-0.24)
<i>Age2 (in years)</i>		0.0002 (1.43)		0.0002 (1.20)	0.0002 (1.29)
<i>Gender (women)</i>		0.025 (1.16)		0.025 (1.09)	0.022 (0.98)
<i>Education 1 (lower secondary)</i>		0.037 (0.91)		0.046 (1.07)	0.047 (1.09)
<i>Education 2 (upper secondary)</i>		0.094 (2.69)		0.118 (3.03)	0.122 (3.09)
<i>Education 3 (tertiary)</i>		0.323 (3.46)		0.362 (3.85)	0.370 (3.87)
<i>Occupation 1 (Managers)</i>		0.030 (0.27)		-0.033 (-0.29)	-0.041 (-0.36)
<i>Occupation 2 (Professionals)</i>		-0.444 (-4.43)		-0.318 (-3.41)	-0.319 (-3.41)
<i>Occupation 3 (Associate professionals)</i>		-0.300 (-4.29)		-0.214 (-3.23)	-0.220 (-3.29)
<i>Occupation 4 (Clerks)</i>		-0.152 (-3.50)		-0.127 (-2.71)	-0.128 (-2.72)
<i>Occupation 5 (Craft and related trades workers)</i>		0.000 (0.01)		0.042 (1.11)	0.039 (1.01)
<i>Occupation 6 (Plant-machine operators)</i>		-0.109 (-4.20)		-0.031 (-1.00)	-0.032 (-1.03)
<i>Occupation 7 (Elementary occupations)</i>		0.072 (2.05)		0.105 (3.19)	0.103 (3.15)
<i>Supervisors</i>		-0.122 (-2.13)		-0.162 (-2.63)	-0.160 (-2.61)
<i>Tenure (in months)</i>		-0.0007 (-4.37)		-0.0007 (-4.27)	-0.0008 (-6.10)
<i>Part-time</i>		0.157 (3.38)		0.110 (2.26)	0.110 (2.28)
<i>Type of contract (indefinite duration)</i>		-0.469 (-2.90)		-0.414 (-2.59)	-0.415 (-2.61)
<i>Type of contract (fixed term)</i>		-0.451 (-3.24)		-0.395 (-2.86)	-0.395 (-2.87)
<i>Type of contract (other)</i>		-0.456 (-2.77)		-0.429 (-2.60)	-0.438 (-2.64)
<i>Establishment characteristics</i>					
<i>Establishment's size 1 (20-49)</i>			-0.093 (-3.43)	-0.086 (-3.27)	-0.085 (-3.26)
<i>Establishment's size 2 (50-99)</i>			-0.122 (-4.75)	-0.110 (-4.34)	-0.108 (-4.30)
<i>Establishment's size 3 (100-249)</i>			-0.150 (-5.91)	-0.126 (-4.97)	-0.124 (-4.95)
<i>Establishment's size 4 (250-499)</i>			-0.148 (-5.66)	-0.135 (-4.94)	-0.133 (-4.92)

Table 10b (ctd.) - Estimates of intra-establishment pay inequality based on first stage residuals (Ireland)

<i>Establishment's size 5 (500-999)</i>			-0.160 (-5.48)	-0.142 (-4.58)	-0.138 (-4.52)
<i>Establishment's size 6 (1000 and over)</i>			-0.141 (-4.72)	-0.114 (-3.77)	-0.102 (-3.26)
Collective bargaining (ref: National Agreements)					
<i>National + Decentralised Agreements</i>	0.064 (5.59)	0.039 (3.05)	0.028 (2.54)	0.021 (1.80)	-0.016 (-0.70)
<i>Decentralised Agreements*Tenure</i>					0.00043 (1.80)
<i>Decentralised Agreements*Size (n.° of employees)</i>					-0.00001 (-1.66)
Region and Industry controls					
<i>Regions</i>	no	no	No	no	no
<i>Industries (19 dummies; ref: Mining and Quarrying)</i>	no	no	Yes	yes	yes
<i>Constant</i>	0.341 (63.90)	0.737 (2.82)	0.276 (1.97)	0.491 (2.00)	0.526 (2.12)
F-test	31.30	23.55	16.62	19.78	45.65
R ²	0.0119	0.1226	0.0908	0.1558	0.1575
N. Obs.	2696	2696	2696	2696	2696
<p>Note: (Robust) t-test in parentheses. Reference variables: Service workers; Primary school; Apprentice (contract); Mining and Quarrying; 5-19 employees; National Agreements Only.</p> <p>*"Personal characteristics" variables represent proportions except when indicated differently.</p>					

Table 10c - Estimates of intra-establishment pay inequality based on first stage residuals (Italy)

VARIABLES	Dependent Variable: Coefficient of Variation				
	OLS estimates				
	(1)	(2)	(3)	(4)	(5)
<i>Average establishment personal characteristics*</i>					
<i>Age(in years)</i>		0.005 (0.97)		0.004 (0.90)	0.005 (0.94)
<i>Age2 (in years)</i>		0.00001 (0.10)		0.00001 (0.19)	0.00001 (0.12)
<i>Gender (women)</i>		0.027 (1.14)		-0.021 (-0.84)	-0.021 (-0.84)
<i>Education 1 (lower secondary)</i>		0.065 (3.19)		0.078 (3.79)	0.078 (3.80)
<i>Education 2 (upper secondary)</i>		0.175 (5.60)		0.192 (5.90)	0.193 (5.90)
<i>Education 3 (tertiary)</i>		0.308 (8.11)		0.331 (8.05)	0.330 (8.03)
<i>Occupation 1 (Managers)</i>		0.246 (3.83)		0.181 (2.41)	0.177 (2.33)
<i>Occupation 2 (Professionals)</i>		-0.125 (-3.49)		-0.137 (-3.39)	-0.135 (-3.37)
<i>Occupation 3 (Associate professionals)</i>		-0.086 (-3.59)		-0.075 (-2.90)	-0.073 (-2.83)
<i>Occupation 4 (Clerks)</i>		-0.070 (-3.24)		-0.045 (-1.92)	-0.045 (-1.89)
<i>Occupation 5 (Craft and related trades workers)</i>		0.088 (3.36)		0.035 (1.65)	0.034 (1.62)
<i>Occupation 6 (Plant-machine operators)</i>		0.048 (2.63)		0.017 (1.09)	0.016 (1.00)
<i>Occupation 7 (Elementary occupations)</i>		0.029 (1.22)		0.028 (1.07)	0.028 (1.05)
<i>Supervisors</i>		0.029 (0.65)		0.053 (1.06)	0.054 (1.08)
<i>Tenure (in months)</i>		-0.0004 (-4.99)		-0.0003 (-2.96)	-0.0003 (-2.99)
<i>Part-time</i>		0.411 (4.01)		0.429 (4.00)	0.428 (3.99)
<i>Type of contract (indefinite duration)</i>		-0.026 (-0.79)		-0.033 (-1.02)	-0.031 (-0.97)
<i>Type of contract (fixed term)</i>		0.050 (0.76)		0.061 (0.95)	0.063 (0.98)
<i>Type of contract (other)</i>		0.043 (0.64)		-0.005 (-0.08)	-0.001 (-0.02)
<i>Establishment characteristics</i>					
<i>Establishment's size 1 (20-49)</i>				-0.0005 (-0.05)	0.005 (0.56)
<i>Establishment's size 2 (50-99)</i>				-0.009 (-1.10)	-0.009 (-1.18)
<i>Establishment's size 3 (100-249)</i>				-0.002 (-0.22)	-0.005 (-0.51)
<i>Establishment's size 4 (250-499)</i>				-0.014 (-1.07)	-0.012 (-0.92)

Table 10c (ctd.) - Estimates of intra-establishment pay inequality based on first stage residuals (Italy)

<i>Establishment's size 5 (500-999)</i>			-0.023 (-2.82)	-0.018 (-1.81)	-0.020 (-2.15)
<i>Establishment's size 6 (1000 and over)</i>			-0.031 (-3.68)	-0.021 (-2.22)	-0.030 (-3.11)
Collective bargaining (ref: National/Sectoral Agreements)					
<i>National/Sectoral + Decentralised Agreements</i>	-0.023 (-3.18)	-0.013 (-1.78)	-0.0125 (-1.48)	-0.015 (-1.80)	-0.035 (-2.46)
<i>Other Agreements</i>	0.039 (2.96)	0.012 (0.92)	0.030 (2.21)	0.012 (0.88)	0.011 (0.84)
<i>Decentralised Agreements*Tenure</i>					0.0001 (1.00)
<i>Decentralised Agreements*Size (n. ° of employees)</i>					0.00002 (2.56)
Region and Industry controls					
<i>Regions (11 dummies; ref: Abruzzo-Molise)</i>	no	no	yes	yes	yes
<i>Industries (22 dummies; ref: Transport, storage and communication)</i>	no	no	yes	yes	yes
<i>Constant</i>	0.263 (76.69)	-0.010 (-0.09)	0.188 (7.80)	-0.067 (-0.61)	-0.070 (-0.64)
F-test	10.77	26.01	22.55	23.72	23.77
R ²	0.0023	0.0920	0.0338	0.1122	0.1126
N. Obs.	7703	7703	7703	7703	7703
<p>Note: (Robust) t-test in parentheses. Reference variables: Service workers; Primary school; Apprentice (contract); Abruzzo-Molise; Transport, storage and communication; 10-19 employees; National/Sectoral Agreements. *“Personal characteristics” variables represent proportions except when indicated differently.</p>					

Table 10d - Estimates of intra-establishment pay inequality based on first stage residuals (Spain)

VARIABLES	Dependent Variable: Coefficient of Variation				
	OLS estimates				
	(1)	(2)	(3)	(4)	(5)
<i>Average establishment personal characteristics*</i>					
<i>Age(in years)</i>		0.001 (0.09)		0.002 (0.20)	0.002 (0.20)
<i>Age2 (in years)</i>		0.0001 (0.43)		0.00004 (0.31)	0.00004 (0.31)
<i>Gender (women)</i>		0.017 (0.77)		0.001 (0.05)	0.001 (0.05)
<i>Education 1 (lower secondary)</i>		0.013 (0.47)		0.015 (0.58)	0.015 (0.59)
<i>Education 2 (upper secondary)</i>		0.037 (0.68)		0.051 (0.90)	0.051 (0.91)
<i>Education 3 (tertiary)</i>		0.138 (3.34)		0.143 (3.06)	0.143 (3.06)
<i>Occupation 1 (Managers)</i>		0.081 (1.41)		0.105 (1.42)	0.105 (1.42)
<i>Occupation 2 (Professionals)</i>		-0.164 (-2.28)		-0.187 (-2.45)	-0.187 (-2.45)
<i>Occupation 3 (Associate professionals)</i>		0.001 (0.04)		-0.009 (-0.24)	-0.009 (-0.23)
<i>Occupation 4 (Clerks)</i>		0.016 (0.53)		0.013 (0.52)	0.013 (0.51)
<i>Occupation 5 (Craft and related trades workers)</i>		0.016 (0.58)		-0.033 (-0.73)	-0.033 (-0.73)
<i>Occupation 6 (Plant-machine operators)</i>		-0.049 (-1.80)		-0.082 (-1.62)	-0.082 (-1.62)
<i>Occupation 7 (Elementary occupations)</i>		-0.011 (-0.19)		-0.027 (-0.48)	-0.027 (-0.48)
<i>Tenure (in months)</i>		-0.0007 (-5.45)		-0.0006 (-4.82)	-0.0006 (-4.45)
<i>Part-time</i>		-0.063 (-0.51)		-0.061 (-0.49)	-0.061 (-0.49)
<i>Type of contract (indefinite duration)</i>		-0.240 (-5.00)		-0.276 (-5.88)	-0.276 (-5.88)
<i>Type of contract (fixed term)</i>		-0.161 (-2.85)		-0.188 (-3.35)	-0.188 (-3.35)
<i>Establishment characteristics</i>					
<i>Establishment's size 1 (20-49)</i>			-0.012 (-0.71)	-0.007 (-0.43)	-0.007 (-0.43)
<i>Establishment's size 2 (50-99)</i>			-0.030 (-1.97)	-0.018 (-1.20)	-0.018 (-1.21)
<i>Establishment's size 3 (100-249)</i>			-0.050 (-2.80)	-0.028 (-1.53)	-0.028 (-1.51)
<i>Establishment's size 4 (250-499)</i>			-0.077 (-2.13)	-0.048 (-1.30)	-0.048 (-1.27)
<i>Establishment's size 5 (500-999)</i>			-0.054 (-3.29)	-0.019 (-1.04)	-0.017 (-0.92)
<i>Establishment's size 6 (1000 and over)</i>			-0.078 (-4.41)	-0.039 (-1.81)	-0.032 (-1.32)

Table 10d (ctd.) - Estimates of intra-establishment pay inequality based on first stage residuals (Spain)

<i>Collective bargaining (ref: National + Provincial Agreements)</i>					
<i>Decentralised (Ent + Est) agreements</i>	-0.052 (-4.87)	-0.020 (-1.82)	-0.036 (-3.56)	-0.016 (-1.63)	-0.008 (-0.35)
<i>Other agreements</i>	0.065 (2.42)	0.062 (2.31)	0.062 (2.33)	0.058 (2.17)	0.058 (2.16)
<i>Decentralised Agreements*Tenure</i>					-0.00005 (-0.42)
<i>Decentralised Agreements*Size (n.° of employees)</i>					-0.000004 (-1.00)
<i>Region and Industry controls</i>					
<i>Regions (7 dummies; ref: Centre)</i>	no	no	yes	yes	yes
<i>Industries (22 dummies; ref: Transport, storage and communication)</i>	no	no	yes	yes	yes
<i>Constant</i>	0.320 (41.97)	0.467 (2.64)	0.339 (28.74)	0.499 (2.58)	0.497 (2.58)
F-test	17.82	40.66	17.37	25.77	25.45
R ²	0.0008	0.0068	0.0047	0.0100	0.0100
N. Obs.	17899	17899	17899	17899	17899
<p>Note: (Robust) t-test in parentheses. Reference variables: Service workers; Primary school; Apprentice (contract); Centre; Transport, storage and communication; 10-19 employees; National/Sectoral Agreements.</p> <p>*“Personal characteristics” variables represent proportions except when indicated differently.</p>					

In general, in all countries, coefficient estimates show that (average) age has not a significant impact on residual wage inequality once the (individual) market returns to age have been controlled for, while educational dummies (tertiary education, in particular) are statistically significant and positive. That is, the share of highly educated workers in the establishment further contributes to increase wage dispersion over and above the market return. The proportion of females is no longer statistically significant suggesting that there are no additional segregation effects over and above individual gender wage differentials. Occupational variables are in general not statistically significant (only the share of managers is significant in some countries). Residual wage inequality still decreases with tenure, and increases with the share of part-timers in Ireland and Italy (not in Belgium nor Spain). 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 quit propensity). 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 and Ireland, while has no effect in Belgium and Spain. Finally, the effects

of decentralised agreements on within-establishment wage (residual) inequality are now negative in all countries (except Ireland), although in some cases – i.e. when controlling for a large set of average personal and establishment characteristics – only weakly significant. Interestingly, the interaction terms do not show up consistently as before.

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.

6.4. Decentralised bargaining: IV estimates

The previous analysis of the effects of decentralised bargaining on intra-firm wage inequality has shown that the initial positive impact obtained from simple OLS regressions, turns to negative or becomes non significant once (observed) personal and establishment attributes – from matched employer-employee data – are adequately controlled for. Similarly, the decomposition analysis has shown that differences in establishment features across bargaining regimes can explain the largest part of the (observed) wage inequality differences. 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. In practice we estimate the following model:

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

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:

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

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 term³⁴.

The model is estimated following the two approaches used in the previous section. 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 parameter α . The results are reported in Table 11³⁵. The impact of decentralised bargaining is found to be negative (and statistically significant) in Belgium and in Spain, whilst it is generally not significant for the other countries. Furthermore, when residual wage inequality is considered there seems to be no (statistically significant) effect for any of the four countries considered. 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.

This result should cast some doubts on all those studies that, using inadequate data and methods, have reported a compressing effect of decentralised bargaining on within establishment wage inequality, for there seems to be significant workers and workplaces heterogeneity (both observed and unobserved) that if not adequately modelled and controlled for can seriously bias the results.

Table 11
Treatment effect model estimates

Establishment characteristics	Estimates of intra -establishment pay inequality				Estimates of intra -establishment pay inequality based on first stage residuals			
	Belgium	Ireland	Italy	Spain	Belgium	Ireland	Italy	Spain
<i>Other Agreements</i>	-0.017 (-3.23)	--	0.014 (1.40)	0.018 (2.03)	-0.023 (-1.28)	--	0.012 (0.76)	0.059 (1.44)
<i>Centralised+Decentralized agreements</i>	-0.161 (-4.29)	0.224 (1.62)	-0.038 (-1.27)	-0.292 (-13.52)	0.114 (0.90)	0.314 (1.75)	-0.004 (-0.08)	-0.186 (-1.85)
<i>Constant</i>	1.055 (5.89)	0.694 (2.76)	0.188 (3.59)	0.965 (18.29)	3.487 (8.67)	0.090 (0.29)	-0.061 (-0.75)	0.520 (2.44)
<i>Wald-chi</i>	2388	1067	6704	8564	2388	1067	6704	8564
<i>N. Obs.</i>	4147	2691	7680	17863	4147	2691	7703	17863

Note: other variables included are the same as in Tabeles 8 and 10

³⁴ We also assume that η and u are independent of X and Z such that $E(u|X,D,Z)=E(u|X,D)$.

³⁵ The whole set of results is reported in the Appendix.

7. 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 characteristics, as well as by institutional factors such as union presence and collective bargaining. In order to assess 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 pay 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. Finally, we accounted for the endogeneity of the bargaining structure and the self-selection of establishment according to the bargaining structure, and found no causal effect of decentralised bargaining on within establishments inequality.

In other words, the empirical evidence presented here seem 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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