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Valeria Cirillo [a]
Matteo Sostero [a,b]
Federico Tamagni [b,c]

[a] INAPP, National Institute for the Analysis of Public Policies, Rome, Italy.
[b] Institute of Economics, Scuola Superiore Sant'Anna, Pisa, Italy.
[c] Department EmbeDS, Scuola Superiore Sant'Anna, Pisa, Italy.

Firm-level pay agreements and within-firm wage inequalities: Evidence across Europe

Valeria Cirillo[a], Matteo Sostero[a,b], and Federico Tamagni[*][b]

[a]INAPP, National Institute for the Analysis of Public Policies, Rome, Italy
[b]Institute of Economics, Scuola Superiore Sant'Anna, Pisa, Italy

Abstract

This article investigates the relation linking single-employer bargaining and within-firm wage dispersion, a significant driver of overall wage inequality. The study considers six European economies (Belgium, Spain, Germany, France, the Czech Republic and the UK), featuring different collective bargaining institutions, in 2006 and 2010. We examine two different measures of within-firm inequality, allowing to capture how different groups of employees (top vs. bottom paid, and managers vs. low-layer employees) may differently benefit or lose from firm-level bargaining. Our findings show that firm-level bargaining has heterogeneous effects across countries, by inequality measures and over time. We interpret our evidence as supporting that country-specificities and the heterogeneous balance of power within organizations represent key elements to understand the role of the bargaining system in shaping inequalities.

Keywords: within-firm wage inequalities, occupational wage-gap, firm-level bargaining, matched employer-employee data
JEL classification: J31, J33, J51, J52

[*]*Corresponding author*: Federico Tamagni, Scuola Superiore Sant'Anna, Pisa, Italy. Postal address: c/o Institute of Economics, Scuola Superiore Sant'Anna, Piazza Martiri 33, 56127, Pisa, Italy, *E-mail* f.tamagni@sssup.it, *Tel* +39-050-883343.

1   Introduction

The notable raise of inequality observed since the Great Depression reopened the debate on the causes of this phenomenon among social scientists. Together with technological changes, globalization, financialization and changes in power relations among social groups, the change of wage-setting institutions is among the major candidates in explaining rising wage inequality (Cobb, 2016). In this article, we focus on the possible role played by devolution of bargaining levels – the progressive shift in the locus of collective wage setting from more centralised levels (national or industry) to the level of single firms (Undy, 1978). This trend has affected wage bargaining systems – particularly in Europe – with the intended aim to provide more flexibility and a better match with the specific needs arising in the firms. The "corporatist" system of industrial relations (Wallerstein et al., 1997) that characterized most European countries in the second half of the 20th century, has progressively given way to an "hybrid" system (Braakmann and Brandl, 2016), where "multi-employer" collective bargaining conducted at centralised level still prevails, but "single-employer" collective agreements signed locally at the firm level are increasingly spread and allowed to derogate to specific provisions stipulated at centralised levels (Visser et al., 2013).

The increased role of firm-level collective agreements has been connected to two types of wage inequality, that is between or within firms. The vast majority of the studies focus on between-firm wage inequality, comparing the dispersion of wages among workers that are covered only by a centralised agreement against the dispersion observed among workers who also bargain at the firm-level, on top of centralised contracts (Dell'Aringa and Lucifora, 1994; Hibbs and Locking, 1996; Palenzuela and Jimeno, 1996; Hartog et al., 2002; Rycx, 2003; Cardoso and Portugal, 2005; Checchi and Pagani, 2005; Plasman et al., 2007; Card and De La Rica, 2006; Dell'Aringa and Pagani, 2007; Dahl et al., 2013; Daouli et al., 2013).

In this paper, we explore the effects of the level of collective bargaining on within-firm wage inequalities, comparing whether firms that apply firm-level collective bargaining exhibit more unequal wages than firms that only adopt centralised collective bargaining. Therefore, consistently with approaches focusing on firms as drivers of inequality, we examine whether firm-level bargaining is one of the ways through which employers shape inequality by setting the pay of workers in different occupations. In fact, within-firm wage inequality is as relevant as between-firm inequality, as it accounts for around half of overall wage dispersion in most economies (Lazear and Shaw, 2007; Fournier and Koske, 2013; ILO, 2016).

Theoretically, the relation between the level of collective bargaining and within-firm wage inequalities can be framed within several approaches, across different fields of research.

The labour economics literature offers a variety of frameworks explaining why wage setting at the workplace – as opposed to market wage-setting – may be central in the creation of inequality. Tournament theory (Lazear and Rosen, 1979) predicts that firm-level bargaining firms show a more unequal wage structure, due to performance-related pay or other differentials-

in-compensation schemes designed to elicit or reward employee effort in the firm. Conversely, in insider-outsider models "with unions" (Lindbeck and Snower, 1986, 2001), firms bargaining locally are expected to show lower wage dispersion, since unions are known to favor wage compression. Likewise, in "fair wage" theories (Akerlof, 1984), firms seek to avoid too large pay differences, which may be perceived as "unfair" and eventually harm firm performance.

Other wage-setting practices that may affect within-firm wage dispersion can be explained by the use efficiency wages, rent-sharing or differential compensations for unmeasured workers' ability. Although these schemes are usually invoked to explain inequalities between firms, they can contribute to inequalities within them if they are used selectively by employers to reshape the pay-scale. In fact, we would expect within-firm inequality to be higher in firms bargaining locally – as opposed to firms bargaining only at more centralised levels – every time firm-level agreements are used to compensate unequally the contribution of different employees to the firms' objectives (Bayo-Moriones et al., 2013). High within-firm inequality may also arise when firms selectively remunerate human capital or particularly valuable firm-specific resources (according to the resource-based view of the firm), or to solve transaction costs and agency problems arising for different occupational groups (Eisenhardt, 1989; O'Shaughnessy, 1998). Yet, the actual implementation of such practices may also end up reducing within-firm inequalities vis-a-vis firms that only bargain at centralised levels, if these types of work-place collective agreements respond to motives of re-distribution, fairness or equality (e.g. by workers or unions). Overall, many contrasting mechanisms may operate in different firms.

A major limitation of many economic theories is that they ignore the institutional contexts of countries, while cross-country differences in wage bargaining practices and their evolution over time represent key elements stressed in other literatures. Recent developments in organizational approaches to stratification, recognizing the central role of firms as drivers of wage inequality, offer a broader perspective explaining how and why firms act on their internal wage structure. Three main driving forces coexist and shape stratification (Stainback et al., 2010). Inertia and the relative balance of power among groups represent the two key factors internal to the firm. Resistance to change favors reproduction of relative wages and positions of individuals within a firm, whereas the resolution of conflicts among groups within the firm may result into either reducing or increasing inequalities within firms, both statically and over time. Outside the firm, institutions shaping the environment constitute a third driver of inequality. Internal and external forces always coexist and constantly interact. Elaborating along these lines, Cobb (2016) proposes a systematic theory about the contribution of firms to shaping inequality. The building blocks are located between environment-level characteristics – epitomized by the system of corporate governance prevailing in a country – and their interactions with internal distribution of power (among firms' stakeholders). Our study speaks to this literature.

Institutional and environment characteristics also interact to determine inequality via the overlap of different levels of collective wage bargaining – between those allowed for by labour and industrial regulation in different countries and "chosen" by firms. These approaches suggest us

that power struggles within firms are critical to within-firm wage stratification. As we explain below, in fact, we use various measures of within-firm inequality that try to differently capture how groups of employees (between highest and lowest wage groups, and between managers and low-layers workers) may benefit from firm-level bargaining. Indeed, different sociological studies have focused on occupations and occupational structures referring to social stratification and distribution of power (Blau and Duncan, 1967; Goldthorpe and Hope, 1972; Wright, 1980; Erikson and Goldthorpe, 2002). These studies suggest that the nature of occupation is a relevant driver of income disparities.

The (mostly economic) empirical literature exploring the relation between within-firm wage inequalities and the level of collective bargaining is limited and based on fairly old data, dating back to the 1990s. Dell'Aringa and Lucifora (1994) find that within-firm wage dispersion does not differ between firms which only apply centralised bargaining and firms which also apply firm-level agreements, in a sample of Italian firms active in 1990. The result is confirmed in Dell'Aringa et al. (2004) for Italy, Spain, Belgium and Ireland on data covering the year 1995: enterprises covered by a single-employer agreement display greater *unconditional* within-establishment inequalities than multi-employer bargaining firms, but such differences become statistically insignificant once controlling for other factors and potential endogeneity of the choice to bargain at the firm level. Conversely, Canal Dominguez and Gutierrez (2004) find that firm-level bargaining reduces within-firm wage dispersion in Spain, on data again for the year 1995. Overall, these studies reflect the expectation that multiple contrasting mechanisms may be at work.[1]

The present work contributes to this relatively underdeveloped empirical literature. We consider matched employer-employee data on six European countries – Belgium, Spain, France, Germany, the Czech Republic and the UK – available for the years 2006 and 2010, and exploit the variety of collective bargaining models in place at different firms in each country to shed light on three interrelated research questions.

Our first and central contribution is to examine the difference in within-firm wage inequality between firms bargaining locally (*on top of* more centralised agreements) as compared to firms which only apply centralised bargaining. We employ two different measures of within-firm wage dispersion. The first is an inter-decile wage ratio (measured as the 90th-to-10th percentile wage-gap) to measure the distance between the top vs. the bottom part of the internal wage structure. The second is the wage ratio between managers and low-layers employees (manual workers and elementary occupations) to capture whether the effect of firm-level bargaining varies according to the occupation hierarchy. Although one can expect some degree of overlap between the two measures, they do capture different aspects of wage inequalities within firms. The occupational wage-gap, in particular, more directly connects to whether firm-level bargaining works through

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[1]A more recent study, posing a related although different question, is by Addison et al. (2014), showing a modest widening of workplace wage dispersion across establishments that abandoned centralised (sector-level) collective bargaining in Germany over the period 1996-2008.

the degree of power or control on firms' decisions. In fact, there is a recent renewed emphasis on the decline in wage premia of low-layers or low-skilled workers (Song et al. 2015) vis a vis the skyrocketing wages of managerial positions (Piketty 2014; Mishel and Sabadish 2012).

Whether the level of collective wage bargaining negotiations contributed to these trends has not been yet investigated. As theories and previous evidence suggest, many counteracting effects are likely at work, preventing to formulate a sharp a-priori hypothesis on whether firms which bargaining only at more centralised levels should be expected to be more or less unequal than firms which also bargain locally. Our analysis shall be informative about which forces prevail. Beyond estimating the effect of firm-level bargaining on the two measures of within-firm wage inequality, we also explore the effect of firm-level bargaining on the components of the two wage-gaps. This allows to uncover if an eventual statistically significant effect of firm-level bargaining on internal wage structures arises from favouring (or discriminating) certain categories of employees.

The second question is whether the relations linking firm-level bargaining to within-firm inequality exhibit comparable patterns across countries. In line with theory, differences in environment and institutional frameworks are central to establish in which direction within-firm inequalities may evolve. The scope for firm-level collective agreements vis-a-vis more centralised wage bargaining changes significantly by country, depending on the legal and institutional framework of the country where each firm operates its industrial relations, as explained in Section 2. Accordingly, it would be difficult to predict that we shall observe exactly the same effect of firm-level bargaining in all countries. However, despite country-level peculiarities, some of the countries selected in our study can be classified as sharing similar wage bargaining regimes (Fulton, 2013), in turn mapping into a sort of "narrow" version of a Varieties of Capitalism framework. In countries with a *market-oriented* model of capitalism, firm-level bargaining has always been commonplace (e.g., the UK and the Czech Republic). *Coordinated market economies* instead prefer more centralised forms of bargaining (e.g., Germany, France, Belgium and Spain).[2] In this respect, our analysis shall provide a test for whether such *a-priori* taxonomization is supported in the data, or it would otherwise suggest a different taxonomy, depending on which countries turn out to exhibit comparable patterns in the way firm-level bargaining shapes within-firm wage gaps. Indeed, institutions such as the collective bargaining system, which regulate the labour market as well as the relations between employers, unions and states, have weakened since the collapse of the long postwar boom due to an universal neoliberal transformation that blurs the borders of previous varieties of capitalism (see Baccaro and Howell, 2017)). This might lead to high level of variability across countries that were so far characterised by a certain kind of bargaining structure or, more generally, labour market institutional setting.

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[2]See Crouch (2005) for a critical review of the Varieties of Capitalism literature, also discussing important refinements going beyond the original dualistic model distinguishing between market-liberal vs. coordinated-market countries, as developed, e.g., in Amable (2003).

Lastly, our third goal is to explore whether the relations linking firm-level bargaining to within-firm inequality change over time, in between the two years covered in our data (2006 and 2010). In the regulatory framework of all countries we study, the legal provision to stipulate firm-level collective agreements was already established before the time span under analysis, but the years under study are those when the major reforms introduced in late 1990s and beginning of 2000s likely deployed their consequences. Also, the pressure toward assigning more relevance and wider scope to firm-level negotiations increased over time, as part of the broader tendency toward greater flexibility and diminished role of unions. Our intuition is that, along these processes, an increasing use of firm-level agreements to differentiate salaries established over the years spanned in the data, thereby fueling the potential inequality-enhancing role of firm-level bargaining. As a result, we expect to see that, over time, firms bargaining locally show more unequal wage structures than firms only bargaining at more centralised levels. This may be particularly the case in countries closer to coordinated-market regimes, where the structure of industrial relations at more centralised (i.e., national or industry) levels remains comparatively more rigid and more complex to manage. Whether this is the case may be particularly interesting, also considering that the Great Depression hit in between the two years available to us. Although we do not claim to identify any causal effect related to the global crisis, our results contribute to the discussion whether firm-level agreements have been a factor of amplification of inequalities in such a turbulent period.

The article is organised as follows. In Section 2 we describe the key features of the wage-bargaining systems in the selected countries and provide some hypotheses about the role of firm-level bargaining in the different national contexts. In Section 3 we introduce the data and provide details on the definition of the main variables we use in the empirical analysis. The empirical models and the estimation strategy are next described in Section 4, while the estimation results are presented in Section 5. We discuss interpretations of results in the concluding Section 6.

2 Firm-level bargaining across selected countries: characteristics and working hypotheses

The countries for which data are available for this study – Belgium, the Czech Republic, Germany, Spain, France and the United Kingdom – provide a good representation of the different bargaining regimes in Europe. Here we present a brief description of the main characteristics of collective bargaining systems featuring the various countries.[3] This allows to sketch country-specific hypotheses about whether we can expect differences in within-firm wage in-

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[3]We draw here from our own elaboration from a number of data-sources and reports, cited in the text. See Fulton (2013, 2015) for a broader discussion of legal and institutional aspects featuring the bargaining systems of different countries.

equality between firms which negotiate their wages only at more centralised levels, and firms which choose to also apply firm-level collective agreements. Then, at the end of the section, we reflect on similarities and heterogeneities across countries and over time.

In Belgium, collective wage bargaining is highly structured with a central level at the top covering the entire private sector, an industry level covering specific industries, and company level negotiations at the bottom. Wage bargaining takes place predominantly at the national, cross-industry level. Notwithstanding two reforms occurred during the period under analysis (as reported in the *Labour Market Reforms*-LABREF database maintained by the European Commission[4]), the percentage of employees covered by collective bargaining has remained steady at 96% over the period 2006–2010 (source: ILOstat database[5]). According to the data from the *European Company Survey*-ECS (run by the Eurofound Industrial Relations Observatory), in 2009 66.08% of companies apply a collective agreement which has been negotiated at a level above the establishment or the company, while 88.2% of companies applying national, intersectoral or sectoral collective bargaining declare it was not possible for them to derogate from these agreements. Elements of pay and work conditions – including national minimum wage, job creation measures, training and childcare provision – are set in binding national agreements, while industry and company bargaining mostly address non-pay issues, not affected by the ceiling imposed by the central agreement (Visser et al., 2013). The room for pay bargaining at the enterprise level is also limited due to indexation of wages in national agreements. As a result, we do not expect firm-level bargaining to play a major role in this country. The scope for local contracting to affect internal wage structures is limited, with no major changes over time.

Spain and Germany feature bargaining systems where wages are predominantly set at the sector or industry level. The percentage of employees covered by enterprise-level agreements amounts to less than 9% in both countries in 2006 and such percentage does not significantly change in 2010 (source: the *Institutional Characteristics of Trade Unions, Wage Setting, State Intervention and Social Pacts*-ICTWSS database).

In Germany, wages are bargained mostly at the industry level between individual trade unions and employers' organisations, although the agreements allow for flexibility at the company level. Collective agreements regulate a wide range of issues such as pay, shift-work payments, pay structures, working time, treatment of part-timers and training. Work councils play a central role because they can reach agreements with individual employers on issues not covered by collective agreements, or negotiate improvements on pay-related and other issues already covered by collective agreements, under the favourability principle. During the period considered in our analysis, some reforms were implemented in the field of wage setting policies, such as the introduction of binding minimum wages in several sectors (LABREF data). However, the large prevalence of the higher bargaining level remains quite stable over time. According to the ECS data, in 2009, the share of companies covered by forms of collective

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[4]The LABREF dataset is available on-line at https://webgate.ec.europa.eu/labref/public.

[5]See the section "Industrial Relations" of the ILOstat website http://www.ilo.org/ilostat.

agreement above firm-level bargaining was around 66.92%, and the possibility to derogate from these higher level agreements was open to only a modest 17% of the surveyed companies. Given these features and the central role of workers/unions in the work councils, typically pushing toward wage standardization, we could conjecture that firm-level agreements signed on top of more centralised bargaining are in this country especially likely to pursue egalitarian purposes, thus aiming at compressing wage dispersion within firms.

In Spain, the majority of firms (66.09% in 2009 according to the ECS dataset) report to negotiate their wages outside the firm, and the structure of wage bargaining system shows a predominant role of industry-level much like in Germany. But there are features that are quite peculiar to this country. A first specific characteristic rests in the complex coexistence and interaction of negotiations at national and province-level, within industries. On top of this, firms adopting firm-level collective bargaining in Spain traditionally feature a higher presence of unions than multi-employer bargaining firms (Plasman et al., 2007), suggesting that in this country the union's pressure to compress wage inequalities may be particularly strong in firm-level bargaining firms.[6]

The Czech Republic and the United Kingdom represent two instances of countries where collective agreements mostly takes place at the local (firm or establishment) level.

The United Kingdom epitomizes the Anglo-Saxon tradition of industrial relations, where wage bargaining is mostly un-coordinated, with most workers bargaining work contracts individually with employers. In fact, only about a third of all employees (33.3% in 2006 and 30% in 2010, according to ILOstat) is covered by some form of collective bargaining. When a collective agreement occurs, the majority of them are signed at the firm-level (53.4% of companies in 2009, according to the ECS), but such agreements do not establish legally binding norms and, as a rule, they contain no contractual obligations such as opening clauses, they are not subject to legal regulation, and pay rates cannot be claimed in court (Visser et al., 2013). Also, collective agreements are very rare in the private sector, while in the public sector workers' coverage is more comparable to other countries (Fulton, 2013). This warrants public servants some more protection, although in May 2010 an emergency budget was approved freezing wages

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[6]A feature of the bargaining system common to Belgium, Germany and Spain that we cannot measure in our data, but potentially relevant for inequality connected to firm-level bargaining, is the existence in these countries of the so-called "opening clauses" (since 1982 in Belgium, since 1993 in Germany, and since 2001 in Spain). While firm-level agreements cannot worsen conditions settled at higher bargaining levels, these clauses allow for that in certain specific circumstances. However, even if prima facie they could work as an inequality-enhancing driver attached to firm-level bargaining, by allowing to pay at least some of the employees less than what stipulated at more centralised levels, clear predictions about their potential impact on within-firm pay structures are not easy. In fact, their use does not necessarily entail pay reductions, but ranges from working-time adjustments, to suspension of pay increases or supplementary grants. Also, it is not clear if they are applied to some categories *only* (e.g., the bottom paid workers), thus impacting on within-firm wage structure, or to *all* employees, which would instead affect all wages, keeping the rankings unchanged. Previous studies do not provide much help, since detailed information on their specific use by firms is at best limited, if any, exactly as in our data. For Germany, they were mostly used to increase wages, as a monetary compensation bargained by unions in exchange of more flexibility in covered firms (Brändle and Heinbach, 2013), but their use may have also produced significant wage worsening in some firms (Ellguth et al., 2012).

for high earners in the public sector for a two-year period as a temporary measure to face the 2008 global crisis (see LABREF data). Altogether, these features and the traditionally high flexibility in the use and content of heterogeneous pay schemes at firm-level in this country, we suppose that in the UK within-firm pay inequalities are especially wide in firms bargaining locally compared to firms which also adopt firm-level bargaining. Considering

The Czech Republic belongs in the Eastern European trend to embrace decentralised, market-oriented institutional settings in the post-Soviet era. In fact, uncoordinated wage setting occurring directly between firms and individuals are quite spread, although less than in the UK. The employees covered by collective wage bargaining are 50.8% in 2006 and 50.1% in 2010, according to ILOstat data. When collective agreements are reached, they occur at firm level: more than 80% of companies in Eurofound-ECS dataset declare to have conducted negotiations of wages at the firm or the establishment level. There exist a legal provision of the favourability principle, since collective bargaining regulations exclude opening clauses and derogations that set less favourable terms than those provided in agreements stipulated at higher levels. However, collective agreements signed at the industry level last for at least two years, while those signed at company level run for one year, thus allowing for a certain degree of flexibility in reshaping the wage ladder in the enterprise. These features suggest that in the Czech Republic, similarly to the UK, there is more room than in other countries for firm-level bargaining to result into more unequal within-firm pay structures.

The last country that we analyse, France, represents an outlying case, due to its complexity, since all the levels of collective negotiations – intersectoral, industry or company – are closely intertwined and, in turn, they occur at both national or local level (Fulton, 2013, 2015). Industry level bargaining is the most important in terms of numbers of employees covered (97.3% in 2006 and 98% in 2010 according to ILOstat data). More than 50% of companies declare to apply centralised bargaining in 2009 (see ECS data), but the vast majority apply a combination of different levels. The inversion of the favourability principle was introduced in 2004, recognizing to firm-level agreements the possibility to derogate from any condition settled at more centralised levels, if not explicitly prohibited (Keune, 2011). This mostly concerned working time, however, and few firms exploited the opportunity to act on pay structures. Overall, the combination of elements pushing to increase flexibility in the firm, with the enduring and complex role of centralised bargaining levels, makes particularly difficult to provide predictions.

Summarizing, and with all the caveats due to possibly many contrasting factors in place in the use of firm-level settings, the broad review on country-specific wage bargaining systems suggests that bargaining locally may be more likely to increase within-firm disparities in the UK and Czech Republic, while more egalitarian pressures may be in place in Germany and Spain. Belgium and France, for different reasons, appear as more difficult to predict cases.

Beyond providing these intuitions on the possible effect that firm-level bargaining may

exert on within firm inequality in different countries, the basic elements characterizing different bargaining systems also have noteworthy implications for an appropriate interpretation of our empirical analysis. First, country peculiarities can affect the inter-temporal changes we could expect to observe in the estimated effect of firm-level bargaining. As argued in the introduction, we hypothesize that firm-level bargaining is likely to have gained an increasing role, and thus its potentially inequality-enhancing effects to become more likely to manifest over time in all countries. Yet, as the discussion of bargaining systems here above shows, major reforms did not take place in the period under study. In fact, firm-level bargaining was already legally established in all countries well before the initial year of our analysis. In this respect, any inter-temporal change that we shall uncover in the relation between firm-level bargaining and within-firm wage inequalities should be taken as mirroring changes in the use of firm-level agreements, and not as a test of what happens when firms in a country are given the opportunity to move from a fully centralised system to fully decentralised wage bargaining.

An additional important issue for the interpretation of our empirical results regards the relative balance between the similarities and the heterogeneities observed comparing wage-bargaining systems. Our choice to perform separate analysis by country exactly accomplishes the need to recognise that negotiating wages at firm level on top of more centralised levels has different meaning in different countries. Indeed, from the above review of the different country bargaining systems, clear-cut differences emerge in terms of bargaining coverage, structures and mechanisms of coordination: national, sectoral and company bargaining do not operate equally in all countries, and the relative diffusion, scope and content of firm-level collective bargaining are highly heterogeneous. However, on top of country-specific effects, interesting hypotheses may be derived in view of some broad common tendencies shared by some sets of countries. In particular, countries can be grouped based on the prevailing locus where collective bargaining occurs, with Belgium being an emblematic example of the "inter-industry/national regime", the UK and the Czech Republic representing instances of an opposite "individual-employer model", Spain and Germany falling into the intermediate "sectoral model", and France somehow outlying due the specifically complex interaction across all levels (Fulton, 2013). Different hypotheses could be developed about the role of firm-level bargaining in shaping within-firm inequalities in these different regimes or models. On the one hand, it may be argued that where more centralised or complex models prevail, there is stronger resistance (by the laws or due to workers' action) to allow for firm-level contracts to introduce inequalities in the firm internal wage structure. This would lead firms bargaining locally to be characterised by an only mildly higher inequality – if at all – compared to firms which bargain at higher levels in countries like Belgium or France, and to a less extent also in Spain and Germany. On the other hand, it may also be the case that firm-level bargaining is used more markedly by firms to differentiate their pay structures to escape the strictures, complexities of negotiations and the greater pressures toward wage standardization that exactly characterize the more centralised regimes. Eventually, the process of progressive decentralization of wage-setting was justified and

sponsored by the dominant narrative precisely to allow firms more freedom to shape internal incentives as compared to the limited margins of maneuver allowed for by corporatist industrial relations. If this second tendency prevails, we could expect firm-level bargaining firms to display larger within-firm inequalities than other firms also in countries like Spain, Germany, France or Belgium.

One can go even further. In fact, as mentioned in the introduction, this grouping by prevailing level of bargaining eventually ends up evoking a Varieties of Capitalism type of reasoning. The prediction would be that firm-level bargaining is more likely to increase inequality in market-oriented, flexibility-friendly countries like the UK and the Czech Republic, than in the other countries we study, where a coordinated-market type of capitalism is reflected in their more centralised bargaining systems.

3 Data, sample and main variables

3.1 Data source

The *Structure of Earnings Survey* (SES) dataset collected by Eurostat is a well-known source of information for labour dynamics across Europe. It collects a rich number of earnings-related, personal and jobs-related variables for a vast set of workers, matched with information on some characteristics of the employing firms. For this study, we had access to the 2006 and 2010 waves of the SES for Belgium, Germany, Spain, France, the Czech Republic and the United Kingdom. We pool the two waves of the survey in the empirical analysis, but the pooled data must be intended as a repeated cross-section, since the SES does not report any identification code that can be used to match the same firm or the same employee over time.

The structure of the SES data is such that, for each country, a random sample of firms (stratified by size, sector of activity and geographical location) is selected to be representative of the national industrial system. Then, within each selected firm, a representative sample of employees is drawn, and for those employees a large set of personal and job-related characteristics is provided, including age, gender, education, wages, type of contract, tenure, occupation type (according to the 2008 International Standard Classification of Occupations, ISCO), and others. As such, the SES data can be seen as a matched employer-employee dataset, representing a unique source for a consistent comparison across European economies, indeed repeatedly used in previous studies. Of course, the dataset has its own limitations. First, while the surveying procedure provides information on an impressive number of workers across Europe (about 10 million per survey year), for the firms which enter the data the sampling rate of employees varies by firm size and by country. Second, the sample of business units considered in the survey is restricted to those with at least 10 employees, which limits the analysis as far as micro firms are concerned. Third, the data are very rich concerning employees' personal and work-related characteristics, but the information on firms is limited to five variables: size class, geographical

location, sector of activity, public vs. private control and – crucial for our purposes – the level of wage bargaining adopted in the firm.

3.2 Main variables

The outcome variables of interest are two measures of *within-firm* wage inequalities. For each firm j, we first consider the ratio between the 90th and 10th percentile of the wages paid to the employees of the firm

$$\Delta w_j^{90/10} = \frac{w_j^{90}}{w_j^{10}} \quad , \tag{1}$$

This measures the wage distance between top and bottom earners within the firm. This is in line with previous empirical studies, which in fact discuss a purely statistical measurement of within-firm wage inequalities.

Second, departing from the existing literature, we provide a novel occupation-related measurement of inequality, considering the ratio between the average wage of managers and the average wage of workers employed in low-layers occupations

$$\Delta w_j^{\text{jobs}} = \frac{\mathbb{E}\left(w_j^{\text{Managers}}\right)}{\mathbb{E}\left(w_j^{\text{Low}}\right)} \quad . \tag{2}$$

Information on employees' occupation is reported in the SES data according to the ISCO categories, at 1-digit level. We take employees with ISCO code 1 ("managers") to define apical managerial positions, while low-layers workers include employees with ISCO code 8 ("plant and machine operators, and assemblers") or 9 ("elementary occupations").

The two measures of inequality may correlate to some extent, but they may reveal different facets of earnings inequality resulting from firm-level bargaining. The first measure relates to the more standard question whether company-level agreements are used selectively across employees differently positioned in the within-firm wage distribution. The occupational wage-gap, instead, allows us to ask whether firm-level negotiations favour or reduce inter-occupational wage differences in relation to the hierarchical jobs structure within the enterprise. In fact, managerial tasks usually associate to high level of autonomy, control and power in the hierarchy of firms, while working tasks entail lower autonomy and decision power in firm organization. From this point of view, while the ISCO code 8 ("plant and machine operators, and assemblers") profiles the type of manual jobs observed in manufacturing firms, the ISCO code 9 ("elementary occupations") defines low-skill jobs in service industries such as cleaning, caring, assistance workers etc. Although these activities envisage non-routine tasks and human interactions, they are usually associated to low-wages and low-level of autonomy and decision power.

In order to compute wage inequality measures in a commensurable way across firms (accounting for different composition of employees in different firms) we compute wage dispersion from adjusted residual wages, following an established practice in the literature since Winter-

Ebmer and Zweimüller (1999). That is, the wages w that enter the two definitions above are the residuals from an augmented Mincerian wage-regression

$$\log(\hat{w}_{ij}) = b_0 + b_1 \boldsymbol{Z}_i + b_2 \mathrm{Firm}_j + \varepsilon_{ij} \tag{3}$$

where the (log-)wage reported in the data for employee i of firm j, $\hat{w}_{ij}$, is regressed against a standard set of individual characteristics $\boldsymbol{Z}_i$ (age, tenure and tenure squared, gender, education, contract duration, part-time status, share of full-time's hours, and occupation at 1-digit ISCO), plus firm fixed-effects, Firm_j. Separate regressions are estimated by year (2006 and 2010) and sector (one digit NACE), within each selected country.

As the proxy for observed wages, $\hat{w}$, we use hourly wages. In SES, these are recorded as the compensation actually paid to the workers, without distinguishing between the wage components that are set through firm-level bargaining from the components agreed upon at more centralised levels. In particular, as it is often the case in the literature, we do not have information on un-bargained wage drifts. These are parts of compensation granted by firms to specific employees (or group of employees) outside collective bargaining, whatever the level of collective bargaining adopted by the enterprise. Cardoso and Portugal (2005) find for Portugal that such unilateral components increase wage inequalities within firms, although the theoretical possibility remains open that wage drifts – much in line with the mechanisms that may lie behind firm-level collective bargaining – operate to re-balance the internal pay structure, for instance for fairness reasons. Also, although unilateral wage drifts may affect in principle all types of firms, they are expected to be stronger and more frequent in firms which only bargain at national or industry level (e.g. when allowed for via opening clauses), as a way to gain flexibility and adjust the internal wage structure vis-a-vis the centralised agreements, but without going through collective bargaining at the firm-level (Dell'Aringa and Pagani, 2007). If this is the case, then we expect such wage drifts to increase within-firm inequalities less in firms which bargain locally.

As our main explanatory variable we build a dummy that distinguishes firms that only adopt centralised bargaining vs. firms that also apply firm-level bargaining. This allows us to respond our key research goal to estimate the incremental effect of firm-level collective agreements on top of centralised collective negotiations. The variable in SES which records the type of wage bargaining in place at each firm, precisely reflects the incremental engagement of firms in different bargaining levels. It distinguishes firms which do not apply any form of collective bargaining, and then splits those which do negotiate collective agreements into two groups: firms which only negotiate at more centralised levels and firms which also apply firm-level bargaining on top of higher level negotiations. Accordingly, we created a dummy variable FLB taking value 1 for the latter group, and zero for the former. More precisely, firms defined as bargaining only at centralised, multi-employer levels (FLB = 0) apply wage

agreements classified by Eurostat as "national level or inter-confederal agreement", "industry agreement", or "agreement for individual industries in individual regions". Firms which we define as engaging in firm-level bargaining (FLB = 1) also subscribe agreements classified as "enterprise or single employer agreements" or "agreements applying only to workers in the local unit", on top of one or more of the above centralised contracts.

3.3 Descriptive statistics

The construction of within-firm wage inequality measures, as well as the estimation of residual wages, require by definition that a minimum number of employees per firm is present in the data. After careful consideration of alternative restrictions to the data, and sensitivity analysis about robustness of main results, we define our working sample as including only firms with at least three sampled employees. After this initial cut, all remaining firms do report workers in bottom ranked occupations, but the definition of the occupational wage-gap obviously imply that data about at least one manager are also reported. This is not always the case, however, and thus the sample of firms used for the analysis of occupational wage gaps is smaller. While this limits the possibility of direct comparison of results across the two measures of within-firm wage disparities, our analysis is nonetheless informative about what are the effects of firm-level bargaining when the firm organizational structure is complex enough to foresee managerial positions.

Table 1 shows the number and percentage shares of employees and firms falling in different categories of bargaining in our working sample, by country and by year, also providing information on firms which do not apply any form of collective bargaining (*i.e.,* contract wages separately with each single employee). In line with the discussion about country-specific bargaining regimes, the percentage of firms or employees covered only by more centralised levels of bargaining is generally higher in all other countries than in the UK or in the Czech Republic, whereas in these two latter cases "no-collective bargaining at all" prevails.

Table 2 shows a basic difference-in-means test obtained by running a simple OLS regression of the two measures of (residual) wage inequality $\Delta w^{90/10}$ and Δw^{jobs} against the FLB dummy and a constant term. Considering the percentile wage-dispersion $\Delta w^{90/10}$, firms that adopt firm-level bargaining present, on average, higher inequality in Belgium and Spain, while lower dispersion in France, the United Kingdom, and the Czech Republic (except in 2010). In Germany, instead, the average $\Delta w^{90/10}$ does not differ statistically between the two groups of firms, in both 2006 and 2010. In terms of the professional wage-gap Δw^{jobs}, across firms where we can compute this measure, the more common pattern is that firms bargaining locally display lower inequalities than other firms, although we observe insignificant coefficients on the FLB dummy in some country-year combinations, and a positive coefficient for the Czech Republic in 2010. This exercise just provides a first descriptive assessment of the unconditional relation linking firm-level bargaining and wage inequalities. In the next session, we present the empirical

framework that we design in order to obtain more reliable estimates, controlling for additional observables that may drive the differences in wage inequalities and for potential endogenous selection of the FLB dummy.

4   Empirical models and estimation strategy

To identify the effect of firm-level bargaining across countries and over time, we pool the observations available for each country over the years $t=2006$ and $t=2010$, and specify the following baseline regression model

$$\Delta w_{jt}^d = \alpha + \beta_1 \, \text{FLB}_{jt} + \beta_2 \, \text{Y}_{2010} + \beta_3 \, \text{Y}_{2010} \times \text{FLB}_{jt} + \gamma \boldsymbol{X}_{jt} + \epsilon_{jt} \, . \tag{4}$$

The dependent variable Δw_j^d is, alternatively, one of the two measures of (residual) wage inequality $\Delta w^{90/10}$ or Δw^{jobs}, computed as explained above for each firm j present in each survey year t (2006 or 2010). The set $\boldsymbol{X}_{jt}$ includes control variables (discussed further below). The regressor of primer interest is the dummy FLB indicating if firm j applies firm-level collective bargaining in the year t, which we include both as a stand-alone variable and interacted with the dummy Y_{2010} set to 1 for the year 2010, accounting for possible time-varying effects of firm-level collective bargaining over the two survey years. That is, conditional on the control variables included in the set $\boldsymbol{X}_{jt}$, the coefficient β_1 accounts for the difference in average wage inequalities between firms bargaining locally in 2006 compared to those that do not. The interaction coefficient β_3 captures whether the effect of collectively bargaining at the firm level in 2010 changes as compared to 2006.

As a further contribution, we provide a dissection of the effects of firm-level bargaining on the wages of the groups of employees that we implicitly compare in (numerator and denominator of) the wage-gaps $\Delta w^{90/10}$ and Δw^{jobs}. We estimate the following variation of the specification in Equation (4)

$$w_{jt}^d = \alpha + \beta_1 \, \text{FLB}_{jt} + \beta_2 \, \text{Y}_{2010} + \beta_3 \, \text{Y}_{2010} \times \text{FLB}_{jt} + \gamma \boldsymbol{X}_{jt} + \epsilon_{jt} \, , \tag{5}$$

where as dependent variable w_{jt}^d we employ, alternatively, the 90th or the 10th percentile of the within-firm distribution of (residual) log-wages, or take the average (residual) log-wages of managers and of low-layers employees. In line with Equation (4), the identification works across firms with different wage-bargaining. Thus, the estimates of the coefficient β_1 on the FLB dummy give the difference in average outcomes across firm-level bargaining vs. other firms in 2006, whereas the coefficient β_3 on the interaction term $\text{FLB} \times Y_{2010}$ accounts for changes in the FLB effect over time. Notice that these separate regressions on the components of the two wage-gaps $\Delta w^{90/10}$ and Δw^{jobs} do not correspond to an exact split of the overall effects estimated from Equation (4) regressions. Nonetheless, the results are revealing of the underlying driving forces, telling which group of employees gains or loses from firm-level collective bargaining.

Indeed, it matters whether a hypothetical increase in $\Delta w^{90/10}$ in firms bargaining locally comes from a choice to pay highest earners even more, rather than the same increase resulting from paying low earners even less. In the two cases, the diverging interests between different groups of employees within the firm are clearly solved in opposite ways. Similarly, if it emerges that FLB has any effect on Δw^{jobs}, it would be important to understand who benefits or loses between managers and low-layers workers.

A common empirical strategy is followed in estimating the regression models in Equations 4 and 5. First, as mentioned, all the models are estimated separately country by country. This strategy, as opposed to estimating a pooled model with country fixed effects, allows to properly account for differences in bargaining systems across countries. In fact, while the definition of firm-level bargaining firms (FLB=1) is homogeneous in SES across all countries, there is great variation across countries about what alternative type of bargaining level is likely to prevail in the control group of firms which do not apply firm-level bargaining (FLB=0). By allowing coefficient estimates to vary by country, we avoid any assumption of homogeneity across national institutional settings.

Second, we include the same set of controls $\boldsymbol{X}_{jt}$ in both regressions 4 and 5, accounting for a large number of other determinants of wage inequalities, beyond firm-level bargaining. Building on previous literature, wage dispersion within firms depends on firm characteristics as well as on personal and occupational characteristics of the workforce. The SES data allow to control for a variety of these confounding factors suggested by previous studies. As far as firm attributes are concerned, in SES we have information on firm size (as size-class by number of employees), and a dummy for private vs. public control on the firm. In general, the expectation is that within-firm wage dispersion is lower in large and publicly owned firms, as the unions tend to be more powerful in these contexts (Canal Dominguez and Gutierrez, 2004). Moreover, thanks to information on the sector of the main activity and the geographical location of each firm, we can also control for the well-known variation of both wages and incidence of bargaining level across sectors and regions, via a full set of sector (reported in SES at 1-digit NACE) and regional (reported at NUTS-1 level) fixed-effects.

Concerning personal characteristics of the workforce, previous studies stress the relevance of gender, age, education, and experience. We capture all these features, by including in the empirical model the share of women employed in the firm, the share of employees with secondary or tertiary education, the mean tenure of workers in the firm, and a set of dummies for modal age of the workforce. Usually, wage dispersion is expected to rise with age, tenure and education, because wages tend to increase in all these characteristics, and dispersion is usually higher in firms where average wages are higher (Canal Dominguez and Gutierrez, 2004). As for gender, the well-documented existence of wage-gaps favourable to men would suggest that larger inequalities are to be expected in firms where the proportion of women is lower.

The type of jobs and contracts present in the firm are also known to play a role. Unions' efforts to push for equalization of wages among their members is usually identified as the channel

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trough which within-firm wage differences are influenced by factors like having a permanent vs. a fixed-term contracts, a full-time vs. a part-time job, or the relative weight of blue-collars vs. more professionalised occupations in the firm. Since full-time, permanent, blue-collar workers are generally more likely to unionize, earnings inequalities are expected to be lower in firms with a larger proportion of these job and contract types (Canal Dominguez and Gutierrez, 2004). We control for these factors by including, for each firm, the share of managers and professionals (according to 1-digit ISCO codes 1 and 2), the share of part-time employees and the share of employees with a permanent contract.

Notice, however, that the correlations between the workforce characteristics and the measures of within-firm inequality may be complicated by unobservable compositional effects. In fact, employees with different characteristics may fall more or less frequently into the wage groups that we compare (percentiles or occupation-related wages). For instance, notwithstanding the gender pay-gap, a firm with a 100% share of men can be more equal than a firm with a single woman as employee, to the extent that all the men working as employees earn the same wage (or quite similar wages) in the former firm. An equal reasoning may replicate for the other controls measuring features like age, tenure, job and contract types, and so on, in turn suggesting predictions in contrast with findings in the literature.[7]

Finally, and perhaps most important, in estimating both regressions 4 and 5, we address the potential endogeneity of the FLB dummy, due to non-random endogenous selection of firms between FLB and "non-FLB" status. Indeed, despite we (i) control for employer-specific components of wages and firm-level average wages trough the preliminary Mincerian regression, and (ii) include a rich set of covariates, still there might be unobserved determinants of the decision to apply firm-level collective agreements that correlate with unobserved determinants of the dependent variables of interest in each regression equation.

In order to tackle this source of bias, we follow a solution commonly adopted in the empirical literature of within-firm wage inequality (Card and De La Rica, 2006; Daouli et al., 2013). That is, we augment the model with a preliminary estimate of the probability (propensity score) that a given firm adopts firm-level collective bargaining. This is obtained from a preliminary first-step Probit

$$\text{FLB}_j = \text{P}\left(\alpha_0 + \alpha_1 \boldsymbol{V}_j\right) \tag{6}$$

where FLB_j is the dummy for the *observed* presence of firm-level bargaining in firm j, P is the Probit link function, and $\boldsymbol{V}$ a set of covariates that affect the choice to bargain at firm-level. Separate first-step Probit regressions are estimated country by country, and the corresponding predicted probabilities $\widehat{\text{FLB}}_j = \text{P}\left(\hat{\alpha}_0 + \hat{\alpha}_1 \boldsymbol{V}_j\right)$ obtained for each firm are then included as an

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[7]Basic descriptive statistics on control variables are presented in Appendix A. Notice that some of the controls are not available for the Czech Republic. First, in the data there are no Czech firms with modal employees' age in the range 20-29 years old, so we omit this age category. Second, the Czech Republic defines a single NUTS-1 region, so we cannot further exploit regional dummies in the estimates for this country.

additional control variable in a second-step estimation of the main regressions in Equations 4 and 5. The overall logic is that if FLB status is as good as randomly assigned conditional on observed controls, then conditioning also upon the propensity scores allows to clean any further bias due to unobserved firm characteristics, and, thus, a simple OLS on the second step will return correct estimates of the FLB dummy coefficient. The predictors $\boldsymbol{V}$ are for the most part the same as the controls appearing in the set $\boldsymbol{X}$ in the main equations. However, to ease identification, we exclude average tenure of the workforce, as it is sensible to assume that tenure affects wages and wage inequalities, but it does not directly impact on the decision to adopt FLB. Also notice that, in place of sector and regional fixed-effects included in the set $\boldsymbol{X}$ (likely subject to incidental parameter problems in Probit estimates), the set of covariates $\boldsymbol{V}$ includes the GDP per capita (at purchasing power parity, base year 2006) and the unemployment rate in the region where each firm is located, thus controlling for macroeconomic-and-regional dynamics that may play a direct influence on the decision to apply firm-level bargaining.[8]

5 Results

5.1 Firm-level bargaining and the 90th-to-10th percentile wage-gap

Table 3 shows the estimates of the specification of Equation 4 where we take the 90th-to-10th percentile wage-gap $\Delta w^{90/10}$ as the dependent variable. In general, they suggest that firm-level bargaining has heterogeneous effects on wage dispersion, both across countries and over time. In 2006 (cf. the coefficients on the FLB dummy) we do not observe statistically significant differences between firms that adopt firm-level bargaining, compared to other firms, in any country but the UK, where firm-level bargaining firms are less unequal. This initial picture observed for 2006 does not change in 2010 in four countries (Belgium, Germany, the Czech Republic and the UK, cf. the insignificant interaction coefficients). Conversely, we detect a common inter-temporal pattern in France and Spain, whereby the distribution of wages becomes more unequal over time in firm-level bargaining firms (positive estimated interaction coefficients).

The estimates reveal heterogeneities also with regard to the correlation between the $\Delta w^{90/10}$ wage-gap and control variables. Starting from workforce characteristics, the modal age of employees shows mostly an insignificant association with wage inequality in Belgium, Germany, Spain and France, while the relation with $\Delta w^{90/10}$ is stronger (positive) in the Czech Republic and the UK. A common result across all countries is that within-firm wage inequality is larger for firms with the most senior workforce (60+ years old). The share of women in the workforce, the average on-the-job tenure of employees and the share of permanent contracts show

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[8]These additional variables are taken from EUROSTAT-Regional Statistics and measured at the level of NUTS-1 regions, since this is the precision of the information on firms' geographical location in SES. The results of the first-step Probit regressions are reported in Table 10 in Appendix B. They show a satisfactory goodness of fit, in terms of relatively high values of the area under the ROC curve.

a negative association with within-firm wage dispersion in most countries, while educational levels, the share of part-time employees and the share of higher professional occupations tend to display a positive association (when significant) with within-firm wage dispersion. Further, moving to firm-level characteristics, wage dispersion within firms increases with firm size in Germany, Spain and France, but larger firms display lower wage dispersion than the baseline in the UK. Publicly-controlled firms feature lower wage dispersion compared to private firms in Belgium, the Czech Republic and France. Note, lastly, that the significant coefficient on the propensity score $\widehat{\text{FLB}}_j$ confirms the need to correct for endogenous selection into FLB in most countries. This latter result holds throughout all the estimates of this article, although we do not stress it hereafter.

Next, we dissect the separate effect of firm-level bargaining on the 90th and the 10th percentile of the within-firm distribution of wages. Table 4 reports the estimates of the corresponding specifications of Equation 5.

We highlight three main patterns. First, consider the three countries (Belgium, the Czech Republic and Germany) where firm-level bargaining did not have any significant effect in the analysis of $\Delta w^{90/10}$ shown above in Table 3. In Belgium and the Czech Republic, the analysis by percentiles confirms that firm-level bargaining does not have any statistically significant effect. In Germany, conversely, firm-level bargaining firms feature both a lower 90th percentile and a lower 10th percentile than other firms in 2006 (cf. the coefficient on FLB dummy), and these differences do not change over time (insignificant interaction coefficients). The magnitudes of the FLB effect on the two percentiles are comparable, hinting at why we do not see, in Table 3, an overall statistically significant difference in the $\Delta w^{90/10}$ wage-gap between FLB and other firms. Yet, the underlying dynamics seem to be that the adoption of firm-level agreements in Germany reduces wages at both the top and the bottom extreme of the within-firm wage distribution.

Second, the analysis by percentiles suggests that the equality-enhancing effect of firm-level collective bargaining on $\Delta w^{90/10}$ observed in Table 3 for the UK mainly works through FLB practices favouring low-paid workers. Indeed, we find that, in the UK, firm-level bargaining firms show an higher 10th percentile wage than other firms in both 2006 and 2010.

Third, and finally, the results also add to the understanding of the increasingly detrimental effect of firm-level bargaining over time, as detected in Table 3 for Spain and France. In both countries, indeed, we observe a clear divergence in the patterns of high-paid and low-paid employees: over time, the employees in the 90th percentile are paid significantly more in firm-level bargaining firms than in other firms, whereas the opposite holds for employees in the 10th of within-firm wage distribution. In Spain, in particular, the 10th percentile wages in firms adopting firm-level agreements are lower than 10th percentile wages paid by other firms already in 2006.

Results on the control variables are rather consistent across countries, although with some

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variation in the significance levels. Modal age tends to positively correlate with the 90th percentile and negatively with the 10th percentile. A higher proportion of women in the workforce associates with lower wages at the 90th percentile, but with higher wages at the 10th percentile. A similar pattern is also detected for mean in-job tenure (with the exception of Spain) and for the share of workers covered by permanent contracts. Conversely, the share of educated workforce associates with higher wages at the 90th percentile and lower wages at the 10th percentile, and exactly the same pattern is detected for the proportion of apical professions in the firm and for the share of part-time workers (not in Belgium). Moving to firm characteristics, larger firms show higher wages at the 90th percentile, but lower wages at the 10th percentile (not in the UK), whereas publicly-owned firms tend to pay more than private firms their workers at the 10th percentile and to pay less their workers at the 90th percentile.

5.2 Firm-level bargaining and inequalities between managers and low-layers workers

We then present the findings concerning whether firm-level bargaining affects wage inequality across occupations. To recall, the firms used in these analyses are different from the sample used in the analysis of the $\Delta w^{90/10}$ wage-gap, since we can only consider firms reporting at least one manager in the data. In this sense, the results here are not directly comparable with the above exercise. Nonetheless, the fact that as we shall see, the estimated effects do not completely replicate the analysis of the $\Delta w^{90/10}$ supports that accounting for the occupational content of wage inequalities does convey relevant additional information.

Table 5 reports the estimates of Equation 4, taking the within-firm professional wage-gap Δw^{jobs} as the dependent variable. The general finding is that bargaining at firm-level on top of more centralised levels has widely heterogeneous effects, both across countries and over time.

In three countries, namely Belgium, the Czech Republic and the UK, firm-level agreements do not display any relations with the occupational wage-gap, neither in 2006 nor in 2010, whereas in Germany, Spain and France we observe statistically significant effects, varying by country and over time variation. In Germany, the Δw^{jobs} pay-gap is less unequal in firms bargaining locally than in other firms in 2006, but we observe a reversal in the effects of FLB over time, such that the inequality-reducing effect of firm-level contracts vanishes by 2010. Indeed, the estimated interaction coefficient is of similar magnitude, but of opposite sign compared to the coefficient on the FLB dummy. In France and Spain, firm-level agreements show a somewhat opposite effect, more favourable to compressing the occupational wage-gap. In France, FLB firms feature a lower Δw^{jobs} than other firms in both 2006 and 2010. In Spain, firms which bargain at firm-level and other firms do not differ significantly in their occupational wage-gaps in 2006, while firm-level bargaining firms become less unequal than the other firms in 2010.

Concerning the estimates on the set of control variables, a higher share of women (when

significant, i.e., Belgium, Germany and Spain) associates with a higher occupational wage-gap across occupational groups, while average tenure shows cross-country heterogeneity: it is negatively related to the occupational wage-gap in France and the Czech Republic, while we observe a positive correlation in Belgium, and insignificant estimates are obtained for the other countries. In general, a higher proportion of educated workers associates with a higher occupational wage-gap in most countries (not in France). A larger share of part-time contracts negatively relates with the occupational wage-gap in Germany, Spain and the Czech Republic. The opposite relation holds in the case of the share of workers with permanent contracts, at least in Germany and Spain. Among firm-level characteristics, firm size seems to play a consistent role, as larger firms experience greater occupational wage-gaps in all countries but France. Public control associate with reduced wage differences across occupations as compared to private firms, in most countries (not in Spain and the United Kingdom).

As the last step, we examine the relations between firm-level bargaining and the two components of the occupational wage-gap. Table 6 presents the estimates of Equation 5 taking the average wage of either the managers or the low-layers employees as the dependent variable. A first notable finding regards Belgium, the Czech Republic and the UK, namely the three countries for which firm-level bargaining did not show any statistical association with the Δw^{jobs} wage-gap in Table 5 above. Dissecting by wages of different occupational groups confirms the same picture: firms which bargain locally do not show significant differences compared to other firms, neither in terms of average wages of low-layers employees, nor insofar as wages of managers are concerned.

Second, as for Germany, the over time reversal in the effect of FLB on the occupational wage-gap emerged in Table 5 seems to be driven by a change in the FLB practices towards managers. Indeed, FLB firms and other firms do not show differences in the average wages of their low-layers employees. Conversely, managers are paid on average less in FLB firms than in other firms in 2006, but they see an increase in their wages in 2010 in firms adopting FLB.

Finally, we find that a common underlying dynamics characterizes the overall equality-enhancing effect of FLB on Δw^{jobs} emerged in Table 5 above for France and Spain. In both countries, indeed, FLB firms are more equal than other firms due to both lower average wages paid to managers and higher average wages paid to low-layers workers. There is a different timing in the two countries, however. In France, this differential treatment of managers and low-layer employees across FLB and other firms is already in place in 2006, and remains unchanged in 2010. In Spain, it is only in 2010 that the average wages of the two occupational categories become statistically different across FLB and other firms.

Results on controls display, once again, heterogeneity across countries. The modal age of the workforce displays a significant association with wages of managers in Spain (positive) and in the UK (negative), while a relatively strong and negative association emerges with the average wage of low-layers employees in Belgium. The share of women in the workforce features a

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positive relation with managers' wages in Spain and Germany, but the relation is negative in France. Also, wages of low-layers employees are higher in firms with more women in the Czech Republic, while they decrease with the number of women in Germany and Spain. Average tenure does not display strong associations in most countries, whereas education does, and the share of employees with tertiary education, in particular: in all countries (but France), firms with relatively more educated workforce pay relatively higher wages to managers and relatively lower wages to low-layers employees. The share of managers/professionals and the contract types do not show systematic patterns. Among enterprise characteristics, we observe that larger firms pay managers more than other firms in most countries (not in France). The opposite holds for public firms as compared to private firms.

6   Conclusions

The impact of collective pay agreements on inter-firm wage inequality is well-documented. However, there is less evidence on whether wage-setting happening at the level of firms – on top of more centralized bargaining levels – can explain wage differences emerging within the firm. A-priori, effects are uncertain. By allowing to firms more flexibility and more discretionality than higher level negotiations, firm-level agreements may induce an increase in within-firm inequality, if they are used to selectively provide incentives or rewards to specific employees or groups of employees. Conversely, firm-level agreements may reduce inequalities within firms if they respond to fairness, egalitarian or redistributive motives. The balance between contrasting forces may, in turn, depends from the institutional context, according to the changing scope of firm-level bargaining in different national frameworks and over time.

Exploiting matched employer-employee data for six European countries over 2006 and 2010, in this work we contribute to advance the existing literature by addressing three questions. First, does firm-level bargaining increase or decrease within-firm inequality and what, if any, are the emerging patterns robust across measures of inequality that differently address possible conflicts of power across different groups (high vs. low paid, and managers vs. low-layer) of employees? Second, have these relations remained stable or changed over the years under study, when a broad process of increasing emphasis on decentralization of wage bargaining took place and the Great Depression hit? Third, in case firm-level bargaining emerges as significantly shaping – either statically or over time – the internal wage structure of firms, are there patterns common to all or at least to some of the selected countries, mapping into broad bargaining regimes or models of capitalism?

Our empirical results, in summary, reveal ample heterogeneities by wage-inequality measure, by country and over time.

First, by country, we find no effect of the use of firm-level bargaining on within-firm in-

equality in Belgium and the Czech Republic, while statistically significant results emerge for Germany, Spain, France and the UK. Interestingly, Belgium and the Czech Republic are examples of opposite models, one highly centralised and featuring coordinated industrial relations, and the other characterised by markedly decentralised and market-oriented institutional setup. Also, quite diverse bargaining and institutional models coexist in the group of countries where we estimate a significant effect of firm-level negotiations. This observation suggests that country-specific heterogeneities deliver stronger explanatory power than taxonomies predicting consistent patterns across countries a-priori classified as sharing homogeneous bargaining systems or varieties of capitalism.

Second, if we focus on those country-cases where we estimate a significant effect of firm-level bargaining (France, Germany, Spain and the UK), we do not find evidence of a single, precise direction in the effect. To some extent, one could have put forward explanations justifying the emergence of more consistent results across the different countries, in spite of the observed wide country-level specificities featuring these countries. For instance, one could have expected firm-level bargaining to increase within-firm inequalities in the UK where it is historically designed to promote specific groups of workers. And a similar inequality-enhancing effect of wage-bargaining could have also been predicted for France, Germany, and Spain, to the extent that firm-level negotiations there aim to provide flexibility against the standardization of wages and the complexity of negotiations typical of more centralised bargaining levels in these countries.

Instead, we find that firm-level bargaining can either enhance or reduce within-firm pay inequality, and the effects significantly vary even within the same country, over time and also depending on the measure of wage-gap. In the UK, firms bargaining locally are more unequal than other firms in terms of the wage distance between high and low-paid employees, but this is not the case on the sample of firms for which we can measure the occupational wage-gap between managers and low-layers workers. In Spain and France, firms bargaining locally become more unequal over time than other firms in terms of the high-paid vs. low-paid employees wage-gap, while an opposite inequality-reducing effect of firm-level bargaining over time emerges when we can track the occupational wage-gap. This pattern in the occupational wage-gaps replicates also for German firms where we can observe this inequality measure, whereas we do not observe differences across firms bargaining locally and the other firms in the wage distance between high and low paid employees.

Whatever the inner underlying mechanisms, we show that bargaining at the firm-level (on top of more centralised levels) allows for some leeway in the power relations within firms. As the ample heterogeneities in the estimated effects on the two wage-gap measures suggest, corroborated by decomposition analysis of the effects by groups of employees, firm-level bargaining enhances or reduces within-firm pay inequality according to how relative power is distributed among groups of workers. The final outcome heavily reflects the management and the resolution of potential conflicts of power within organizations. These processes do not seem related to a peculiar prevailing regime, however.

Overall, our study offers new evidence and methods to inform the renewed debate on the determinants of increasing inequalities. We highlight the importance of the locus of collective wage bargaining as a central driver of wage inequality within firms, as it is deeply linked to how the scope of firm-level negotiations interacts with stakeholders' power and executive decision making.

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Tables

Table 1: Total number of firms and employees by country, year, and type of collective agreement in the sample.

Bargaining	Centralized				Firm-level				None				Total	
	N firms	% firms	N empl	% empl	N firms	% firms	N empl	% empl	N firms	% firms	N empl	% empl	N empl	N firms
BE														
2006	7341	82,0%	131339	79,5%	1606	18,0%	33852	20,5%	0	0,0%	0	0,0%	165191	8947
2010	5581	81,1%	108109	78,8%	1304	18,9%	29145	21,2%	0	0,0%	0	0,0%	137254	6885
CZ														
2006	466	2,6%	122565	6,2%	1315	7,3%	942397	47,8%	16278	90,1%	905902	46,0%	1970864	18059
2010	517	2,9%	91588	4,6%	1504	8,3%	985320	49,4%	16025	88,8%	916717	46,0%	1993625	18046
DE														
2006	7546	20,3%	1688535	58,4%	2397	6,5%	161995	5,6%	27189	73,2%	1042351	36,0%	2892881	37132
2010	8001	27,0%	774884	45,5%	1787	6,0%	120223	7,1%	19815	66,9%	806251	47,4%	1701358	29603
ES														
2006	23896	87,5%	189372	80,5%	3405	12,5%	45900	19,5%	0	0,0%	0	0,0%	235272	27301
2010	19294	76,9%	141643	65,3%	3992	15,9%	57641	26,6%	1818	7,2%	17485	8,1%	216769	25104
FR														
2006	13583	88,3%	86640	76,2%	983	6,4%	19036	16,8%	820	5,3%	7965	7,0%	113641	15386
2010	27333	89,1%	180504	81,9%	3089	10,1%	37974	17,2%	271	0,9%	1891	0,9%	220369	30693
UK														
2006	9645	22,4%	32113	24,1%	12104	28,1%	33509	25,1%	21262	49,4%	67721	50,8%	133343	43011
2010	17838	17,1%	43622	24,4%	21611	20,7%	41709	23,3%	64778	62,2%	93785	52,4%	179116	104227

Table 2: Within-firm wage inequalities: OLS Difference-in-means test across firms under firm-level bargaining and other firms, by country and year.

	Country	Year	Firm-level bargaining		Constant		Obs.
			Coeff.	S.e.	Coeff.	S.e.	N
$\Delta w^{90/10}$	BE	2006	0.0120**	(0.00463)	0.384***	(0.00211)	8639
		2010	0.00927*	(0.00382)	0.357***	(0.00179)	6633
	DE	2006	-0.00735	(0.00521)	0.495***	(0.00238)	7462
		2010	0.00868	(0.00532)	0.494***	(0.00238)	9753
	ES	2006	0.0784***	(0.00453)	0.410***	(0.00168)	24278
		2010	0.0838***	(0.00434)	0.403***	(0.00193)	19108
	CZ	2006	-0.0225*	(0.0104)	0.531***	(0.00953)	1780
		2010	-0.000329	(0.00960)	0.521***	(0.00866)	2019
	UK	2006	-0.0196***	(0.00551)	0.531***	(0.00399)	9178
		2010	-0.0730***	(0.00680)	0.489***	(0.00524)	6079
	FR	2006	-0.0317***	(0.00963)	0.472***	(0.00270)	10900
		2010	-0.0475***	(0.00412)	0.451***	(0.00214)	19109
Δw^{jobs}	BE	2006	0.000427	(0.0207)	-0.0166	(0.0115)	1411
		2010	-0.0179	(0.0179)	-0.0108	(0.00858)	1164
	DE	2006	-0.0706***	(0.0186)	-0.000797	(0.00913)	2706
		2010	-0.0115	(0.0170)	0.00555	(0.00747)	3529
	ES	2006	-0.0528*	(0.0212)	0.0597***	(0.0116)	2068
		2010	-0.154***	(0.0226)	0.0855***	(0.0138)	1695
	CZ	2006	0.0298	(0.0213)	0.0792***	(0.0192)	1598
		2010	0.127***	(0.0229)	-0.0490*	(0.0215)	1689
	UK	2006	-0.0156	(0.0260)	-0.0318	(0.0206)	1544
		2010	-0.124***	(0.0357)	-0.0228	(0.0259)	646
	FR	2006	-0.167***	(0.0216)	0.0479***	(0.00875)	2572
		2010	-0.108***	(0.0178)	0.0338***	(0.00638)	4323

Notes: Robust standard errors in parenthesis; asterisks denote significance levels: * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Table 3: FLB and 90th-10th percentile wage inequality

	BE	DE	ES	CZ	UK	FR
FLB	-0.00158	-0.00285	0.00510	-0.0103	-0.0129**	-0.00478
	(0.00420)	(0.00638)	(0.00458)	(0.0100)	(0.00634)	(0.00990)
Year 2010	-0.0334***	0.00454	-0.0326***	-0.0142	-0.0798***	-0.0151***
	(0.00265)	(0.00424)	(0.00273)	(0.0119)	(0.00842)	(0.00348)
FLB×2010	0.00148	0.00323	0.0217***	0.00496	-0.00420	0.0362***
	(0.00592)	(0.00846)	(0.00672)	(0.0129)	(0.00849)	(0.0114)
Prob. FLB	0.0953***	-0.000383	-0.226***	0.117**	-0.00772	0.105***
	(0.0355)	(0.0520)	(0.0250)	(0.0458)	(0.125)	(0.0359)
Modal age workers:						
20-29	-0.0297	0.0330	0.0101		0.00383	-0.0654*
	(0.0242)	(0.0455)	(0.0242)		(0.0127)	(0.0369)
30-39	-0.0133	0.0204	0.0264	0.0363***	0.0378***	-0.0557
	(0.0244)	(0.0446)	(0.0244)	(0.00985)	(0.0127)	(0.0370)
40-49	-0.00313	0.0156	0.0177	0.0120	0.0466***	-0.0577
	(0.0242)	(0.0446)	(0.0243)	(0.0119)	(0.0131)	(0.0360)
50-59	0.0197	0.0124	0.0157	0.0152	0.0470***	-0.0389
	(0.0250)	(0.0451)	(0.0248)	(0.0103)	(0.0139)	(0.0366)
60+	0.0322	0.103*	0.0785***	0.0955**	0.0309*	-0.0315
	(0.0311)	(0.0572)	(0.0284)	(0.0381)	(0.0166)	(0.0404)
% of women empl.	-0.0616***	-0.0490***	-0.0392***	-0.0230	-0.0386***	-0.0451***
	(0.00599)	(0.0119)	(0.00467)	(0.0157)	(0.00986)	(0.00603)
Mean experience empl.	-0.00216***	-0.00245***	0.00344***	-0.00468***	-5.36e-05	-0.000761***
	(0.000392)	(0.000522)	(0.000360)	(0.000980)	(0.000576)	(0.000287)
% empl. with tert. educ.	0.116***	0.0847***	0.165***	0.249***	0.103***	0.0799***
	(0.00836)	(0.0272)	(0.00634)	(0.0386)	(0.0159)	(0.00814)
% empl. with sec. educ.	0.0184***	0.0532***	0.0730***	0.0206	0.0592***	0.00665
	(0.00498)	(0.0185)	(0.00480)	(0.0275)	(0.0134)	(0.00802)
% managers and profess.	0.0931***	0.0688***	0.0745***	0.121***	0.251***	0.148***
	(0.00971)	(0.0204)	(0.00949)	(0.0260)	(0.0111)	(0.00853)
% part-time empl.	-0.0108	0.140***	0.109***	0.175***	0.0419***	0.00672
	(0.00773)	(0.0126)	(0.00664)	(0.0529)	(0.0108)	(0.00832)
% permanent contracts	-0.0781***	-0.0861***	-0.00416	-0.00757	-0.0464**	-0.160***
	(0.0101)	(0.0184)	(0.00509)	(0.0173)	(0.0190)	(0.0136)
Firm size:						
50–249 empl.	0.000931	0.0361***	0.121***	0.0163	-0.0631***	0.0378***
	(0.00562)	(0.00545)	(0.00357)	(0.0108)	(0.0131)	(0.00429)
≥ 250 empl.	-0.00323	0.0340***	0.193***	0.0112	-0.0652***	0.0490***
	(0.00967)	(0.00513)	(0.00641)	(0.0164)	(0.0117)	(0.00490)
Public firm	-0.0502***	-0.00360	0.0287	-0.0797***	0.0194	-0.0694***
	(0.0119)	(0.0140)	(0.00823)	(0.0116)	(0.0598)	(0.00937)
Constant	0.455***	0.529***	0.299***	0.463***	0.596***	0.624***
	(0.0340)	(0.0539)	(0.0259)	(0.0427)	(0.122)	(0.0401)
Observations	13,765	12,312	37,887	3,498	14,502	30,009
R-squared	0.187	0.064	0.197	0.230	0.123	0.118
Region FE	✓	✓	✓	✓	✓	✓
Sector FE	✓	✓	✓	✓	✓	✓

Notes: Boostrapped standard errors in parentheses (200 repetitions); asterisks denote significance levels: * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Table 4: Decomposition of FLB effects on the 90th and 10th wage percentiles

	BE		DE		ES		CZ		UK		FR	
	q_90	q_10	q_90	q_10	q_90	q_10	q_90	q_10	q_90	q_10	q_90	q_10
FLB	-0.00106	0.000520	-0.00945***	-0.00660*	-0.000250	-0.00535**	-0.00479	0.00548	-0.00414	0.00877***	-0.00187	0.00292
	(0.00276)	(0.00244)	(0.00343)	(0.00394)	(0.00260)	(0.00239)	(0.00521)	(0.00535)	(0.00373)	(0.00320)	(0.00500)	(0.00601)
Year 2010	-0.0189***	0.0145***	0.00678***	0.00223	-0.0174***	0.0151***	-0.00548	0.00871	-0.0392***	0.0406***	-0.00764***	0.00741***
	(0.00158)	(0.00135)	(0.00236)	(0.00262)	(0.00139)	(0.00131)	(0.00623)	(0.00728)	(0.00530)	(0.00419)	(0.00202)	(0.00162)
FLB×2010	0.00159	0.000108	0.00578	0.00255	0.0148***	-0.00693**	0.00125	-0.00371	-0.00431	-0.000113	0.0195***	-0.0167***
	(0.00332)	(0.00298)	(0.00451)	(0.00452)	(0.00346)	(0.00316)	(0.00693)	(0.00771)	(0.00533)	(0.00443)	(0.00600)	(0.00598)
Prob. FLB	0.0539***	-0.0415**	-0.0153	-0.0149	-0.133***	0.0928***	0.0595**	-0.0576***	-0.0112	-0.00350	0.0678***	-0.0374**
	(0.0173)	(0.0171)	(0.0238)	(0.0296)	(0.0151)	(0.0129)	(0.0259)	(0.0212)	(0.0739)	(0.0573)	(0.0183)	(0.0167)
Modal age workers:												
20-29	-0.0141	0.0156	-0.00923	-0.0423*	0.00651	-0.00356			0.00736	0.00353	-0.0306	0.0348**
	(0.0136)	(0.0117)	(0.0251)	(0.0244)	(0.0131)	(0.0109)			(0.00635)	(0.00660)	(0.0211)	(0.0165)
30-39	-0.00464	0.00867	-0.0135	-0.0339	0.0153	-0.0111	0.0183***	-0.0180***	0.0267***	-0.0111*	-0.0250	0.0308*
	(0.0138)	(0.0115)	(0.0250)	(0.0239)	(0.0129)	(0.0108)	(0.00523)	(0.00603)	(0.00684)	(0.00663)	(0.0209)	(0.0166)
40-49	0.00105	0.00418	-0.0175	-0.0331	0.0108	-0.00687	0.00668	-0.00533	0.0315***	-0.0151**	-0.0249	0.0329**
	(0.0139)	(0.0116)	(0.0249)	(0.0238)	(0.0131)	(0.0108)	(0.00628)	(0.00640)	(0.00635)	(0.00674)	(0.0208)	(0.0166)
50-59	0.0127	-0.00702	-0.0167	-0.0291	0.0101	-0.00561	0.00820	-0.00701	0.0332***	-0.0138*	-0.0146	0.0243
	(0.0141)	(0.0118)	(0.0252)	(0.0237)	(0.0133)	(0.0110)	(0.00538)	(0.00583)	(0.00681)	(0.00723)	(0.0210)	(0.0164)
60+	0.0193	-0.0129	0.0232	-0.0798**	0.0437***	-0.0348***	0.0538***	-0.0417**	0.0233***	-0.00762	-0.0108	0.0206
	(0.0175)	(0.0160)	(0.0317)	(0.0325)	(0.0147)	(0.0128)	(0.0184)	(0.0176)	(0.00895)	(0.00815)	(0.0224)	(0.0186)
% of women empl.	-0.0294***	0.0323***	-0.0203***	0.0287***	-0.0176***	0.0216***	-0.00670	0.0163**	-0.0215***	0.0171***	-0.0255***	0.0196***
	(0.00340)	(0.00323)	(0.00576)	(0.00646)	(0.00280)	(0.00247)	(0.00815)	(0.00750)	(0.00520)	(0.00427)	(0.00333)	(0.00321)
Mean experience empl.	-0.00125***	0.000907***	-0.000873***	0.00158***	0.00188***	-0.00156***	-0.00276***	0.00192***	-3.41e-05	1.95e-05	-0.000512***	0.000249*
	(0.000228)	(0.000190)	(0.000266)	(0.000301)	(0.000215)	(0.000176)	(0.000548)	(0.000481)	(0.000359)	(0.000287)	(0.000158)	(0.000144)
% empl. with tert. educ.	0.0587***	-0.0577***	0.0597***	-0.0251	0.0844***	-0.0804***	0.130***	-0.119***	0.0494***	-0.0531***	0.0369***	-0.0430***
	(0.00431)	(0.00406)	(0.0134)	(0.0169)	(0.00319)	(0.00306)	(0.0202)	(0.0193)	(0.00939)	(0.00736)	(0.00473)	(0.00388)
% empl. with sec. educ.	0.00871***	-0.00971***	0.0322***	-0.0210*	0.0384***	-0.0346***	-0.00260	-0.0232	0.0264***	-0.0328***	-0.000259	-0.00690*
	(0.00272)	(0.00263)	(0.00874)	(0.0114)	(0.00267)	(0.00239)	(0.0150)	(0.0145)	(0.00822)	(0.00699)	(0.00400)	(0.00370)
% managers and profess.	0.0438***	-0.0493***	0.0319***	-0.0369***	0.0382***	-0.0364***	0.0571***	-0.0637***	0.125***	-0.126***	0.0820***	-0.0660***
	(0.00600)	(0.00515)	(0.00957)	(0.0108)	(0.00466)	(0.00488)	(0.0166)	(0.0131)	(0.00592)	(0.00558)	(0.00484)	(0.00412)
% part-time empl.	-0.00418	0.00662*	0.0570***	-0.0829***	0.0551***	-0.0535***	0.0777***	-0.0969***	0.0258***	-0.0161***	0.00355	-0.00317
	(0.00418)	(0.00375)	(0.00675)	(0.00791)	(0.00342)	(0.00332)	(0.0301)	(0.0255)	(0.00612)	(0.00545)	(0.00412)	(0.00395)
% permanent contracts	-0.0345***	0.0436***	-0.0242***	0.0619***	0.000483	0.00465*	-0.00203	0.00554	-0.0277***	0.0188*	-0.0778***	0.0826***
	(0.00567)	(0.00617)	(0.00906)	(0.0107)	(0.00255)	(0.00238)	(0.00795)	(0.00835)	(0.00961)	(0.00979)	(0.00750)	(0.00651)
Firm size:												
50−249 empl.	0.000439	-0.000491	0.0217***	-0.0144***	0.0657***	-0.0554***	0.00895	-0.00736	-0.0330***	0.0301***	0.0201***	-0.0177***
	(0.00275)	(0.00287)	(0.00268)	(0.00314)	(0.00235)	(0.00182)	(0.00578)	(0.00566)	(0.00776)	(0.00724)	(0.00258)	(0.00217)
≥ 250 empl.	-0.00293	0.000297	0.0239***	-0.0101***	0.106***	-0.0876***	0.00620	-0.00498	-0.0332***	0.0320***	0.0226***	-0.0264***
	(0.00469)	(0.00472)	(0.00275)	(0.00313)	(0.00397)	(0.00347)	(0.00880)	(0.00795)	(0.00663)	(0.00592)	(0.00256)	(0.00230)
Public firm	-0.0219***	0.0283***	-0.0129*	-0.00926	0.0183***	-0.0105***	-0.0448***	0.0349***	0.00734	-0.0121	-0.0402***	0.0292***
	(0.00592)	(0.00583)	(0.00663)	(0.00830)	(0.00436)	(0.00379)	(0.00719)	(0.00558)	(0.0352)	(0.0268)	(0.00458)	(0.00407)
Constant	0.226***	-0.228***	0.270***	-0.259***	0.148***	-0.151***	0.244***	-0.219***	0.307***	-0.290***	0.315***	-0.309***
	(0.0203)	(0.0173)	(0.0289)	(0.0265)	(0.0134)	(0.0112)	(0.0223)	(0.0195)	(0.0722)	(0.0571)	(0.0234)	(0.0173)
Observations	13,765	13,765	12,312	12,312	37,887	37,887	3,498	3,498	14,502	14,502	30,009	30,009
R-squared	0.138	0.199	0.059	0.059	0.174	0.191	0.226	0.191	0.110	0.124	0.105	0.115
Region FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sector FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: Bootsrapped standard errors in parentheses (200 repetitions); asterisks denote significance levels: * p<0.05, ** p<0.01, *** p<0.001

Table 5: FLB and the wage-gap between managers and low-layers workers

	BE	DE	ES	CZ	UK	FR
FLB	0.00463	-0.0607***	-0.00730	0.0156	0.0307	-0.0862***
	(0.0227)	(0.0231)	(0.0224)	(0.0221)	(0.0315)	(0.0248)
Year 2010	0.00909	0.0167	0.0415**	-0.106***	-0.106**	-0.0116
	(0.0163)	(0.0157)	(0.0199)	(0.0296)	(0.0537)	(0.0119)
FLB×2010	-0.0251	0.0555**	-0.0839***	0.0352	-0.0258	0.0190
	(0.0295)	(0.0278)	(0.0323)	(0.0318)	(0.0554)	(0.0302)
Prob. FLB	-0.311*	-0.756***	-0.710***	0.367***	0.493	0.145
	(0.161)	(0.168)	(0.182)	(0.104)	(0.676)	(0.137)
Modal age workers:						
20-29	0.0630	0.149	0.144***		-0.218*	0.176
	(0.0696)	(0.142)	(0.0441)		(0.121)	(0.169)
30-39	0.0957	0.243*	0.143***	0.0335	-0.227*	0.201
	(0.0690)	(0.141)	(0.0342)	(0.0273)	(0.124)	(0.168)
40-49	0.118*	0.237*	0.129***	-0.0599**	-0.180	0.231
	(0.0687)	(0.140)	(0.0342)	(0.0287)	(0.123)	(0.168)
50-59	0.130*	0.220	0.145***	-0.0348	-0.164	0.270
	(0.0698)	(0.139)	(0.0374)	(0.0279)	(0.121)	(0.168)
60+	0.118	0.279*	0.241***	0.167***	-0.243*	0.283*
	(0.156)	(0.156)	(0.0917)	(0.0600)	(0.136)	(0.172)
% of women empl.	0.0555*	0.130***	0.197***	0.00441	0.0411	-0.0418
	(0.0305)	(0.0380)	(0.0389)	(0.0371)	(0.0539)	(0.0255)
Mean experience empl.	0.00489**	-0.00157	0.00386	-0.00457**	-0.00435	-0.00292***
	(0.00199)	(0.00164)	(0.00266)	(0.00226)	(0.00302)	(0.00106)
% empl. with tert. educ.	0.110**	0.0636	0.233***	0.358***	0.147	-0.190***
	(0.0473)	(0.0759)	(0.0505)	(0.0820)	(0.100)	(0.0290)
% empl. with sec. educ.	0.0672**	0.203***	0.0760*	-0.0734	-0.00143	-0.0784***
	(0.0305)	(0.0607)	(0.0408)	(0.0531)	(0.0930)	(0.0288)
% managers and profess.	0.0408	-0.157***	-0.215**	-0.399***	0.139*	-0.0199
	(0.0565)	(0.0533)	(0.0859)	(0.0600)	(0.0751)	(0.0353)
% part-time empl.	-0.0238	-0.145***	-0.162***	-0.337***	-0.0800	0.0610
	(0.0493)	(0.0376)	(0.0612)	(0.0917)	(0.0775)	(0.0382)
% permanent contracts	0.196***	0.0388	0.212***	0.0339	0.0994	0.0180
	(0.0522)	(0.0560)	(0.0460)	(0.0392)	(0.158)	(0.0532)
Firm size:						
50–249 empl.	0.107***	0.0991***	0.179***	0.0602**	0.0570	-0.0878***
	(0.0302)	(0.0241)	(0.0298)	(0.0248)	(0.0580)	(0.0159)
≥ 250 empl.	0.146***	0.0469**	0.215***	0.0447	-0.0330	-0.177***
	(0.0473)	(0.0230)	(0.0565)	(0.0337)	(0.0579)	(0.0156)
Public firm	-0.0764	-0.268***	0.0199	-0.131***	0.184	-0.119***
	(0.0487)	(0.0458)	(0.0504)	(0.0254)	(0.325)	(0.0383)
Constant	-0.322**	-0.375**	-0.352***	0.0358	-0.564	0.134
	(0.154)	(0.176)	(0.0921)	(0.102)	(0.625)	(0.181)
Observations	2,416	4,396	3,443	3,006	2,059	6,895
R-squared	0.087	0.083	0.091	0.158	0.078	0.069
Region FE	✓	✓	✓	✓	✓	✓
Sector FE	✓	✓	✓	✓	✓	✓

Notes: Bootsrapped standard errors in parentheses (200 repetitions); asterisks denote significance levels: * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Table 6: Decomposition of FLB effects across managers and low-layers workers

	BE		DE		ES		CZ		UK		FR	
	Manag	Low	Manag	Low	Manag	Low	Manag	Low	Manag	Low	Manag	Low
FLB	0.00605	0.00142	-0.0466**	0.0141	-0.0128	-0.00548	0.0195	0.00385	0.0296	-0.00107	-0.0412**	0.0451***
	(0.0177)	(0.00735)	(0.0207)	(0.0117)	(0.0179)	(0.00888)	(0.0176)	(0.00671)	(0.0224)	(0.0150)	(0.0176)	(0.0148)
Year 2010	9.62e-05	-0.00899	0.00862	-0.00812	0.0229	-0.0186**	-0.0790***	0.0268**	-0.0702*	0.0353	-0.00862	0.00299
	(0.0125)	(0.00581)	(0.0143)	(0.00686)	(0.0158)	(0.00749)	(0.0221)	(0.0105)	(0.0369)	(0.0267)	(0.00838)	(0.00565)
FLB×2010	-0.0198	0.00531	0.0390*	-0.0165	-0.0485*	0.0354***	0.0117	-0.0236	-0.0413	-0.0155	0.00421	-0.0148
	(0.0261)	(0.00856)	(0.0249)	(0.0157)	(0.0276)	(0.0111)	(0.0245)	(0.0105)	(0.0390)	(0.0256)	(0.0214)	(0.0190)
Prob. FLB	0.0164	0.327***	-0.540***	0.216***	-0.498***	0.212***	0.284***	-0.0827**	0.564	0.0711	0.0362	-0.109*
	(0.139)	(0.0717)	(0.130)	(0.0743)	(0.153)	(0.0772)	(0.0939)	(0.0402)	(0.455)	(0.308)	(0.104)	(0.0576)
Modal age workers:												
20-29	0.0241	-0.0389	0.134	-0.0147	0.139***	-0.00526			-0.211**	0.00735	0.109	-0.0674
	(0.0999)	(0.0238)	(0.145)	(0.0569)	(0.0328)	(0.0144)			(0.0969)	(0.0544)	(0.100)	(0.0727)
30-39	0.0402	-0.0555**	0.200	-0.0427	0.144***	0.00146	0.0197	-0.0137	-0.211**	0.0165	0.130	-0.0713
	(0.0998)	(0.0238)	(0.144)	(0.0611)	(0.0273)	(0.0124)	(0.0245)	(0.0106)	(0.0976)	(0.0556)	(0.0988)	(0.0722)
40-49	0.0583	-0.0593**	0.194	-0.0424	0.129***	0.000315	-0.0568**	0.00309	-0.178*	0.00148	0.143	-0.0876
	(0.0984)	(0.0234)	(0.145)	(0.0590)	(0.0271)	(0.0109)	(0.0271)	(0.0107)	(0.0985)	(0.0543)	(0.0993)	(0.0719)
50-59	0.0733	-0.0566**	0.179	-0.0406	0.134***	-0.0104	-0.0332	0.00163	-0.195**	-0.0313	0.167*	-0.103
	(0.100)	(0.0246)	(0.146)	(0.0590)	(0.0285)	(0.0113)	(0.0253)	(0.0104)	(0.0988)	(0.0539)	(0.0987)	(0.0723)
60+	0.0541	-0.0636	0.209	-0.0704	0.211***	-0.0297	0.0964*	-0.0706**	-0.232**	0.0105	0.178*	-0.105
	(0.133)	(0.0582)	(0.157)	(0.0701)	(0.0673)	(0.0324)	(0.0512)	(0.0293)	(0.107)	(0.0573)	(0.102)	(0.0779)
% of women empl.	0.0427	-0.0128	0.0672**	-0.0626***	0.133***	-0.0634***	0.0469	0.0425***	-0.000410	-0.0415	-0.0389**	0.00291
	(0.0319)	(0.0140)	(0.0312)	(0.0195)	(0.0331)	(0.0149)	(0.0289)	(0.0123)	(0.0418)	(0.0268)	(0.0155)	(0.0109)
Mean experience empl.	0.00110	-0.00379***	-0.000924	0.000641	0.00212	-0.00173*	-0.00354*	0.00103	-0.00236	0.00199	-0.00254***	0.000382
	(0.00187)	(0.000921)	(0.00150)	(0.000740)	(0.00218)	(0.000979)	(0.00206)	(0.000815)	(0.00218)	(0.00146)	(0.000755)	(0.000562)
% empl. with tert. educ.	0.0552	-0.0550***	-0.0876	-0.151***	0.158***	-0.0743***	0.261***	-0.0971***	0.0715	-0.0757*	-0.102***	0.0886***
	(0.0344)	(0.0197)	(0.0683)	(0.0385)	(0.0364)	(0.0181)	(0.0714)	(0.0325)	(0.0726)	(0.0449)	(0.0218)	(0.0153)
% empl. with sec. educ.	0.0471*	-0.0202*	0.0750	-0.128***	0.0543	-0.0218	-0.0544	0.0190	-0.0254	-0.0239	-0.0588***	0.0196*
	(0.0254)	(0.0108)	(0.0590)	(0.0212)	(0.0350)	(0.0138)	(0.0540)	(0.0178)	(0.0630)	(0.0423)	(0.0196)	(0.0112)
% managers and profess.	0.0930**	0.0522*	-0.0328	0.124***	-0.123*	0.0927**	-0.205***	0.194***	0.115**	-0.0236	0.000121	0.0201
	(0.0470)	(0.0293)	(0.0433)	(0.0376)	(0.0630)	(0.0366)	(0.0475)	(0.0321)	(0.0457)	(0.0421)	(0.0236)	(0.0225)
% part-time empl.	-0.0382	-0.0144	-0.0842***	0.0609***	-0.100**	0.0610***	-0.260***	0.0766***	-0.0671	0.0128	0.0511**	-0.00988
	(0.0461)	(0.0183)	(0.0294)	(0.0206)	(0.0505)	(0.0191)	(0.0898)	(0.0290)	(0.0528)	(0.0336)	(0.0236)	(0.0157)
% permanent contracts	0.0518	-0.144***	0.0115	-0.0273	0.164***	-0.0479***	0.0377	0.00382	0.131	0.0311	0.0670**	0.0490*
	(0.0567)	(0.0231)	(0.0462)	(0.0295)	(0.0402)	(0.0154)	(0.0344)	(0.0124)	(0.114)	(0.0577)	(0.0338)	(0.0294)
Firm size:												
50–249 empl.	0.0613***	-0.0455***	0.109***	0.00998	0.157***	-0.0221**	0.0643***	0.00412	0.0667*	0.00975	-0.0532***	0.0346***
	(0.0238)	(0.0122)	(0.0178)	(0.00996)	(0.0250)	(0.0109)	(0.0213)	(0.0106)	(0.0398)	(0.0311)	(0.0115)	(0.00792)
≥ 250 empl.	0.0662	-0.0801***	0.0595***	0.0126	0.183***	-0.0324	0.0640**	0.0193	0.0349	0.0679***	-0.104***	0.0730***
	(0.0409)	(0.0216)	(0.0199)	(0.0109)	(0.0451)	(0.0221)	(0.0308)	(0.0149)	(0.0379)	(0.0262)	(0.0108)	(0.00859)
Public firm	-0.0209	0.0555**	-0.182***	0.0860***	0.00974	-0.0101	-0.127***	0.00489	0.247	0.0632	-0.0541*	0.0653***
	(0.0444)	(0.0266)	(0.0366)	(0.0224)	(0.0411)	(0.0204)	(0.0209)	(0.0118)	(0.220)	(0.149)	(0.0300)	(0.0168)
Constant	-0.163	0.159***	-0.212	0.163**	-0.295***	0.0568	0.0237	-0.0121	-0.556	0.00833	0.0460	-0.0877
	(0.134)	(0.0472)	(0.180)	(0.0654)	(0.0748)	(0.0351)	(0.0857)	(0.0274)	(0.421)	(0.286)	(0.111)	(0.0828)
Observations	2,416	2,416	4,396	4,396	3,443	3,443	3,006	3,006	2,059	2,059	6,895	6,895
R-squared	0.046	0.347	0.063	0.054	0.079	0.061	0.169	0.098	0.054	0.113	0.052	0.053
Region FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Sector FE	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Notes: Bootsrapped standard errors in parentheses (200 repetitions); asterisks denote significance levels: * p<0.05, ** p<0.01, *** p<0.001

Appendix A: Summary statistics of explanatory variables

Table 7: Distribution of firms by size by country

Firm size:	BE	CZ	DE	ES	FR	UK
1-49	4547	22218	26592	19695	7818	9343
50-249	4533	6633	19021	8662	9019	2765
>=250	5766	3251	15177	10400	14058	20332

Table 8: Summary means and standard deviations for continuous variables in regression

country	Stat.	BE	CZ	DE	ES	FR	UK
Mean experience empl. (yrs)	mean	9,506	9,061	8,574	7,235	10,748	7,079
	s.d.	5,810	5,229	6,051	6,202	6,361	5,278
% empl. with tert. educ.	mean	0,329	0,244	0,123	0,318	0,408	0,379
	s.d.	0,330	0,253	0,195	0,327	0,298	0,266
% empl. with sec. educ.	mean	0,419	0,654	0,706	0,190	0,420	0,523
	s.d.	0,305	0,255	0,236	0,244	0,270	0,262
% managers and profess.	mean	0,197	0,398	0,110	0,142	0,293	0,273
	s.d.	0,287	0,303	0,175	0,241	0,256	0,266
% part-time empl.	mean	0,229	0,139	0,266	0,152	0,159	0,269
	s.d.	0,260	0,186	0,248	0,247	0,231	0,268
% permanent contracts	mean	0,925	0,785	0,885	0,750	0,921	0,938
	s.d.	0,162	0,215	0,148	0,303	0,171	0,156

Table 9: Distribution of firms by modal age of employees by country

Modal age workers:	BE	CZ	DE	ES	FR	UK
14-19	35	19	276	127	68	987
20-29	2414	2288	9277	8726	3664	6954
30-39	4681	6254	10543	18674	9098	8052
40-49	5671	10787	28528	11421	9926	8929
50-59	2417	12166	11563	5275	7648	6174
60+	54	588	603	564	491	1371

Appendix B: FLB propensity scores

Table 10: Probit estimates of FLB propensity

	(1) BE	(2) DE	(3) ES	(4) CZ	(5) UK	(6) FR
Mean experience empl.	0.0300***	0.0243***	0.0409***	0.0755***	-0.0127***	0.00221
	(0.00313)	(0.00276)	(0.00184)	(0.00730)	(0.00277)	(0.00282)
Modal age workers:						
20-29	-0.0844	-0.890***	-0.110		0.115	0.125
	(0.252)	(0.246)	(0.218)		(0.0936)	(0.142)
30-39	0.0366	-0.564**	-0.0319	-0.0328	0.141	0.285**
	(0.250)	(0.245)	(0.218)	(0.104)	(0.0938)	(0.136)
40-49	0.00410	-0.498**	-0.0881	0.0855	0.124	0.395***
	(0.249)	(0.244)	(0.218)	(0.117)	(0.0934)	(0.134)
50-59	-0.124	-0.559**	-0.0560	0.0737	0.152	0.420***
	(0.251)	(0.245)	(0.219)	(0.107)	(0.0956)	(0.134)
60+		-0.829***	-0.113	-0.357	0.120	
		(0.298)	(0.232)	(0.299)	(0.110)	
% empl. with tert. educ.	0.109	0.662***	0.405***	0.455	-0.198**	0.108
	(0.0793)	(0.135)	(0.0393)	(0.347)	(0.0991)	(0.0759)
% empl. with sec. educ.	0.137**	0.728***	0.159***	0.117	-0.133	0.522***
	(0.0557)	(0.0982)	(0.0382)	(0.237)	(0.0945)	(0.0699)
% managers and profess.	-0.0209	0.0162	-0.186***	0.206	-0.00602	-0.581***
	(0.0906)	(0.110)	(0.0604)	(0.290)	(0.0594)	(0.0785)
% part-time empl.	-0.152**	0.115*	-0.0164	0.0864	-0.0706	0.386***
	(0.0682)	(0.0648)	(0.0430)	(0.366)	(0.0560)	(0.0558)
% permanent contracts	0.510***	0.116	-0.156***	-0.279*	0.242**	-0.262***
	(0.115)	(0.127)	(0.0385)	(0.151)	(0.0978)	(0.0797)
Firm size:						
50-249 empl.	0.704***	0.105***	0.624***	0.440***	-0.184**	0.473***
	(0.0408)	(0.0383)	(0.0235)	(0.0855)	(0.0720)	(0.0385)
≥ 250 empl.	1.135***	0.179***	1.133***	1.164***	-0.290***	0.624***
	(0.0425)	(0.0375)	(0.0233)	(0.0916)	(0.0511)	(0.0387)
Public firm	-1.230***	-0.921***	0.570***	0.202	-1.346***	0.838***
	(0.0964)	(0.0404)	(0.0405)	(0.139)	(0.0403)	(0.0428)
NACE Sector:						
D	-0.413*	-0.293**	-0.380***	0.609***	0.201	-1.373***
	(0.243)	(0.137)	(0.0667)	(0.218)	(0.311)	(0.180)
E	-0.809***	0.407***	0.272***	1.075***	0.141	1.157***
	(0.304)	(0.141)	(0.0803)	(0.305)	(0.328)	(0.155)
F	-1.140***	-1.096***	-0.882***	-0.894***	-1.032***	-1.334***
	(0.253)	(0.203)	(0.0770)	(0.225)	(0.318)	(0.278)
G	-0.853***	-0.451***	-0.493***	0.799***	0.405	-1.270***
	(0.245)	(0.156)	(0.0715)	(0.254)	(0.311)	(0.220)
H	-0.999***	0.275	-0.808***		-0.510	-0.486***
	(0.268)	(0.168)	(0.0832)		(0.334)	(0.182)
I	-0.441*	1.229***	-0.112	-0.168	-0.248	0.573***
	(0.248)	(0.136)	(0.0705)	(0.228)	(0.310)	(0.152)
J	-0.0811	-0.816***	-1.105***	0.216	0.562*	-0.00925
	(0.255)	(0.161)	(0.0818)	(0.309)	(0.315)	(0.158)
K	-0.744***	0.117	-0.509***	1.391***	0.0816	0.169
	(0.247)	(0.139)	(0.0728)	(0.286)	(0.314)	(0.155)
L			-0.101	2.351***	0.324	1.735***
			(0.111)	(0.364)	(0.311)	(0.159)
M	-0.966***	-0.0856	-0.953***	0.142	-0.676**	-0.510***
	(0.282)	(0.157)	(0.0920)	(0.286)	(0.311)	(0.189)
N	-0.860***	0.973***	-0.670***		-1.004***	-0.554***
	(0.248)	(0.138)	(0.0834)		(0.312)	(0.163)
O	-0.602**	0.394***	0.126*	1.703***	-0.496	0.338**
	(0.254)	(0.139)	(0.0744)	(0.357)	(0.311)	(0.155)
Regional GDP pps	0.00120	0.000710	0.00371	0.302***	0.00649***	-0.00184
	(0.00157)	(0.00397)	(0.00231)	(0.0712)	(0.00181)	(0.00168)
Regional unemp. rate	0.00426	0.0357***	0.00866***		0.0716***	-0.0433***
	(0.00366)	(0.00585)	(0.00161)		(0.00832)	(0.0101)
Constant	-1.770***	-1.832***	-1.679***	-7.023***	0.544	-2.022***
	(0.374)	(0.329)	(0.235)	(1.437)	(0.351)	(0.243)
Observations	13,730	12,312	37,887	3,498	14,502	29,943
Area under ROC curve	0.781	0.811	0.825	0.870	0.875	0.935

Notes: Dependent variable is FLB dummy. Standard errors in parentheses; asterisks denote significance levels: * p<0.05, ** p<0.01, *** p<0.001