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RESEARCH ARTICLE

# Corporate hierarchies and workplace voice

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## Abstract
We investigate whether workplace voice through institutionalized forms of employee representation (ER) affects the design of firm hierarchies. We look at the role of ER within a knowledge-based view of hierarchies, where the firm's choice of hierarchical layers depends on the trade-off between communication and knowledge acquisition costs. Using a sample of more than 20,000 private-sector firms in 32 countries, we find that the presence of ER is positively associated with the number of organizational layers, though the relationship is tempered by firm size. ER positively correlates with job training, skill development and enhanced internal communication via staff meetings. The analysis of managers' perceptions suggests the higher frequency of meetings in firms with ER does not lead to more delays in the implementation of organizational changes. Taken together, our findings point to ER as facilitating the flow of information to top decision-makers and hence reducing communication costs. This may enable the firm to economize scarce cognitive resources without retarding the accumulation of new shop-floor capabilities. We contribute to recent literature on organizational design by suggesting ER institutions as possibly relaxing the trade-off between communication and knowledge acquisition costs within firms.

**Keywords:** employee representation; European Company Survey; firm hierarchy; organization

## Introduction

The internal organization of firms is a topic that has received wide attention in the literature and it has been studied through different perspectives. Agency theory sees firms as characterized by agents with conflicting interests (e.g. shareholders *versus* managers or employer *versus* employee) and it considers the design of incentives that prevent opportunistic conducts as the main purpose of organization (Alchian and Demsetz, 1972; Fama and Jensen, 1983; Milgrom and Roberts, 1992; Williamson, 1985). Works within the so-called knowledge-based view, on the contrary, emphasize the role of organizations as repositories of individual and collective knowledge, which needs to be integrated to generate economically valuable products and services (Grant, 1996; Hodgson, 1998; Penrose, 1959). From a similar perspective, authors belonging to the Carneige school have stressed the importance of organizational hierarchies as architectures that indeed improve the firm's ability to integrate composite knowledge and deal with the complexity of business operations (March and Simon, 1958; Simon, 1976, 1981).

By building on these different streams of literature, the present paper investigates how the design of organizational hierarchies is affected by institutions channelling cooperation and conflict between owners and workers. We achieve a twofold aim. On the one hand, we integrate agency theory with intuitions concerning the role that institutionalized forms of conflict play in shaping the structure of organizations. On the other, we expand the knowledge-based views by considering hierarchy as an endogenous feature of organizations, which depends on the institutional environment in which firms are embedded.

More specifically, we study if and how the depth of firm hierarchies is affected by industrial relations arrangements at the workplace. Our focus is on the role played by the presence of workplace employee representation (ER), i.e. an institutional channel for employee voice through which workers exert an influence on work organization and employment-related issues as exists in many European countries (e.g. unions, works councils, consultative committees). Does the presence of ER affect the depth of corporate hierarchies? If yes, what are the channels through which this effect takes place?

We answer these questions empirically, within the framework of knowledge-based hierarchies, as developed by Garicano (2000) and Garicano and Wu (2012), among others.[1] The firm is conceived as a collection of workers with diversified competences who deal with problems and need to acquire the relevant knowledge to solve them. Whenever the match between problems and solutions is costly, the firm is organized as a hierarchy, with those at the bottom dealing with routine problems and those at the top with more complex exceptions. The optimal choice of layers depends on the trade-off between communication and knowledge acquisition costs. The former capture the costs of evaluating and passing problems through the hierarchy and are increasing in the number of layers. The latter reflect the costs of acquiring knowledge to deal with problems at each layer and are larger in flatter organizations.

Our intuition is that ER is an institutional body that impacts on the cost structure of the firm. On the one hand, employee representatives are granted with information and consultation rights on a given fraction of problems before they are passed to any layer above the shop-floor (e.g. problems that may have an impact on the employment structure of the company, such as important investment decisions or substantial changes to organization of work). The extension of these rights can vary across countries depending on the system of industrial relations, including the extent to which industrial relations are conflictual (Doellgast and Benassi, 2020). When such rights are present, it is fair to assume that ER increases communication costs by delaying the process of problem evaluation. On the other hand, by improving institutionalized communication, ER can perform 'skip-level' reporting that facilitates the flow of information to top decision-makers. The extent to which 'skip-level' reporting is successful depends on the (more or less) tacit nature of the information that is to be transferred and on the workers' willingness to truthfully engage in information reporting. The type of production that is carried out, and more specifically the sector of activity, can certainly affect the quality of information reporting.[2] With reference to issues related to the conflictual nature of information possession, previous works suggest that bodies of ER can indeed improve information flows and coordination through reciprocal commitment and enforcement of implicit agreements via relational contracting (Freeman and Lazear, 1994; Hogan, 2001; Malcomson, 1983). In these cases, ER reduces communication costs by speeding up the passing of problems across layers of the organization.

Depending on the relative size of these two effects, ER may lead to a higher or lower optimal number of layers. As long as the reduction in communication costs due to skip-level reporting more than compensates the rise in costs due to delayed problem evaluation, ER will induce firms to select a higher number of layers. Such an effect, however, is expected to be moderated by the size of the organization, due to smaller firms typically having a more flexible structure.

We investigate the empirical relevance of our theoretical intuition by using unique establishment-level data from the third wave of the European Company Survey (2013), which covers more than 20,000 private-sector workplaces located in 32 countries and provides harmonized information on the presence of ER bodies, firm hierarchies and a wide range of management practices. Overall, the empirical analysis produces two main stylized facts that are broadly consistent with our intuition: (1) the presence of ER is positively correlated with the depth of hierarchy (number of vertical layers); (2) the number of layers is increasing in establishment size but less so in establishment with ER. We account for the potential endogeneity of ER bodies by exploiting firm coverage by industry-level wage agreements as an exogenous factor that shifts the probability of organizing ER structures at the workplace level. Our instrumental variable (IV) estimates reinforce our main findings.

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[1]See also Williamson (1967) and Sah and Stiglitz (1986) for early contributions along related lines.
[2]For this reason, it is important to control for industry-specific characteristics in our analysis.

Finally, we explore the underlying mechanisms that may explain our main results. We document a positive correlation between ER and different measures of job training and skill development, which suggests that the effect of ER (if any) is to reduce knowledge acquisition costs, for example, by providing information on skill gaps and by facilitating the identification of workforce training requirements. The presence of ER also correlates with reported changes in the way establishments coordinate and allocate work to employees and the frequency of regular staff meetings, possibly enabling skip-level reporting and facilitating the flow of information to top decision-makers. The analysis of managers' perceptions suggests that the higher frequency of staff meetings in establishments with ER does not seem to come at a cost in terms of delayed implementation of organizational changes. Taken together, these pieces of evidence suggest that institutionalized forms of employee voice may enable the firm to economize scarce cognitive resources through deeper hierarchies without retarding the accumulation of new shop-floor capabilities. This points to ER as possibly relaxing the trade-off between communication and knowledge acquisition costs.

The main contribution of our paper is to bring labour institutions and industrial relations arrangements into the analysis of firm organization, particularly in relation to the allocation of authority and the structure of production hierarchies (Aghion and Tirole, 1997; Caliendo et al., 2015; Caliendo and Rossi-Hansberg, 2012; Colombo and Delmastro, 2004; Cordes et al., 2011; Delmastro, 2002; Garicano, 2000; Garicano and Wu, 2012; Hart and Moore, 2005; Reinstaller, 2007). There is an extensive literature analysing a wide range of determinants of firm hierarchies, such as technology, competition, social capital, trade openness and inter-firm transactions (Acemoglu et al., 2007; Bloom et al., 2012, 2014; Bresnahan et al., 2002; Caroli and Van Reenen, 2001; Delmastro, 2002; Guadalupe and Wulf, 2010; Luo et al., 2012). We add to this literature by studying how the depth of corporate hierarchies may be influenced by collective forms of employee voice and by pointing to ER as an institutional hurdle that may refrain firm flattening. As a result, our study suggests that deunionization in Western countries (as documented by Farber et al. [2018] and Ebbinghaus and Visser [1999], among others) may contribute to explain the growing evidence that firms are becoming flatter over time (Acemoglu et al., 2007; Caroli and Van Reenen, 2001). This is a novel insight which adds to the previous literature highlighting the role of competition dynamics (Guadalupe and Wulf, 2010) and technological discontinuities (Bloom et al., 2014) as the only drivers of firm flattening. Second, we expand the voluminous literature on shop-floor ER by studying the organizational implications of ER. There is a rich body of research investigating the role of ER in relation to several aspects of firms' activity and performance, such as wage bargaining (Booth and Chatterji, 1995), work engagement and employee voice (Bryson, 2004; Kwon and Farndale, 2020), productivity (Addison et al., 2004; FitzRoy and Kraft, 2005), investment (Addison et al., 2007), employment (Addison and Teixeira, 2006; Jirjahn, 2010), innovation (Addison et al., 2017; Kraft et al., 2011), production technology (Flynn, 2005) and non-wage aspects of labour, including hours of work (Buchmueller et al., 2004), flexible-time arrangements (Burdin and Pérotin, 2019), human resource practices (Bryson et al., 2007). We embed the well-known information and communication role of ER (Freeman and Lazear, 1994) into the framework of knowledge hierarchies, bridging the gap between disparate bodies of literature in industrial relations, management and organization studies.

The remaining parts of the paper are organized as follows. In section 'Data and variables', we describe the data and the key variables used in the empirical analysis, whose results are presented in section 'Results'. In section 'Alternative explanations', we discuss some possible alternative explanations of the empirical evidence. Section 'Conclusions' concludes.

## Data and variables

### The European Company Survey: overview

We use establishment-level data from the third wave of the European Company Survey (ECS, 2013). ECS data cover a representative sample of non-agricultural establishments employing at least ten employees and located in 32 countries (27 EU Member States and Croatia, Former Yugoslav Republic of Macedonia, Iceland, Montenegro and Turkey). A crucial advantage of this survey is that it provides harmonized cross-country information on ER, management practices and organizational design

at the workplace level. The survey is conducted in two steps. The first step involves a telephone interview with a human resource manager, who is asked about establishment characteristics, organizational practices and industrial relations, including the existence of ER structures. Only one manager per establishment is interviewed. Where a human resource manager is not available, a senior decision-maker responsible for the staff is interviewed (e.g. a general manager, owner or similar). This guarantees that the information is always provided by a person knowledgeable about the firm. The second stage comprises an interview with an employee representative in those establishments in which an ER structure is present. As information obtained in the second stage is conditional on having an ER structure, our analysis is exclusively based on the information gathered in the management questionnaire.[3]

(1) *Measure of shop-floor ER.* We focus on institutionalized forms of ER. ER is a dummy variable identifying establishments with a trade union, works council or any other country-specific official structure of ER (e.g. joint consultative committees). This definition excludes health and safety representatives and *ad-hoc* forms of representation.

(2) *Measure of depth of hierarchy.* To characterize the hierarchical structure of establishments, we rely on the current number of hierarchical levels for each establishment, as reported by the managers. We also have access to information on whether the number of layers has changed since 2010, that we use to validate the data.[4]

(3) *Other variables.* Finally, managers report information on the use of information systems, outsourcing of production activities, changes in technology, firm organization and ownership, frequency of meetings between employees and managers, training activities, workforce composition (gender, age, education, fraction of part-time, permanent employees), average tasks' complexity, plant size, subsidiary/headquarter status and a wide range of management practices. This rich set of information allows to control for conventional technological drivers of hierarchical structures previously studied in the literature. In order to mitigate concerns about respondents' bias, we include a set of 'noise controls' on managers' characteristics (gender, position and job tenure of the manager) in our regressions.

After data cleaning, we remain with about 25,000 establishment-level cross-sectional observations. Descriptive statistics are in Table 1.[5] We observe that, on average, establishments have three layers, which compares well with previous studies using self-reported indicators.[6] In Figure 1, we plot the histogram of the numbers of hierarchical layers for establishments with and without ER. The distribution appears to be skewed to the right for establishments in which ER is present, indicating deeper firm hierarchies in those establishments.

## Results

### *Employee representation and hierarchical depth*

We begin by considering the following baseline regression model:

$$
\begin{aligned}
Y_{ijc} = & \beta_0 + \beta_1 \mathrm{ER}_{ijc} + \beta_2 \text{Medium firm}_{ijc} + \beta_3 \text{Large firm}_{ijc} \\
& + \beta_4 \mathrm{ER}_{ijc} \times \text{Medium firm}_{ijc} + \beta_5 \mathrm{ER}_{ijc} \\
& \times \text{Large firm}_{ijc} + \mathbf{b} \mathbf{X}_{ijc} + \varepsilon_{ijc}
\end{aligned}
\tag{1}
$$

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[3]Further information can be found in the survey's technical report: https://www.eurofound.europa.eu/surveys/european-company-surveys/european-company-survey-2013/ecs-2013-methodology.

[4]We verify that firms adding/dropping a layer tend to grow/shrink in the periods around the change consistently with what has been documented by previous evidence (e.g. Caliendo *et al.*, 2015).

[5]The drop in the number of observations used in the regressions with respect to the original sample due to missing data is not large and not systematic across countries.

[6]Using a French sample of manufacturing firms, Acemoglu *et al.* (2007) report a mean value of 3.2 layers.

**Table 1.** Descriptive statistics of the variables used in the analysis

| Variable | Mean | S.D. | Variable | Mean | S.D. |
|---|---|---|---|---|---|
| Main variables | | | Establishment-level controls (cont'd) | | |
| Number of layers (logs)[a] | 1.082 | 0.402 | Change in labour prod. (last 3y): decreased | Benchmark | |
| Presence of ER | 0.323 | 0.468 | Change in labour prod. (last 3y): stable | 0.383 | 0.486 |
| Size: <49 employees (small) | Benchmark | | Change in labour prod. (last 3y): increased | 0.498 | 0.500 |
| Size: 50–249 employees (medium) | 0.324 | 0.468 | Change in the # of empl.s (last 3y): decreased | Benchmark | |
| Size: >250 employees (large) | 0.166 | 0.372 | Change in the # of empl.s (last 3y): stable | 0.415 | 0.492 |
| Establishment-level controls | | | Change in the # of empl.s (last 3y): increased | 0.319 | 0.466 |
| Employees aged 50+: <20% | Benchmark | | Change in ownership (last 3y) | 0.095 | 0.294 |
| Employees aged 50+: 20–39% | 0.290 | 0.453 | Change in organization (last 3y) | 0.423 | 0.494 |
| Employees aged 50+: 40–59% | 0.125 | 0.331 | Empl.s involved in complex tasks: <20% | Benchmark | |
| Employees aged 50+: >60% | 0.045 | 0.207 | Empl.s involved in complex tasks: 20–39% | 0.117 | 0.321 |
| Female employees: <20% | Benchmark | | Empl.s involved in complex tasks: 40–59% | 0.088 | 0.283 |
| Female employees: 20–39% | 0.231 | 0.421 | Empl.s involved in complex tasks: >60% | 0.283 | 0.450 |
| Female employees: 20–39% | 0.231 | 0.421 | Other establishment-level variables | | |
| Female employees: 40–59% | 0.219 | 0.413 | Outsourcing intermediate production | 0.311 | 0.462 |
| Female employees: >60% | 0.220 | 0.414 | Use of information systems | 0.538 | 0.498 |
| Employees with university degree: <20% | Benchmark | | Respondent's controls | | |
| Employees with university degree: 20–39% | 0.188 | 0.390 | Respondent: female | 0.566 | 0.495 |
| Employees with university degree: 40–59% | 0.090 | 0.286 | Respondent: logs of years of tenure[a] | 2.054 | 0.952 |
| Employees with university degree: >60% | 0.140 | 0.347 | Respondent: owner | Benchmark | |
| Part-time employees: <20% | Benchmark | | Respondent: manager | 0.238 | 0.425 |
| Part-time employees: 20–39% | 0.089 | 0.285 | Respondent: HR manager | 0.475 | 0.499 |
| Part-time employees: 40–59% | 0.036 | 0.188 | Respondent: other | 0.190 | 0.392 |

*(Continued)*

**Table 1.** (*Continued.*)

| Variable | Mean | S.D. | Variable | Mean | S.D. |
|---|---|---|---|---|---|
| Part-time employees: >60% | 0.048 | 0.215 | Other variables (analysis of the mechanisms) | | |
| Employees with open-ended contract: <20% | Benchmark | | % of empl.s with paid time off for training | 2.939 | 2.066 |
| Employees with open-ended contract: 20–39% | 0.028 | 0.167 | Training activity for skill development | 0.914 | 0.280 |
| Employees with open-ended contract: 40–59% | 0.044 | 0.206 | Change in work coordination (last 3y) | 0.335 | 0.472 |
| Employees with open-ended contract: >60% | 0.854 | 0.352 | Meetings open to all staff | 0.609 | 0.488 |
| Multi-plant company | 0.314 | 0.464 | Meetings between empl. and managers | 0.858 | 0.349 |
| Subsidiary site | 0.103 | 0.305 | Employee involvement causes delays | 0.259 | 0.438 |

*Notes:* Variables are dummies unless otherwise specified.
[a]Continuous variable. Pooled data from the European Company Survey 2013. Sample restricted to private-sector establishments. Means are weighted by ECS sampling weights.
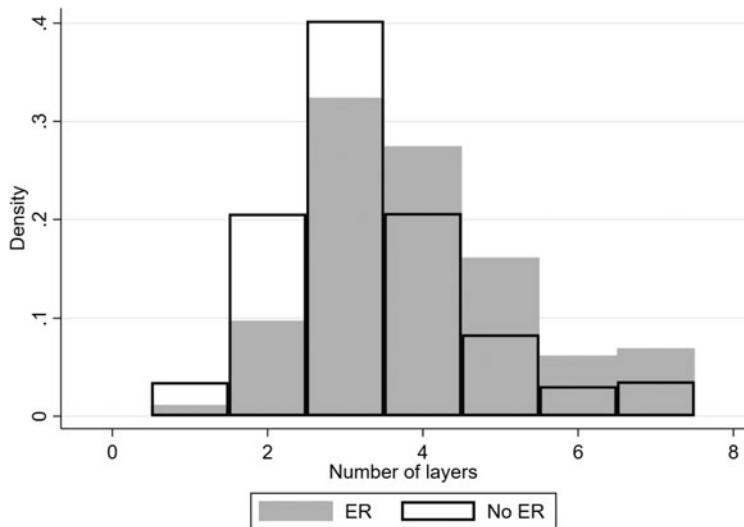


**Figure 1.** Histogram of number of hierarchical layers.
*Notes:* Pooled data from the European Company Survey 2013. Sample restricted to private-sector establishments.

where subscripts $i$, $j$ and $c$ denote the establishment, industry and country, respectively; $Y_{ijc}$ is the natural logarithm of the number of layers in 2013 for establishment $i$ in industry $j$ and located in country $c$; $ER_{ijc}$ is a dummy variable for the presence of ER at the establishment level; Medium firm$_{ijc}$ and Large firm$_{ijc}$ are dummies for medium (50–249 employees) and large firms (250+ employees), the small firm category (10–49 employees) being the benchmark; $\mathbf{X}_{ijc}$ is the vector of controls; $\varepsilon_{ijc}$ are the residuals.

Table 2 reports the results of a series of OLS estimates. In column 1, we estimate a parsimonious model in which we only include a dummy variable that takes value one for establishments in which

there is an ER structure in place, three dummy variables to control for establishment size (small firms being the benchmark category) and interaction terms to capture the interplay between ER and plant size. Estimates reported in column 2 also control for industry and country fixed effects. The industry dummies capture differences in ER prevalence due to sector-specific industrial relations structures as well as cross-sectoral differences in technology, which in their turn may involve differences in the predictability of the production process. The country dummies absorb cross-country heterogeneity in labour institutions, including those regulating ER formation and functioning, and culture (e.g. trust) that may affect the structure of corporate hierarchies. The country dummies also control for differences in average income, judicial efficiency, development of financial markets and other macro-level institutional factors that may have an impact on the firm structure. The presence of ER is positively associated with the number of layers. As expected, larger establishments tend to have more layers. Interestingly, the interaction between ER and size is significantly negative, suggesting that the impact of ER on firm hierarchies tends to vanish as firm size increases.

In columns 3–6, we sequentially add more controls to see the robustness of the results. In column 3, estimates control for establishment-level differences in workforce composition (gender, age, skills, fraction of part-time and permanent contracts) and share of workers performing complex tasks, reported change in productivity and employment since 2010, and dummy variables identifying multi-site firms, subsidiary sites, recent changes in ownership and organizational changes. In column 4, we also account for differences in the prevalence of outsourcing of production activities that may also affect the hierarchical structure of firms. In column 5, we additionally control for the use of information systems oriented to minimize supplies or work-in-process (e.g. just-in-time, lean production systems). Finally, in column 6, we add a series of 'noise controls' on respondents' characteristics (gender, position and job tenure of the manager) in order to increase the precision of our estimates and reduce concerns about measurement error in the organizational variables. None of the described modifications alters the basic finding.[7]

The estimated positive effect of ER on the number of layers can be interpreted as compatible with the fact that on average the reduction in communication costs associated with the presence of ER is sufficiently large to offset any reduction in knowledge acquisition costs. This would also indicate that the net effect of ER on communication costs is negative, i.e. the skip-level reporting effect dominates the cost of delayed decisions resulting from the operation of ER (e.g. information and consultation process). The fact that the effect of ER is heterogeneous across establishment size categories suggests the trade-off between communication costs and information acquisition costs may be size-contingent. This evidence is consistent with the idea that larger organizations are less flexible and are less able to accommodate the layer increasing effects of ER, thereby leading to the negative coefficients of interacted terms observed above.

To give a sense of scale of the impact of ER on the hierarchical depth, we also estimate an ordered probit model which makes the interpretation of the magnitude of the coefficients easier. We recoded the dependent variable into five categories, with the first four categories corresponding to the reported number of layers and the last category including all establishments where the number of layers is five or more. Then we calculated the marginal effects for each value of the dependent variable. The marginal effects of interest are reported in Table 3. We obtain that the probability that establishments have five or more layers is 3.2 p.p. higher in establishments with ER compared to those without ER. This is equivalent to roughly a fifth of the difference between small and medium-sized establishments in the same probability.

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[7]In unreported estimates, we also conduct separate regressions by sector and countries grouped according to industrial relations regimes. We find that the positive correlation between ER and the number of layers holds across sectors and different industrial relations regimes (although there is some indication that the effect of ER is smaller in the South and Centre-East clusters, typically characterized by more politicized and fragmented industrial relations systems, where social partners may be less prone to engage in cooperative solutions).

**Table 2.** Depth of hierarchy: OLS estimates

| | (1) | (2) | (3) | (4) | (5) | (6) |
|---|---|---|---|---|---|---|
| ER | 0.083*** | 0.091*** | 0.077*** | 0.075*** | 0.070*** | 0.066*** |
| | (0.007) | (0.008) | (0.008) | (0.008) | (0.008) | (0.008) |
| Medium firm | 0.306*** | 0.289*** | 0.266*** | 0.268*** | 0.261*** | 0.239*** |
| | (0.008) | (0.008) | (0.008) | (0.009) | (0.009) | (0.009) |
| Large firm | 0.577*** | 0.543*** | 0.516*** | 0.510*** | 0.501*** | 0.467*** |
| | (0.017) | (0.015) | (0.017) | (0.017) | (0.017) | (0.018) |
| ER × medium firm | −0.044*** | −0.022** | −0.023** | −0.026** | −0.020* | −0.017 |
| | (0.011) | (0.011) | (0.012) | (0.012) | (0.012) | (0.012) |
| ER × large firm | −0.131*** | −0.085*** | −0.107*** | −0.101*** | −0.100*** | −0.093*** |
| | (0.019) | (0.018) | (0.020) | (0.020) | (0.020) | (0.020) |
| Observations | 24,192 | 23,973 | 20,739 | 20,129 | 19,461 | 19,037 |
| $R^2$ | 0.224 | 0.253 | 0.277 | 0.279 | 0.280 | 0.286 |
| Country + industry dummies | No | Yes | Yes | Yes | Yes | Yes |
| Establishment-level controls | No | No | Yes | Yes | Yes | Yes |
| Outsourcing | No | No | No | Yes | Yes | Yes |
| Information systems | No | No | No | No | Yes | Yes |
| Respondent's controls | No | No | No | No | No | Yes |

*Notes:* Estimation by ordinary least squares with robust standard errors in parentheses. The dependent variable is the number of layers (in logs). Establishment-level controls: workforce composition (gender, age, education, fraction of part-time, permanent employees), multi-plant, change in employment, productivity, organizational structure and ownership in the last three years, subsidiary site, share of workers involved in complex tasks. Estimates reported in column 4 control for outsourcing of production activities. In column 5, we add controls for the use of information systems. In column 6, we add controls for manager's characteristics (gender, position, tenure). The small firm category (10-49 employees) is the benchmark category for size dummies. ***$P < 0.01$, **$P < 0.05$, *$P < 0.1$.

**Table 3.** Depth of hierarchy: Marginal effects from ordered probit model estimates

|  | Pr[#layers = 1] | Pr[#layers = 2] | Pr[#layers = 3] | Pr[#layers = 4] | Pr[#layers = 5+] |
|---|---|---|---|---|---|
| ER | −0.009*** | −0.0329*** | −0.012*** | 0.021*** | 0.032*** |
|  | (0.001) | (0.003) | (0.003) | (0.002) | (0.005) |
| Medium firm | −0.026*** | −0.140*** | −0.108*** | 0.100*** | 0.175*** |
|  | (0.001) | (0.003) | (0.004) | (0.003) | (0.005) |
| Large firm | −0.030*** | −0.192*** | −0.250*** | 0.094*** | 0.379*** |
|  | (0.001) | (0.003) | (0.007) | (0.003) | (0.011) |
| Observations | 19,037 | 19,037 | 19,037 | 19,037 | 19,037 |

*Notes:* Marginal effects from ordered probit estimation. The full model is considered, including country and industry dummies, establishment-level controls, and controls for outsourcing, information systems and manager's characteristics. Log likelihood null model: −26,849.783. Log likelihood full model: −23,405.669. $\chi^2$ test: 6,513.07. Reported values are the differences between the probabilities that result when the dummy variable under scrutiny takes its five different values. The small firm category (10–49 employees) is the benchmark category for size dummies. ***$P < 0.01$, **$P < 0.05$, *$P < 0.1$.

## Endogeneity

Tables 2 and 3 present conditional correlations that are broadly consistent with our theoretical intuition. Nevertheless, we are concerned about the potential endogeneity bias of our estimates, as due for example to unobservable variables correlated with the organizational outcome and our measure of ER.

To deal with this we consider an IV strategy. We ground the identification of a viable instrument on the analysis of the institutional determinants of unionization. According to standard cost–benefit analysis of union determination (e.g. Berkowitz, 1954; Hirsch and Addison, 1986; Pencavel, 1971), ER can be modelled as though it were an asset available to utility-maximizing workers that provides a flow of services. In this framework, the costs and benefits of unionization (as well as the propensity and the opportunity to organize) are affected by institutional variables such as the centralization of collective bargaining (Schnabel, 2003). Sectoral or regional coverage of collective agreements influences, in particular, the collective action costs needed to establish ER and the benefits that the workers can obtain from it. For instance, when employment conditions are determined by a collective agreement, workers have incentive to be active proponents of these conditions through union action. Setting up an ER structure at the workplace level may also require expert knowledge and operational support which is more likely to be available when there are higher level union confederations involved in collective bargaining (Devicienti *et al.*, 2018). Depending on the labour legislation, it is also possible that sectoral collective agreements cannot be extended to workers if it is absent at the firm an ER body acts as a signatory party of the agreement.

Previous empirical research has showed that the coverage by centralized collective agreements is an important determinant of the degree to which unions can successfully pursue an individual service or insurance strategy. In line with this, Scheuer (2011) finds that coverage by a collective agreement actually triples the likelihood of union membership. Moreover, comparative legal analysis clarifies that extension of collective agreements to third parties at the sectoral or regional level is mostly subject to regulatory institutions and labour laws that are clearly exogenous in our study (Adams *et al.*, 2016). On the other hand, however, even if the literature does not indicate explicitly that collective agreements coverage should exert a direct effect on hierarchical depth, there may be instances in which the exclusion restriction is violated in this empirical context, for example, when collective contracts discipline minimum pay thereby inducing the firm to introduce certain internal labour reorganizations regardless of ER presence. Keeping this limitation in mind, we use information on whether the firm is covered by a collective wage agreement negotiated at the sectoral or regional level as an exogenous factor that shifts the probability of establishing an ER at the establishment level. We build a dummy variable (sectoral bargaining,- *i*.) coded 1 if the firm is covered by a sectoral wage

agreement and 0 otherwise, and use it as an instrument for ER in equation (1). Also the interaction terms capturing ER effects at different firm size classes are instrumented. The results are collected in Table 4. The first-stage results show that coverage by sectoral or regional agreements is a strong predictor of ER presence at the firm level. Moreover, in the second stage, we find again that ER positively correlates with the number of hierarchical layers and that the positive firm size–layers relationship is tempered by the presence of ER. The interaction term is significantly negative for both large and medium-sized establishments, suggesting that the positive association between ER and depth of the hierarchy holds especially for small firms. This intuition is confirmed by running the same empirical exercise while splitting the sample across establishment size classes. Reassuringly, usual IV diagnostic tests for instrument relevance and exogeneity are passed.[8]

## Additional results

In this section, we enrich our basic findings by analysing the relationship between training activities, coordination of work and staff meetings on the one side and ER on the other. We want to see if the sign of the correlations among such variables is consistent with our theoretical framework.

First, we use training as a proxy of firm-specific activities related to the acquisition and accumulation of non-codifiable knowledge (Garicano and Wu, 2012). The survey contains extensive information on training activities at the workplace level, including the fraction of employees entitled to paid time off for training and information on the purpose of training activities. Results are reported in columns 1–2 of Table 5.[9] The presence of ER positively correlates with our measures of training. Interestingly, ER is positively associated with the extent of training activities oriented not only to develop workers' skills at the current jobs but also with those aimed at enabling workers to take different job positions and rotate tasks with colleagues. This suggests that employees in ER establishments are able to deal with and solve a wider variety of production problems.

Hence, the effect of ER (if any) would be to reduce knowledge acquisition costs.[10] Within our theoretical framework, this 'skilling' effect of ER should contribute to push down the number of hierarchical layers. Therefore, our finding that ER is associated with a higher number of vertical layers should be driven by an even stronger reduction in communication costs in establishments under ER. To corroborate such insight, in columns 3–5 of Table 5, we show that the presence of ER at the establishment level is associated with reported changes in coordination and allocation of work to employees and meetings between managers and employees. It is worth noting that the positive correlation between ER and the frequency of staff meetings is an empirical fact that conflates both delay effects and skip-level reporting. Interestingly, according to estimates reported in column 6 of Table 4, managers in establishments with ER are not more likely than their counterparts in establishments without ER to agree with the statement that 'employee involvement causes delays in the implementation of decisions'. Our interpretation is that arguably skip-level reporting dominates so the net effect of ER on communication costs is negative. This is consistent with the results reported in column 7, where we show that the magnitude of the effect of trade unions on the depth of hierarchy is higher with respect to other types of ER (including works councils). The latter result may reflect the fact that unions are typically

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[8]We obtain similar results by instrumenting ER with any form of higher-level wage bargaining, i.e. sectoral and national-level wage agreements.

[9]The fraction of employees involved in training activities is a categorical variable: none at all, less than 20%, 20–39%, 40–59%, 60–79%, 80–99%, all employees. For this reason, column 1 of Table 5 reports estimates from ordered probit models.

[10]Aoki (1990) highlights the advantages of participatory information sharing, non-hierarchical communication and delegation of decision making to frontline workers. These practices should favour workers' skilling and thus reduce knowledge acquisition costs, thereby leading to flatter hierarchies. To account for these organizational practices, we estimate our main model controlling for the use of self-directed teams and its interaction with the presence of ER. The use of self-directed teams appears to be negatively correlated with the number of layers, but the interaction is not significant at conventional levels. This is consistent with the idea that the reductions in communication costs and knowledge acquisition costs due to ER and self-directed teams may compensate each other. Results are available upon request.

**Table 4.** Depth of hierarchy: IV results

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| ER | 0.336*** | 0.348*** | 0.339*** | 0.329*** | 0.329*** |
| | (0.066) | (0.077) | (0.079) | (0.083) | (0.085) |
| Medium firm | 0.302*** | 0.290*** | 0.292*** | 0.292*** | 0.267*** |
| | (0.031) | (0.036) | (0.036) | (0.037) | (0.038) |
| Large firm | 0.524*** | 0.522*** | 0.527*** | 0.509*** | 0.475*** |
| | (0.059) | (0.064) | (0.065) | (0.065) | (0.066) |
| ER × medium firm | −0.150*** | −0.174*** | −0.174*** | −0.175*** | −0.164** |
| | (0.058) | (0.066) | (0.067) | (0.068) | (0.069) |
| ER × large firm | −0.195** | −0.256*** | −0.260*** | −0.242*** | −0.231*** |
| | (0.078) | (0.086) | (0.088) | (0.088) | (0.089) |
| Sectoral bargaining (1st-stage coeff.) | 0.093*** | 0.085*** | 0.084*** | 0.080*** | 0.078*** |
| | (0.009) | (0.009) | (0.009) | (0.009) | (0.009) |
| 1st-stage $R^2$ | 0.649 | 0.653 | 0.655 | 0.658 | 0.660 |
| Weak identification test: | | | | | |
| Kleinbergen–Paap Wald $F$ statistic | 79.503 | 55.714 | 53.246 | 47.463 | 45.519 |
| Observations | 23,973 | 20,739 | 20,129 | 19,461 | 19,037 |
| $R^2$ | 0.216 | 0.231 | 0.235 | 0.238 | 0.242 |
| Country + industry dummies | Yes | Yes | Yes | Yes | Yes |
| Establishment-level controls | No | Yes | Yes | Yes | Yes |
| Outsourcing | No | No | Yes | Yes | Yes |
| Information systems | No | No | No | Yes | Yes |
| Respondent's controls | No | No | No | No | Yes |

*Notes:* Estimation by 2-stage least squares with robust standard errors in parentheses. The dependent variable is the number of layers (in logs). The instrumental variable is a dummy coded 1 if the wages are determined at the sectoral level through collective bargaining agreements. We report the 1st-stage coefficient associated with instrumenting ER. Also the interaction terms are instrumented (but the coefficients are not reported for reasons of space). Establishment-level controls are the same as those in Table 2. Estimates reported in column 3 control for outsourcing of production activities. In column 4, we add controls for the use of information systems. In column 5, we add controls for manager's characteristics (gender, position, tenure). The small firm category (10–49 employees) is the benchmark category for size dummies.
***$P < 0.01$, **$P < 0.05$, *$P < 0.1$.

**Table 5.** Additional results: training, coordination and meetings

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) |
|---|---|---|---|---|---|---|---|
| | Paid time off for training | Skill development | Change in ways to coord. and allocate work | Meetings open to all staff | Meetings between employees and immediate manager | Employee involvement causes delays | Number of layers (in logs) |
| ER | 0.151*** | 0.012** | 0.024*** | 0.038*** | 0.019*** | 0.012 | |
| | (0.019) | (0.005) | (0.008) | (0.008) | (0.006) | (0.008) | |
| Medium firm | 0.135*** | 0.038*** | −0.016** | −0.044*** | 0.015*** | 0.006 | 0.287*** |
| | (0.019) | (0.005) | (0.008) | (0.008) | (0.006) | (0.008) | (0.006) |
| Large firm | 0.233*** | 0.060*** | −0.061*** | −0.034*** | 0.032*** | −0.028*** | 0.486*** |
| | (0.025) | (0.006) | (0.011) | (0.012) | (0.007) | (0.011) | (0.008) |
| ER: trade union | | | | | | | 0.048*** |
| | | | | | | | (0.006) |
| ER: works council | | | | | | | 0.021*** |
| | | | | | | | (0.006) |
| ER: other type | | | | | | | 0.026*** |
| | | | | | | | (0.006) |
| Log likelihood null model | −33,971.52 | | | | | | |
| Log likelihood full model | −31,397.25 | | | | | | |
| $\chi^2$ test | 4,676.54 | | | | | | |
| Observations | 19,084 | 17,144 | 19,145 | 19,194 | 19,196 | 18,809 | 24,192 |
| $R^2$ | | 0.056 | 0.175 | 0.076 | 0.066 | 0.048 | (0.222) |
| Country + industry dummies | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Establishment-level controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Outsourcing | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Information systems | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Respondent's controls | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

*Notes:* In column 1, we report estimates from ordered probit models with robust standard errors in parentheses, where the dependent variable (see definition in footnote 9) is the fraction of workers entitled to paid time off for training. In columns 2–6, we report estimates from linear probability models with robust standard errors. In column 7, we report estimates OLS estimates with robust standard errors. Control variables are the same as those in column 6 of Table 2. ***$P < 0.01$, **$P < 0.05$, *$P < 0.1$.

more structured forms of ER using consolidated communication channels with the top management, whilst works councils and other forms of shop-floor ER tend to represent workers' voice through more informal bottom-up processes involving relatively higher communication costs.

## Alternative explanations

We analyse the effect of ER on the depth of corporate hierarchies through the lens of a view of knowledge-based hierarchies. However, our results may be consistent with alternative models.

For instance, models of hierarchy and delegation put significant emphasis on issues related to incentive design in environments characterized by contractual incompleteness (Aghion and Tirole, 1997; Dessein, 2002; Mookherjee, 2013). Dessein (2002) develops a model in which delegation by the principal to an agent is greater when the agent's reporting bias, which is a proxy of the conflicting interest between him and the principal, is sufficiently small. As long as delegation induces the organization to be flatter, applied to our framework the main prediction of the model would be that the effect of ER on the organization of corporate hierarchies depends on its effect of the reporting bias. If ER increases the reporting bias, then we should expect an increase in hierarchical depth. The fact that we do not find ER to increase hierarchical depth more in large firms, where the conflict between ER-representatives and firm owners is higher (Mayer, 1997), provides little support for this explanation.

An alternative line of reasoning rests on the literature that conceives the design of organizations as functional to resolve bargaining issues between the workers and the entrepreneur. Dow (1989) argues that workers having some degree of firm specificity may be able to capture quasi-rents, thereby inducing in response the entrepreneur to limit worker bargaining power by, for example, 'deskilling' strategies. In relation to our work, such an approach would imply a positive correlation between ER and the number of layers if ER solves collective action problems among workers then leading to a stronger ability to capture quasi-rents. However, once again, it is plausible to assume that the size of such quasi-rents is greater in larger organizations, which are involved in more complex productions. As a consequence, the positive effect of ER on hierarchical depth should increase with firm size, which is not what we find in the data.

A third strand of theory links the decision to delegate authority within organizations to the characteristics of the technology available both inside and outside the firm. Acemoglu *et al*. (2007), for example, argue that the principal's choice to delegate authority to an agent depends on her knowledge about the technology used in production, with delegation (i.e. low hierarchical depth) being more likely in firms at the technological frontier dealing with new technologies about which public information is limited. Related to this, Bloom *et al*. (2014) suggest that firm-level investments in information technologies that reduce knowledge acquisition costs may induce decentralization, while the availability of more efficient communication technologies that reduce communication costs fosters centralization. With respect to our analysis, these contributions can be relevant as long as the presence of ER is correlated with the technological characteristics of the environment where the firm operates. For instance, ER structures may be more frequent in technologically mature industries, in which decentralization would be less common. This selection pattern could be driving the positive correlation between ER and the number of layers. However, the fact that our result holds even after controlling for industry fixed effects and the use of information systems at the workplace level suggests that our underlying theoretical argument remains valid.

Fourth, the differential negative effect of ER on the depth of hierarchy in large firms may be driven by the relationship between size, ER and complexity. Models based upon information processing (see Radner, 1992 and Bolton and Dewatripont, 1994) predict that the larger the number of items that need to be processed by an organization, the deeper the management hierarchy that minimizes total planning and implementation time. Since larger firms deal with greater complexity, firm size should be observed to correlate with the depth of the organization positively. In the context of our framework, this positive correlation may be comparatively reduced where ER is present, if ER bodies reduce the

complexity of the items the firm deals with, e.g. due to workers' risk aversion. While this possible interpretation shares with ours the empirical prediction of deeper hierarchies in larger firms, it also requires that ER has an independent negative effect on the number of layers: this is something that instead we do not observe in the data. Also, the argument that ER reduces complexity does not fit well with the positive correlation between ER and training that we detected in our analysis.

Fifth, there is a variety of work in industrial relations that ties ER to the growth of formalization and bureaucratization, because it increases the need for professional staff in the firm to deal with ER itself. This literature highlights that institutions of ER are traditionally hierarchical and bureaucratic and that they encourage the firms where they operate to adopt the same structures (Voss and Sherman, 2000). Therefore, our results may simply reflect differences in bureaucratization, not controlled for in our regressions. Yet, this alternative explanation fails to account for the negative correlation between hierarchical depth and ER in large firms. A long line of research suggests that large firms have a more fine-grained division of labour and more structured organizational hierarchies (e.g. Blau and Schoenherr, 1971; Grusky, 1961) and organizational size is a key measure of how bureaucratic a firm is (Sørensen, 2007). Hence, had the bureaucratization mechanism driven our findings, the positive correlation between ER and hierarchical depth should have been higher, and not lower, in large firms, because their structure is more prone to excessive bureaucratization. This is not what we observe in the data.

Sixth, there is also the possibility that corporate hierarchy emerges not as a result of conflicting interests between workers and owners, but as a consequence of colluding activities between workers and managers aimed at leaving firm owners worse off. Together, they may try to transform cash flow into fixed assets rather than dividends, and engage in so-called empire-building (Jensen and Meckling, 1976). If ER makes such type of collusion easier, and under the assumption that hierarchical depth correlates positively with empire-building behaviour, we should expect firms with ER to be more hierarchical. However, this effect should hold independently of firm size, or possibly be larger in larger firms where management's prestige associated with empire-building is higher. Again, this is not supported by our results.

In addition, ER may influence the depth of hierarchy indirectly, by reducing the expropriation risk to which employers are exposed. Rajan and Zingales (2001) propose a theory where the flatness of the corporate hierarchy is a mechanism for the entrepreneur to protect herself from the risk of expropriation. If ER is a commitment device reducing the risk of expropriation, then this may create an additional channel through which ER influences the number of hierarchical layers optimally chosen by the employer. However, since the expropriation risk envisaged by Rajan and Zingales (2001) is determined by the type of technology predominant in the sector (i.e. whether the technology is physical capital intensive or human capital intensive), industry fixed effects should absorb most of the effect coming from this source of variation. Reassuringly, our estimates remain significant even after controlling for industry fixed effects and we can then exclude that this mechanism drives our results.

Finally, recent evidence has showed that the structure of corporate hierarchies may be shaped by the cost of accessing external knowledge as determined in the market of knowledge outside the firm's boundaries (Pieri and Vatiero, 2022). From this point of view, access to complementary business services and the size of the firm itself may be relevant factors. In particular, larger firms may have cheaper access to the market of knowledge with respect to their smaller counterparts. In our empirical context, the advantage of large firms in accessing external knowledge may mitigate the effect of ER and may be responsible for the negative sign of the interaction term that we find in our estimates. Yet, there are no reasons why ER may alter the access to the market of knowledge directly. Therefore, the estimated coefficient associated with the direct (not interacted) ER effect should not be influenced by the role of the knowledge market.

## Conclusions

Our study sheds light on the interplay between labour institutions and the internal organization of firms. Using establishment level data from 32 countries, we analysed the effect of shop-floor ER on

the depth of corporate hierarchies. We interpreted our empirical results within the knowledge-based view of firm hierarchies, in which the optimal number of layers depends on the trade-off between communication costs and knowledge acquisition costs.

We found that ER is positively associated with the number of organizational layers. In the absence of cleaner sources of exogenous variation in ER rights, we exploited features of the institutional environment and instrumented ER using firm coverage by sectoral or national wage agreements. Ordinary least squares and IVs estimates yielded consistent estimates. This positive association between ER and the number of layers seems to be driven by a reduction in communication costs, suggesting that skip-level reporting may dominate the delay costs inherent to the information and consultation procedures involving managers and employee representatives. Clearly, for this information improving effect to be effective, ER needs to be directly involved in the business decision-making as an integral part of the corporate structure, and not to be relegated in a passive role where it is only informed without any substantive role. This is something that we did not elaborate in the paper, yet it is implicitly assumed in our conceptual framework.

An important limitation of our study is that we were not able to consider other channels of ER apart from shop-floor arrangements. Many European countries also grant employees with codetermination rights in companies' boards. Unfortunately, the lack of information on board-level ER precludes us from studying the interplay between the two channels of employee voice. One can conjecture that in the presence of codetermination, the reduction in communications costs associated with ER should be even stronger. Unsolved problems that require skills pertaining to the managerial domain could go directly from the shop-floor to the top management through direct interactions between shop-floor and board-level employee representatives.[11] Arguably, also the predominant political orientation in the region or country where the firm is located may play a role, with labour-friendly environments supporting the involvement of ER in the firm decision-making thereby further reducing communication costs and reinforcing the link between ER and hierarchical depth.

Our results have important implications for the design of firm organizations and labour market institutions. The positive relationship between ER and hierarchical depth may offer an alternative explanation for the growing evidence showing that firms are becoming flatter over time (Acemoglu *et al.*, 2007; Caroli and Van Reenen, 2001). Previous literature explains such trend either as a result of rising market competition, which requires faster decision-making (Guadalupe and Wulf, 2010), or as the consequence of the spread of information and communication technologies, which reduces communication costs (Bloom *et al.*, 2014). Our work suggests that a third possible explanation is deunionization, i.e. the shrinking proportion of workers covered by unions that has characterized the labour market of most advanced countries during the last decades (Ebbinghaus and Visser, 1999; Farber *et al.*, 2018). By reducing the share of firms with unionized forms of ER, and under the assumption that the latter have been only partially replaced by non-union types of ER, deunionization may have created incentives for many firms to design flatter organizations.

Our findings suggest that alongside well-known effects of ER on workers' bargaining power and wage composition, such bodies affect also the internal organization of corporate hierarchies. This insight contributes to extend the view of employee representatives beyond the approach that sees them mainly as tools to protect workers' interests. We suggest that institutionalized forms of employee voice may enable firms to economize scarce cognitive resources through deeper hierarchies without retarding the accumulation of new shop-floor capabilities. This means that ER may relax the trade-off between knowledge acquisition and communication costs, thereby weakening the 'deskilling' effect of deeper hierarchies. We do not investigate these dynamic features explicitly. Nevertheless, our results are compatible with the possibility that optimal static decisions diverge from dynamic profit maximization. This clearly reinforces our argument that ER effects may be broader than supposed by the traditional view and they cannot simply be circumscribed to rent sharing.

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[11]In the case of Germany, worker board representatives typically also serve in the work council (Jäger *et al.*, 2019).

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