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Strikes, Employee Workplace Representation, Unionism, and Trust: Evidence from Cross-Country Data

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ABSTRACT

Strikes, Employee Workplace Representation, Unionism, and Trust: Evidence from Cross-Country Data*

This paper investigates the determinants of industrial conflict in companies, using a multi-country workplace inquiry for 2009 and 2013 and various measures of strike activity. The principal goal is to address the effect of formal workplace representation on strikes, distinguishing in the first instance between works councils on the one hand and broadly equivalent trade union based entities on the other. The role of unionism is also central to this inquiry, not only with respect to the degree to which workplace representation is union dominated but also and more familiarly perhaps through workplace union density and the level at which collective bargaining is conducted. Attention is also paid to the quality of industrial relations, as reflected in dissonance, namely *divergent* assessments of managers and employee workplace representatives as to the state of industrial relations. Although country effects do matter, it is reported that works councils are associated with reduced strike activity. However, any such effect is sensitive in particular to the union status of work councilors and *time*. There is also some indication that collective bargaining at levels higher than the company can exacerbate strike activity but this effect does not persist, possibly because of decentralization and the development of hybrid bargaining structures. For its part, good industrial relations appears key to strike reduction, independent of workplace representation.

JEL Classification: J51, J52, J53, J83

Keywords: works councils, employee representation, union density, collective bargaining, industrial relations quality, strikes, trust

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I. Introduction

The influence of workplace representation on firm behavior has long been discussed in the economic and industrial relations literature at both the theoretical and empirical levels (Freeman and Medoff, 1984; Freeman and Lazear, 1995; Bryson, Forth, and George, 2012, Forth, Bryson, and George, 2016; Jansen, 2014). Less discussed are the specific contributions of different types of formal/institutional workplace representation such as works councils or joint consultative committees. Whether it really makes a difference having one type or another, and ultimately whether having a workplace representation matters at all, are the key issues to be examined in the present treatment. The principal independent variable considered here is strike incidence, although we also consider strike activity along the dimensions of duration, frequency and intensity. We see strikes as reflecting the extent to which workplace institutions are unable to generate a favorable climate of employee-management relations or trust which may in turn adversely impact plant-level productivity and financial performance.

That strikes and quality of industrial relations have consequences for firm performance have been confirmed in various studies (by Katz, Kochan, and Gobeille, 1983, of direct labor efficiency and product quality in an analysis of U.S. automobile plants; by Kleiner, Leonard, and Polarski (2002) of labor productivity in a U.S. plant assembling commercial aircraft; by Krueger and Mas (2004) of product quality in the Decatur tire plant of Bridgestone/Firestone; and by De Fusco and Fues (1991) and McDonald and Bloch (1999) on the share prices/profitability of struck firms in the U.S. airline industry and Australian manufacturing industry, respectively). But it is the determinants of strikes rather than their consequences – which may be smaller because of the spillover effects of industrial action – that assume center stage here. And, to repeat, they are seen as reflecting the extent to which workplace institutions are able to generate a favorable climate of employee-management relations or trust.

In a new departure, we are able to investigate the issues raised by *employee workplace representation* using large-scale cross-national data on firms; whereas past studies of strikes have been hampered by small samples of firms, mostly pertaining to a single country.¹ Specifically, we use the European Community Survey (ECS) in repeated cross sections for 2009 and 2013.

The ECS is managed by the European Foundation for the Improvement of Living and Working Conditions (<http://www.eurofound.eu/ecs/index.htm>). It covers the EU-27(28) countries – plus the former Yugoslav Republic of Macedonia, Croatia, and Turkey – and contains information on workplace representation (inter al.) in over 27,000 companies with 10 or more employees. The survey is conducted in two stages. The first, more detailed component, is an interview with a management representative, while the second comprises a much briefer interview with an employee from the workplace representation agency in only those workplaces with formalized channels of employee representation, but crucially containing information on strikes as well as subjective measures of the industrial relations climate.

For its part, and in addition to information on workplace representation and the perceived quality of that representation, the management survey contains data on other labor-institutional characteristics such as union membership or density, collective bargaining coverage, and multi-unionism at plant level, as well as union membership among the members of the workplace representative entities themselves. In addition, the management survey documents bargaining structure, permitting a distinction to be drawn between individual bargaining, company-level bargaining, higher-level bargaining (i.e. sectoral or national, and multi-level bargaining. Union organization variables as well architecture of collective bargaining (i.e. collective bargaining structure) are also central elements of the present inquiry.

As we have noted, each component of the 2009 and 2103 surveys contains questions on perceived industrial relations quality. We use this information to construct a measure of *dissonance* between managers and employee representatives as to the perceived quality of industrial relations. Such differences in perception – and their potential consequences – have not been exploited in past research. To complicate the picture, however, although the 2009 survey offers a unified management-employer dataset with a unique establishment identifier this is not the case for the 2013 survey when the two components are disjoint. Nevertheless, we were able to match some 48 percent of establishments, albeit at the cost of a further diminution in sample size.

By way of summary, then, we can examine the relation between employee representation and strikes using the employee inquiry, or a subset thereof in the case of the 2013 survey. Our primary interest resides in uncovering the association between strikes and the efficacy of industrial relations of which formal employee workplace

representation, perceived industrial relations quality, unionism, and collective bargaining are the key components.

We exploit both cross-country and between-establishment institutional variety to capture the main hypothesis – that workplace representation matters – while using the different layers of cross-country data to discern trends over time. To account for differences between individual companies, in addition to the level of collective bargaining and the other labor-institutional variables introduced earlier we control for economic activity based on 1-digit NACE categories, public ownership, company size, whether the companies are single entities as opposed to being part of a larger organization, and workforce composition, inter al. To account for country differences we implement a simple mixed effects logistic regression estimation procedure. We supplement this procedure in designating certain subsets of countries, but we do not attempt a more sophisticated modeling of country differences along the dimensions of bargaining coverage, structure, and coordination. Scope for a more sophisticated modeling of country differences using a typology of national collective bargaining systems is, however, touched upon in our literature review and again in our closing remarks.

Workplace employee representation is widely interpreted as a vehicle with the potential for delivering improved workplace relations. By the same token, however, union-dominated workplace representation is often equated with bargaining pure and simple. Taking domination to be a situation in which 50 percent or more of the employee representation body are trade union members, we will examine the association between union dominated employee representation and strikes. Interactions between collective bargaining coverage and the two types of formal employee workplace representation will also be examined. Again, since we have direct measures of industrial relations quality, as well as differences in perceptions of the two sides as to that quality, these indicators will also be used to supplement employee representation.

Clearly, in the absence of longitudinal data, the associations revealed in this study will inevitably not be free of controversy. But it is our contention that its structure and innovations should reflect and refresh the extant literature while informing the current debate on the efficacy of formal employee representative bodies.

The plan of the paper is as follows. We first provide a brief review of the literature on (formal) employee representation and firm performance, together with a discussion of the relevant part of the strikes literature. There follows a comprehensive review of the

dataset(s) and presentation of a broad set of hypotheses. A concluding section offers a discussion of our findings while offering some suggestions for future research.

II. Literature Review

Cross-country evidence on union organization and strikes is sparse, and that between the institutions of employee workplace representation and strikes more so. A number of studies have demonstrated that union presence is intimately related to strike incidence at national level (e.g. Kaufman, 1982) but the ongoing decentralization of collective bargaining (see Traxler, Blaschke, and Kittel, 2001; Visser, 2013, 2016) has yet to be reflected in national studies. The corollary is that the few cross-country studies of this genre (e.g. Piazza, 2005) also have no purchase on these developments.

This leaves strike studies based on company-level data. Although such inquiries might be said to have flourished in comparison, as was noted earlier they have seldom ventured beyond individual countries. This parochialism reflects the lack of cross-national datasets or even sufficiently comparable national data sets.

Notwithstanding these deficiencies, some progress has been made in the micro strikes literature. Analyses of strikes and other industrial relations events at company level have offered some interesting insights into the quality of industrial relations at the workplace, and the effect of the latter on productivity and output quality (see above). For their part, macro-level investigations of strike activity have suggested that the climate of industrial relations may help explain outcomes such as unemployment. Thus, Blanchard and Philippon (2004) have argued that, in countries where wages are largely determined by collective bargaining, the effects on unemployment of changes in the economic environment (i.e. aggregate shocks) will depend in large part on the speed of learning of unions. The latter is seen as a reflection of the quality of the dialogue between the two sides or the quality of industrial relations, which is proxied by strike intensity, averaged over 1960-67. Blanchard and Philippon subsequently use a second, direct measure based on the survey responses of senior executives in large firms to a 1999 *World Economic Forum* question inquiring of the manager respondent the extent to which labor relations in their firms were 'cooperative.' As the outcome measure might be reflected in the response, the authors ultimately use the 1960-67 strikes data to provide a predicted value for the survey measures. It is reported that countries with a one standard-deviation better quality had about 1 percentage point lower unemployment than the average OECD

country (n=18) in 1965-74, improving to some 2-2.5 percentage points less in 1985-2002 (see also Feldman, 2008).²

By contrast with the strikes literature, country studies of workplace employee representation are considerably more extensive, especially in the cases of Britain, using the Workplace Employee Relations Surveys, and Germany, using the IAB Establishment Panel (see, respectively, Forth, Bryson, George, 2016; Addison, 2009). That said, cross-country comparisons are mainly qualitative (see Bryson and Frege, 2010). Quantitative comparative treatments though certainly more common than in the strikes literature are still rare; examples include comparisons of Germany and Britain by Addison et al., 2000; of Norway and Britain by Bryson and Dale-Olson, 2008; and of France and Britain by Bryson, Forth, and Laroche, 2011).

The theory of workplace employee representation is of course fairly highly developed, having a basis in notions of collective voice introduced by Hirschman (1970) and developed by Freeman and Medoff (1984) in particular. Linkages with collective bargaining proper are discussed by Freeman and Lazear (1995) in the specific context of the works council, empirical support for the pro-productive nature of which in the German context (i.e. the dual system of industrial relations) is adduced by Hübler and Jirjahn (2003) on the grounds that the collective agreement may police the works council, allowing it to fulfill an integrative as opposed to distributive bargaining function. Nevertheless, the evidence on this exemplar of collective voice is mixed (see the review in Addison, 2009). Less is known of the performance effects of various types of workplace employee representation other than the works council even if more is expected of the latter by virtue of its more thorough-going information, consultation, and participation rights. Note also that outside of Germany, Austria, and (to a somewhat lesser extent) the Netherlands, the works council seldom exists in isolation. More common are systems having both union and works council bodies, whose relative importance may vary. And while employee representation may lead to improved performance via lower turnover and enhanced investment in worker human capital, the voice aspect of the collective voice model may have other behavioral influences that are less overtly favorable. That is, the exertion of voice may lead to a more strained employment relations climate. As a result, the equation of workplace employee representation with a favorable industrial relations climate is by no means clear cut, even if the performance effects may be positive. For example, in their study using the 2009 European Company Survey (ECS), Forth, Bryson, and George (2016) report that worker representation encompassing works

councils and union bodies is associated with poorer (management) perceptions of the employment relations climate but improved staff retention. However, the main preoccupation of this study is the *incidence* of workplace employee representation among the sample of 27 EU nations.

The availability of the ECS for the first time allows large-scale cross-country analysis of the effect of unionism and worker representation on a variety of outcomes including examination of the possibility that *some* industrial relations and economic effects might diverge, as in the previous study. As a practical matter, just two studies of which we are aware offer a comprehensive discussion of the *effects* of workplace representation and unionism and at the company (and national) level(s). Both use the 2009 ECS, but one in focusing upon strikes uses the reduced sample based on interviews with the designated employee representatives, while the other in examining the (subjectively assessed) economic performance of the firm uses the manager-respondent sample. It will be recalled that the present study uses both the 2009 and 2013 surveys but focuses on strikes.

In their study of workplace representation and economic performance, Van den Berg et al. (2013) estimate the impact of the ‘information and consultation body’ on the economic performance of the firm, as proxied by the subjective evaluation of the management respondent of the ‘economic situation’ of the firm on a 5-point Likert scale. The model also includes the presence or otherwise of a trade union in the firm. In a second specification, the ‘attitudes’ of the employee representation body as assessed by management (either positive or negative according to whether “the employee representation helps us in a constructive manner to find ways to improve workplace performance” as opposed leading to often leading “to considerable delays in important management decisions”) are the added regressors, albeit now only for the reduced sample of firms with an information and consultation body.

The hallmark of both specifications is the prior grouping of nations into five clusters, according to whether worker representation conforms to the Germanic, French, Anglo-Saxon, Scandinavian, or Transitional Economy models. Interestingly, it is reported that the information and consultation body has a negative impact on performance in the Germanic 3-nation cluster but is very positive in the 2-nation Anglo-Saxon cluster. The interpretation offered is that where worker involvement is voluntary the firm may benefit from installing such representation. Less controversial, perhaps is the finding that union presence has a negative effect in the French and Transitional Economy clusters

“underscoring the more active and ideological role of trade unions in these parts of the EU” (Van den Berg et al., 2013: 42). The combined effect of union presence and worker representation for the Germanic and Anglo-Saxon clusters *reinforces* the differential effects of worker representation noted earlier.

The authors’ second specification, which introduces the attitude variables, suggests that a positive management view of the worker involvement process is associated with improved economic performance in all but the Anglo-Saxon and Transitional Economy clusters, while the combination of union presence and a positive attitude generally produces a beneficial effect on firms’ economic performance.

The second study considered here by Jansen (2014) examines strike incidence. Its focus is upon union organization arguments rather than employee workplace employee representation per se. In the latter context, note that Jansen does not consider differences in types of worker representation in a single country, referring to all such bodies as ‘works councils.’ In examining how company-level effects differ across countries, in common with the present treatment Jansen deploys a mixed effects logistic regression procedure. However, drawing on separate, non-ECS indicators, he also considers the effect of cross-national differences in overall union density, number of union confederations, and union decentralization together with their cross-level interaction effects. Union decentralization is defined as the inverse of the authority unions have over local branches. Given his focus on union organizational factors, it is hypothesized that decentralization should have weakened the positive association between union and density upon strikes.³

Abstracting from differences in national trade unions systems – other than to note the finding that density, number of confederations, and degree of decentralization are found to independently increase strike activity – and focusing therefore upon his company-level effects, Jansen reports that the likelihood of a strike is some 1.4 times greater where a collective agreement is negotiated at a level higher than company level. For their part, the proportion of union members in the workforce, multi-unionism, and union penetration of the ‘works council’ are all positively related with strike incidence. For example, companies in which trade union members make up more than one-half of the local works council are 1.3 times more likely to confront a strike than their counterparts where there is no union majority.

As part of his strategy to examine detailed union organization effects, Jansen also examines interactions between these three latter arguments. Of these, only that between union membership and multiunionism is statistically significant, its negative sign

suggesting that in multi-union companies the capacity to mobilize the base is lessened because the base is both more diffuse and reflective of different interests. Interestingly, however, there is no suggestion that multiunionism weakens the organizational capacity of union-dominated works councils. The strength of this study resides in its attempt to make concrete potential differences in union organization on strike incidence, including cross-level effects of national indicators. Limitations of this and the previous study include the focus on a single cross section of data as well as insufficient differentiation between types of worker representation.

III. Data

This study uses the European Community Survey (ECS) in repeated cross-sections for 2009 and 2013, with the original files downloaded from the U.K. Data Service site at <https://www.ukdataservice.ac.uk/>. In 2009 the survey included all EU-27 countries, plus Croatia, the former Yugoslav Republic of Macedonia, and Turkey. In 2013, the ECS was enlarged with the addition of Iceland and Montenegro. Our empirical analysis is restricted to the original EU-27 nations, plus Croatia (which joined the EU in 2013) and Macedonia and Turkey.

In each year, the survey is conducted in two stages: the first, more detailed component, is an interview with a senior manager, while the second comprises a briefer interview with an employee representative in only those establishments with an employee representation body present at the workplace. These two components are referred to as the Management (MM) Questionnaire and the Employee Representative (ER) Questionnaire. The latter constitutes a necessarily smaller sample, as an establishment may have no workplace representation at all (or, even if an employee representative body – formal or informal – is present, the ER questionnaire may be missing either because the employee representative declines to answer or the manager respondent fails to provide the proper employee representative contact information). Thus, from a total of 27,160 establishments in the 2009 MM survey, no less than 13,708 (or 54.5 percent) reported an absence of any employee representation at the establishment level. Of the latter, just 47.9 percent (or 6,569 units) furnished responses to the ER survey, almost all of which (>98 percent) had formal workplace representation. (Formal and informal representation are defined below.) The corresponding number of units from the 2013 ECS were 27,019, 13,698, and 7,629, with 97 percent of the latter having a formal employee representative

body. It follows that the non-response rate in both ECS surveys is considerable. As we shall see, a second caveat concerns the combined use of the MM and ER surveys in 2013 when, unlike 2009, further data manipulation is required, the end result of which is to reduce the sample of matched establishments to 3,637 units. Both data issues are elaborated upon below.

Starting with the larger MM questionnaire, the data allow us to fully characterize the presence of workplace representation over the entire set of (30) countries. Thus, the very first step consists of generating a proper employee representation code that maps institutions to establishments, both across countries within a given year and for the two selected years. Given national idiosyncrasies (coupled with material changes in classification from 2009 to 2013), this is a quite critical aspect of our inquiry, as different assignment rules produce different employee representation types in cross-section and longitudinally.

Our first procedure was therefore to generate a 1/0 dummy, taking the value of 1 if formal employee representation is practiced at the establishment, 0 otherwise. By formal employee representation we mean the presence of a trade union entity per se or a work council type of representation. Thus, in the case of the United Kingdom, for example, formal representation requires that there is some *recognized shop floor trade union representation* or a *joint consultative committee*. Similarly, in Spain there is a formal representation whenever a *Sección Sindical* or a *Comité de Empresa* is present, while in Germany formal representation requires the presence of a *Betriebsrat* (or *Personalrat*). For its part, any ad hoc form of worker representation is classified as *informal*; examples include a *Delegado de Personal* in Spain or a *Mitarbeitervertretung* in Germany, neither of which qualify the establishment as having a formal employee representation body.⁴

Our complete mapping of formal employee representation by country for 2009 and 2013 is given in Appendix Table 1, which also documents further details used in the implemented code. Observe that countries are grouped in Types 1 through 3. Type 1 countries are permitted to have a trade union or a works council-type agency, or both, a typical case being France. Type 2 (Type 3) countries are those in which only works council (trade union) representation is allowed as in Germany (Sweden). In other words, an establishment in countries of Type 2 either has a works council or no formal employee representation body at all, while in Type 3-countries there is either a trade union or no formal employee representation body. More complicated, therefore, is the situation in

Type 1 countries where there are four possible pairs of outcomes: (trade union agency, works council), (trade union agency, no works council), (no trade union agency, work council), and (no trade union agency, no works council).

For countries in the Type 1 subset it is also possible to assign mutually exclusive employee representation agencies, despite the existence of both types of formal workplace representation. All that is required is information on the type of respondent, necessarily a member of the relevant trade union agency or a works councilor. The presumption is that whenever the two institutions are present and the person interviewed is a works councilor, then the works council is assumed to be the predominant institution. Conversely, if the respondent is a member of the trade union agency, then the union club can be thought of as dominant. In practice, this imputation rule turns out to be quite straightforward because in such countries as France, Belgium, Italy, and the Netherlands the interviewee is always a member of the works council. This information is provided in the last column of Appendix Table 1, while the generated incidence rates by country are provided in Tables 1 and 2 (unweighted data) and further commented upon in section IV below.

By design, the questions in the MM and ER component surveys are separate with almost no overlap. In particular, the employee representation information is extracted from the MM dataset, while the information regarding employee organization at the workplace is exclusively based on the ER dataset. Although matching is immediate for the 2009 ECS, as the variables are provided in a single dataset with a unique establishment identifier, this is not the case for the successor survey because enhanced confidentiality constraints in 2013 led to the variables being provided in separate files with no establishment identifier. However, it is possible to devise a strategy that uniquely maps the ER units to the corresponding MM dataset.⁵ The downside of this matching procedure is that almost 50 percent of the raw ER observations are lost in the process. As will be shown below, however, there is no obvious difference in observed characteristics across the two samples (matched and the original ER survey).

The list of variables extracted from the MM and ER datasets are described in Appendix Table 2. Beginning with the 2009 MM, in addition to employee representation status, we select establishment size (given by the number of employees in 10 intervals) and industry affiliation (11 groups), and also specify whether the establishment is an independent unit as opposed to being part of a multi-establishment organization and whether or not it is in the public sector. In addition to these establishment characteristics,

we deploy information on the type of collective wage agreement (4 categories, including no agreement) and, for our robustness/representativeness check, a measure of establishment performance in the form of managements' subjective description of the economic situation of the firm. We also identify organizational change (4 measures). A final subset of variables from the 2009 MM exploits information on the manager respondents' assessments of the quality of industrial relations at establishment level.

From the 2009 ER survey we extract variables related to union organization, namely the number of unions represented at the establishment (but see section V), union density at the establishment, and union membership of the employee representation body. Based on the latter, we generate a dichotomous variable that flags whether the employee representation entity is union dominated (set equal to 1 if trade union membership exceeds 50 percent). Accordingly, we either have a union-dominated union agency, a union-dominated works council, or none. We note parenthetically that that even if the workplace representation vehicle is designated as exclusively a union agency it does not necessarily follow that the majority of the employee representatives are trade union members.

A final subset of variables taken from the ER survey is drawn from the employee respondents' views of the state of industrial relations at the workplace. In conjunction with the corresponding measure taken from the MM survey, we compute the level of deviation from 'good' practice on the basis of the two sides' perceptions as to the quality of the general work climate. After experimentation, we constructed a single, three-element indicator. The first element represents agreement on the part of both sides that the work climate is unequivocally bad/hostile while the second and third elements are designed to reflect sharply divergent views of the parties, with management claiming that the situation is very good/good and the worker side claiming it is hostile, and conversely. Agreement between the parties to the effect that the work climate is unambiguously favorable provides the reference category.

For 2013, the number of establishment size and industry affiliation categories are reduced (to 6 and 3, respectively). Note that although the climate of industrial relations variables is on this occasion augmented, we are to construct the same three-element measure of deviation from good practice as before, including the two dissonance components. In general, the set of selected variables in 2013 is virtually unchanged with the exception of the number of trade unions present at the establishment, which variable is not available in the 2013 ECS. However, this statement masks the fact although the 2009 and 2013 surveys are very similar in structure the survey questions are not framed

in exactly the same way, requiring some effort to achieve comparable measures across time. We refer in particular to the construction of 1/0 dummies generated from the original 1-4 and 1-5 Likert scales.

Finally, we turn to our crucial strike variable(s) and the four themes of strike incidence, duration, frequency, and intensity. In the 2009 ECS, the ER survey asks respondents whether or not there have been (a) one or (b) more instances of industrial action in their establishments in the last 12 months and, in each case, whether the incident consisted of (i) a stoppage of work or strike of less than one day, (ii) a strike of one day or more, (iii) a refusal to work overtime, or (iv) some other actions. To simplify the notation let us flag (a) and (b) as $_a$ and $_b$, and (i), through (iv) as $_1$, through $_4$, respectively. We have therefore the following two disjoint subsets, $\{(_a, _1), (_a, _2), (_a, _3), (_a, _4)\}$ and $\{(_b, _1), (_b, _2), (_b, _3), (_b, _4)\}$.

Based on these two subsets, one fairly obvious construct that has found favor is to generate a 1/0 strike *incidence* dummy that simply flags the existence of a ‘stoppage or strike,’ irrespective of its duration (which in the case of stoppages is necessarily less than one day) and irrespective of its frequency (i.e. one or more than one instance). Accordingly, the generated *strike* dummy is set equal to 1 whenever the respondent reports at least one of the following combinations $(_a, _1)$, $(_a, _2)$, $(_b, _1)$ or $(_b, _2)$. This will be our first outcome measure, namely strike incidence.⁶

Given the structure of the questionnaire, one can construct some alternative ordering of the strike events observed at the workplace, and although it is not possible to construct a continuous measure of strike duration/frequency one can at least arrive at a measure of strike intensity. Thus, if the respondent reports just one instance, then the *one strike or stoppage for less than one day* case can easily be distinguished from *one strike for one day or more* case to yield the newly-generated categorical variable *strike_ord*, defined as equal to 1 if $(_a, _1)$; 2 if $(_a, _2)$; and 0 if no strike at all is reported (i.e. if *strike* = 0).

Further data manipulation is required in the case of the *more than one instance* scenario, as the counting cannot be based on $_3$ or $_4$ events (i.e. non-strike/stoppage events). Again, given the structure of the dataset, it is possible to uniquely distinguish the case of ‘more than one strike for less than one day’ from ‘the more than one strike for one day or more’ in situations where they are mutually exclusive events. These cases correspond to $(_b, _1)$ and $(_b, _2)$, respectively, so that *strike_ord* = 3 if $(_b, _1)$ and

$strike_ord = 4$ if ($_b, _2$), conditional on both ‘refusal to work overtime’ and ‘other actions’ not being observed at all.⁷

Given the procedures required to correctly code all required mutually exclusive events flagged by the categorical variable $strike_ord$ in the 0 through 4 scale, some observations are lost in comparison with the $strike$ variable. This is the cost of having some relevant measure of strike intensity. Indeed, from a total of 768 cases in which the $strike$ variable is equal to 1, $strikes_ord$ produces a total of 494 observations, with 181 coded as 1, 195 as 2, 61 as 3, and 57 as 4. The raw number of observations in which there is no stoppage/strike is of course unchanged (at 5,761).

Once $strike_ord$ is coded, the second step amounts to generating some relevant ordering. Clearly, the ordering $0 < 1 < 2 < 3 < 4$ is not valid as, for example, one strike for one month (coded as $strike_ord = 2$) would appear to dominate, say, three strikes of less than one day (coded as $strike_ord = 3$); while, similarly, two strikes of two days (coded as $strike_ord = 4$) are apparently dominated by, say, one strike of one week (coded as $strike_ord = 2$). In other words, any of the ordering $2 < 3$, $2 < 4$ can be reversed, while $3 < 4$ can be reversed as well. Given the construction of $strike_ord$, it nevertheless transpires that the ordering $0 < 1 < \text{all the rest}$ (the rest being given by the amalgamation of cases defined by the categories 2, 3, and 4) can be implemented safely. Furthermore, the following more restrictive cases are also valid: $0 < 1 < 2$ (cases 3 and 4 are dropped); $0 < 1 < 3$ (cases 2 and 4 are dropped); and $0 < 1 < 4$ (cases 2 and 3 are dropped).

Alternatively, we may flag the number of strike episodes. In this way, we have a newly generated variable, $strike_N$, defined as equal to 0 if none (or $strike = 0$); 1 if there is one strike (amalgamating strikes of less than one day and strikes lasting one day or more); and 2 if there is more than one strike (again amalgamating the two possibilities). In this scenario, we have $0 < 1 < 2$, and we end up with 631 ‘non-zero’ observations, a larger number than in the previous $strike_ord$ case as some of the cases in which ($_b, _1$) and ($_b, _2$) were both observed need not to be dropped in this configuration.

Another possibility is to flag strikes of less than one day’s duration versus those strikes lasting one day or more, to obtain the variable $strike_dur$, set equal to 0 if $strike = 0$; 1 if strikes are of less than one day; and 2 if strikes are of one day or more. Again, we have $0 < 1 < 2$, with no need to discard any of raw 768 observations.

Thus, the 2009 ECS offers scope for constructing strike measures that range beyond incidence. Unfortunately the options for exploring strike intensity and context are much more heavily circumscribed in the case of the 2013 ECS. The major limitation is

that we are no longer informed as to whether the strike is a single event or not. Accordingly, for 2013, our sole strike measure is based on the *strike_dur* variable.

IV. Modeling

Our basic regression model that explains strike incidence can be described as follows:

$$Y_{ij} = B_0 + B_1X_{1ij} + B_2X_{2j} + u_j + e_{ij}, \quad (1)$$

where entity i is nested in group j , with $i, = 1, 2, \dots, I$, and $j = 1, 2, \dots, J$. Omitting these establishment and country subscripts, X_1 and X_2 denote a vector of establishment- and country-specific characteristics, respectively. In particular, X_1 includes establishment size, industry affiliation, and type of workplace employee representation inter al., while X_2 may include any characteristic that is common to all entities in a given country. Familiarly, u_j is a random intercept (or group-level disturbance) that is assumed to be uncorrelated with both X_1 and X_2 and the error term e_{ij} . Y_{ij} is the selected 1/0 outcome indicator. The resulting two-level mixed-effects logistic model is implemented using the *melogit* command in Stata 13.1.

One possible extension of equation (1) is to allow for a random slope of, say, establishment characteristic x_{1k} , in which case the model becomes:

$$Y_{ij} = B_0 + B_1X_{1ij} + B_2X_{2j} + u_{0j} + u_{1j} * x_{1kij} + e_{ij}. \quad (2)$$

Neither model contains an unobserved establishment term because no longitudinal dimension is available in the data. However, we could have specified a third level to flag the survey year (i.e. 2009 and 2013). Given that many of the observables do not have the same definition over time, however, inclusion of a third level would require a considerable number of assumptions. Accordingly, we opt to present separate estimation results for each year.

In the first place, as was implicit in our earlier remarks, a key component of our modeling strategy from the outset was the construction of outcome measures additional to strike occurrence. That is, we shall subsequently replace the strike incidence dummy in models (1) and (2) with a measure of strike intensity (and duration and frequency). This in turn involves the use of a two-level mixed-effects ordered logit with Y_{ij} now flagging a categorical and ordered variable. In the case of strike frequency, for example, 0, 1, 2 may denote ‘no strikes,’ ‘one strike,’ and ‘more than one strike,’ respectively. For strike duration, the ordered variable can be characterized as 0 for ‘no strikes,’ 1 for ‘strikes for less than one day,’ and 3 for ‘strikes of one day or more.’

Secondly, for both 2009 and 2013, we experiment with different comparison groups. For example, once we draw a distinction between formal and informal worker representation, it is possible to contrast ‘absence’ of worker representation with any type of formal worker representation. All that is required in this case is simply to proxy ‘absence’ by the presence of ‘informal’ worker representation, followed by the selection of the corresponding samples as described in the data section. The point here is that even if the presence of an informal body is small in percentage terms, it is sufficiently sizable for us to be able to gauge the impact of having no (formal) workplace representation at all.

Thirdly, it will be recalled that by being able to identify the interviewee, it is possible in practice to flag the prevalent type of formal workplace representation at establishment level. This key aspect allows us to uniquely contrast these two types of worker representation (and indeed with the absence of worker representation as well, using the proxy described in the previous paragraph). Furthermore, using the information on the percentage of trade union members in the prevalent worker representation agency, we can also distinguish between a union-dominated works council and a union-dominated union club.

Finally, we use workplace deviation from agreed best practice labor relations – where mutual agreement on there being good labor relations is the reference category – to proxy the quality of industrial relations, inter al. The hypothesis is that difference between the two sides as to the state of workplace relations, and even mutual agreement to the effect that conditions are in fact bad, are aspects of ‘dissonance’ which we regard as a symptom of less cooperative industrial relations at establishment level, likely mirrored in a higher level of contestation. It may also reflect trust and asymmetric information if, as Blanchard and Philippon (2004) surmise, the quality of the dialogue between the two sides captures the speed of learning of labor. Further, we would conjecture that the use of this deviation from best practice industrial relations argument may have the advantage of reducing the presence of any endogeneity bias arising from the use of a one-sided or unilateral measure of quality.

Our focus on worker representation at the workplace has a basis in the notion that works councils ‘work,’ that is, such entities reduce strikes on much the same lines as they are expected to improve firm performance because of their informational, consultative, and, ultimately participative/codetermination roles. Also, because of (diminished) rent seeking, more is expected of works councils than similar union workplace agencies (but

see below). Further, other things being equal, problems such as information asymmetries and (slow) speed of learning of the worker side associated with strikes in the formal literature can in principle be resolved in the works council model.

This brings us to the role of unionism per se. Abstracting to begin with from the union-workplace representation nexus, the simple contention of organizational models is that unions ‘cause’ strikes in the sense that they have the often unique capacity to strike (i.e. make the decision to withdraw labor). The potential problem here is of course that if it is union power we are talking about then, mistakes aside, unions should mostly achieve their goals without the need to strike, management recognition of that power duly leading to management concessions and settlements.⁸ However, to the extent that unions are generally not to be viewed as integrative bargaining institutions, there are grounds for expecting a positive association between union density and strikes on enhanced capacity to strike grounds.

Another union organizational variable is the number of unions present at the workplace. Multiunionism causes especial problems. Not only has it been linked to poor firm performance – perhaps most notably in Britain (see Metcalf, 2003) – but there is also a distinct literature linking multiunionism to strikes. Thus Akkerman (2008), using industry-sector-level data for seven European countries for the years 1990–2006, reports a strong relationship between multiunionism and strike incidence. Her explanation for this association is that where unions are divided they will make propagandistic use of strikes to attract members. The counter argument that in such circumstances unions compete with each other by driving up wage demands does not find support in the data. We, too, found a strongly positive association between multiunionism and strike incidence in the ECS data, but do not present the results here because of a sharp fall-off in sample size due to missing observations on the variable. (However, full results are available from the authors upon request.)

The association between union organization and worker representation agencies has typically been downplayed in the literature other than for Germany given that country’s unique dual system of industrial relations. The German literature on firm performance suggests that distributional conflicts regarding the terms of employment at the firm level may be avoided because they have already been settled at sectoral level, leaving the works council free to focus on production issues and engage in integrative bargaining (Hübler and Jirjahn, 2003). More recent research offers some confirmation of this finding. Thus, Addison et al. (2016) report that, although there is weak evidence that

German collective bargaining inhibits innovation, it might actually foster innovative activity when taken in conjunction with workplace representation in the form of a works council. However, Germany may be a special case (for the French case, see Fairris and Askenazy, 2010), and there is also enough evidence for that country that works councils are not a datum but differ in type (Dilger, 2002). In the present study, therefore, we exploit the question in the survey allowing us to identify situations in which more than 50% of works councilors are union members, one hypothesis being that union-dominated works councils may be more likely to be involved in distributive bargaining and thereby experience more conflict. In a parallel exercise, we investigate whether greater union density nullifies any potential advantage of a works council over the alternative formal representation type (the union club). The interaction term between union organization and both types of formal representation thus offers a clearer view of the role of organizational capacity at the workplace. We do not anticipate that the sign of the coefficient on the interaction term should differ from that on union dominated works councils.

With respect to bargaining structure there is a presumption in the literature in favor of company agreements, at least insofar as firm performance is concerned (Jimeno and Thomas, 2003; Boeri, 2014). On the basis of that literature, and assuming that strikes do indeed have negative implications for productivity and profitability, there is an expectation that strikes will be higher when bargaining is conducted at levels higher than firm or company level. Even if accepted at face value, this argument is likely to have been attenuated by the growth in decentralization of both sectoral and national bargaining, some hint of which might be conveyed by comparing 2013 with 2009. The bottom line would perhaps be that less today is to be expected of the standard bargaining level arguments (such as those captured in the ECS) than heretofore (Visser, 2013, 2016). However, even if as anticipated such changes prove accommodative and lead to reduced strike incidence and improved firm performance any such positive influence may nevertheless take some years to take effect. Indeed, in the interstices, the process of change may prove disruptive (see Brandl and Ibsen, 2014). In extending the reach of our strikes analysis to accommodate national idiosyncrasies, we shall therefore rely on some long-standing differences between countries.

From the perspective of Pareto optimal accident models of strikes (Siebert and Addison, 1981), we need to look at role of changing workplace conditions. (Other arguments that may be related to the accident model include firm size and non-independent units, reflecting workplace and institutional complexity, respectively.) Our

premise would be that the greater the change in working conditions, the greater the likelihood of mistakes and the higher strike incidence.

Finally, we revisit the question of strike measure. As noted earlier, we experiment with three new strike measures in addition to incidence. This is partly because work using the ECS dataset has only used the incidence measure (Jansen, 2014), and in part because of the perhaps inevitable imprecision of any single measure gleaned from the ECS. We readily admit that which strike measure to use as the dependent variable is not obvious, as Stern (1978) noted long ago. Country studies in continuing to provide estimates using these alternative measures, have typically assumed, either implicitly or explicitly, that variables measuring frequency, size, and duration reflect similar information (see Hirsch and Addison, 1986), even if more recent research suggests that strike duration is counter-cyclical whereas strike frequency *may* be pro-cyclical (see Crampton and Tracy, 2003: 104-108). We construct three additional strike measures simply to determine whether there is anything distinctive in the results for incidence.

V. The Effect of Workplace Employee Representation on Strike Incidence, Strike Frequency and Strike Duration

Workplace employee representation across Europe

A key aspect of this study is the setting of comparable workplace employee representation institutions across Europe. Given national idiosyncrasies, as a first step we implemented a set of procedures to ensure a proper mapping of these workplace entities, a full description of which is provided in Appendix Table 1 and the accompanying *Notes*. To facilitate ease of replication, the table also contains the raw variables codes used to generate the respective categories.

As described in the data section, in order to make the generated trade union and works council dummies sufficiently comparable across a large sample of countries, we used the notion of ‘formal’ workplace employee representation. However, while the mapping of institutions to countries was relatively straightforward in 2009 (see also Forth, Bryson, and George, 2016) considerably greater effort was required to achieve comparability in the successor ECS survey for 2013, given the changes in the definition of the relevant raw variables. Full details of our procedures are again described in Appendix Table 1.

(Table 1 near here)

In Table 1, we present the derived values of union ‘clubs’ and works council incidence by country, using unweighted data. (The corresponding statistics based on weighted data are available upon request.) As in some countries the two agencies may coexist at the same workplace, separate columns of the table indicate for each country the percentage of establishments in which there is only a single formal representation agency (either a union ‘club’ or a works council, but not both) (in columns (1) and (2)), and the percentage of establishments with the two types (column (3)). We also provide in column (5) information on the presence of any type of employee representation (formal and informal), so that the incidence of informal representation can be easily derived by subtraction from column (4). The last *row* of the table reports the overall, cross-country incidence of employee representation.

Starting with the latter in 2009, columns (1) and (2) show that representation in union bodies alone obtains in 14 percent of all establishments, while works council representation alone is to be found in 18 percent of the cases. The corresponding proportions in 2013 are virtually the same, at 15 and 19 percent. Formal representation, in column (4), is found in almost one half of all selected European establishments (or 48 percent to be more precise); and by comparing the last two columns, observe that informal representation is a residual 2 to 3 percent. Accordingly, works council-type representation is slightly more common than the corresponding union agency, while one in two establishments have formal employee representation.

The dispersion in the incidence of workplace representation across countries is obviously large, ranging from situations in which countries have a persistently high presence of formal worker representation, at approximately 70 percent in Denmark, France, the Netherlands, and Sweden, to those in which it is less than below 25 percent (Greece, Malta, and Portugal). This heterogeneity is well illustrated in Figure 1 in the next subsection, where the regression random intercepts are plotted for each country.

Table 2 uses the notion of prevalent or dominant employee workplace representation, again providing incidence rates. Following the definition given in the data section, each establishment with a formal employee representation system is flagged as either a prevalent union or a prevalent works council entity. Recall that these are mutually exclusive categories by construction. Overall, the split between the two cases in establishments with a formal representation body is virtually equal, at 24/24 percent in 2009 and 25/23 percent in 2013, respectively. Thus, taking into account the results in Table 1, which indicate that the sample probability of a European establishment having a

formal employee representation body is about 50 percent, it follows that roughly one in four European establishments will have a union agency, one in four a works council-type of representation, and two in four will have no formal employee representation at all (unweighted data).

(Table 2 near here)

Using the distinction between prevalent works councils and prevalent union entities, in conjunction with information on the percentage of trade union members in these employee representation bodies, Table 3 gives the percentage of union-dominated agencies in the two survey years. Starting with 2009, 60 percent of all establishments with formal employee representation have a majority of union members among the employee representatives. The percentage is given in the last column of the table. In turn, from the first two columns of the table we see that union dominance is as expected higher among establishments with a union entity than in establishments with a works council, at 78 and 35 percent, respectively, whenever there is a single entity at the workplace. It is also clear that the works council agency will tend to be more often dominated by the union if the two agencies are present vis-à-vis the situation where the works council appears as the single representative agency (56 and 35 percent, respectively).

[Table 3 near here]

Before describing the interesting corresponding patterns as of 2013 a caveat is in order given that in approximately 50 percent of the cases it was not possible to compute whether a majority of union members was present. This percentage is substantially higher than in the 2009 survey. The results for 2013 are therefore based on a smaller sample than for 2009. It might be the case that the reduction in the overall incidence of union domination from 60 percent in 2009 to 40 percent in 2013 (last column) reflects sampling differences. However, since the means of the non-missing observables are quite close in the two surveys (as described in Appendix Table 2), we interpret the observed reduction rather more as a confirmation that unionism is ‘slip sliding away.’ In any event, note the confirmation of the result that works councils tend to be increasingly dominated by trade union members in circumstances where both the union and works council agencies coexist (compare the values of 75 percent in the fourth column with 60 percent in the second). The weaker unionism trend is also mirrored in the reduced percentage of union-dominated union clubs in 2013, at 36 and 35 percent, in comparison with 78 and 72 percent in 2009, for the corresponding subsets of ‘union representation only’ and ‘prevalent union.’

Strike incidence

Table 4 reports the first set of regression results generated by our modeling strategy. The estimated coefficients are presented separately for the 2009 and 2013 surveys in panels (a) and (b), respectively. The main reason for not pooling the data or implementing a three-level mixed effects model is, it will be recalled, distinct differences in sample size, as well as the differences in industry classification and collective agreement type.

[Table 4 and Figure 1 near here]

In column (1) we present our baseline model, that is, the implementation of equation (1). In this case, country heterogeneity is dealt with by introducing random country intercepts. The log-likelihood ratio test at the base of each panel confirms that the two-level mixed effects model is preferable to an ordinary logistic regression, while the variance component $\hat{\sigma}_u^2$ is statistically significant, meaning that countries do differ in their strike incidence rate, other things equal. This variation is plotted in Figure 1, where countries are arranged by increasing order, with Italy, Portugal, and Greece in particular showing higher than average intercepts (or a higher than average strike incidence) in both survey years. France in 2009 and Spain in 2013 are also notable cases.

The first block in the table contains the set of worker representation and union organization variables. Observe initially that in considering the roles of the works council, the union-dominated union agency, and the union-dominated works council the state of being a nonunion-dominated union club is the reference category. Accordingly, the coefficient estimate of the first dummy variable allows us to obtain the works council effect vis-à-vis the nonunion dominated union club situation, while the second coefficient gives the union domination effect in relation to the nonunion-dominated agency, and the third coefficient the union domination effect versus the nonunion dominated works council. Thus, as shown in column (1), a (prevalent) works council agency is associated with a lower strike incidence than is the case where workplace representation is through a union agency or club. In contrast, the positive coefficient on the union-dominated works council indicates that establishments in which a works council is dominated by union members have a higher incidence of strikes than the situation in which there is no such majority. The coefficient of the union-dominated union agency is in turn not statistically significant at conventional levels. *Vulgo*: a majority/minority of union members is expected to be less of an issue whenever worker representation is in the form of a union club.

Regarding the direct role of trade membership, there is a statistically strong indication that union density at the establishment level implies a higher strike rate. Less obvious, however, is the role of the interaction between union density and workplace representation, with the two corresponding two interaction terms failing to achieve strong statistical significance. We have therefore the result that once we control for the full set of workplace institutions, only the level of union density seems to play a discernible role. Union density will be further addressed in the context of model specification in column (3).

A connected issue is multiunionism. First of all, note that the variable is not included in the common set of regressors in panels (a) and (b). The reasons are twofold. First of all, the variable is missing in 15 percent of the cases, further reducing the 2009 estimation sample. Second of all, the variable is simply not available in the 2013 ER survey. In any event, introduction of this covariate (albeit not reported in the table) was found not to disturb either the signs or significance levels of the selected set of regressors included in column (1). That said, there was clear confirmation in the data of the result from past research: the higher the number of trade unions at an establishment, the higher is strike incidence.

Strike incidence is clearly higher in the public sector, raising the wider issue that the role of worker representation and labor organization may differ across the private and public sectors. However, we postpone examination of this issue until after we have reviewed the baseline results for 2013. Meantime we see that single establishment firms clearly evince a lower strike incidence rate than their multi-establishment counterparts, while collective agreements at higher than company level are associated with a greater incidence of strikes. However, for their part neither company-level agreements nor the mixed collective agreements display statistical significance at conventional levels. In terms of industry affiliation it appears that the Education sector is more strike-prone than Manufacturing and Energy (the omitted category), while all the other sectors reveal a lower strike incidence albeit never achieving statistical significance at the 0.01 level. Furthermore, larger establishments are more likely to have strikes.⁹

All of these findings pertain to 2009. The results for 2013 are presented in panel (b) of the table. It can be seen that union density, works councils, and union-dominated works councils remain statistically significant and of the expected sign, although for the former variable only at the 0.10 level. For their part, both the union-dominated union club and the two interaction terms are not statistically significant. In contrast with 2009, the

public sector in 2013 no longer displays a differentiated role. These findings would appear to speak to the erosion of unionism.¹⁰ Finally, all the regression diagnostic statistics for 2013 are very much similar to those reported for 2009.

In columns (2) and (3) of the table we take a closer look at the role of the public sector and union density by allowing for random slopes of the two arguments across countries, no longer assuming, as in column (1), the presence of a unique, public sector/union density term common to all countries. If for a given country strike behavior is driven by the particular profile of the public sector, then we should expect a different pattern of results in column (2) than for column (1). Equally, if union density ultimately flags country idiosyncrasies, then country slopes will play a role such that the results in column (1) may no longer hold. In both exercises, we also plot the corresponding country (random) intercepts and slopes in Figures 2 and 3; a higher than average country intercept indicating a higher strike rate or, in the case of the random slope, that the impact of the variable is larger in magnitude than the average, all else constant.

In 2009, in particular, we see that allowing a country slope for either the public sector variable or establishment-level union density, does not have any major impact on the estimated coefficients. It is true that the union density term alone is statistically weaker in column (3), and that the impact of higher than company collective agreements vanishes, but the principal result from column (1) – that works councils ‘work’ provided they are not union dominated – holds comfortably.

In 2013, given that the public sector variable is not statistically significant in column (1), our expectation is that the corresponding introduction of a random slope in column (2) will not materially change the results. That is indeed the case, with only the statistical significance of the union-dominated works council term decreasing slightly. In column (3), this variable maintains its significance at the 0.10 level but neither the works council nor the union density variable is statistically significant. On the whole the three exercises for 2013 in columns (1) through (3) show that in comparison with 2009 the differentiated role of workplace representation through a works council as opposed to a union club is becoming less pronounced.¹¹

[Figures 2 and 3 near here]

Country heterogeneity corresponding to columns (2) and (3) of Table 4 is shown in Figures 2 and 3, respectively. For the random intercepts case – item (i) in panels (a) and (b) of the two figures – observe that the country rankings obtaining in Figure 1 are maintained to a very large degree; with Italy, for example, always occupying an elevated

position in the ranking. Regarding the corresponding country slopes – items (ii) – note that in Figure 2 country variability is clearly less pronounced than in Figure 1, especially in 2013, while in Figure 3 variability is visibly smaller across countries and also much smaller in magnitude.

Strikes may be regarded as bargaining failures, and in Table 5 we next introduce the deviation in perceptions or dissonance argument which is perhaps best seen as proxying trust at the workplace. In panel (a), column (1), we see that *dissonance* has indeed a strong impact on strike incidence: if worker representatives and management differ on their views about the work climate, or the two parties consider that the *climate* is not good, then strikes will be higher. (Recall that mutual agreement on a good climate is the reference category.) All the other reported coefficients remain very stable in comparison with column (1) of Table 4. The evidence on the impact of workplace representation types for 2013 in panel (b) is as expected less strong, but *dissonance* remains a very good predictor, especially in the case of *dissonance_3*. Whether these results are ultimately produced by a much smaller number of establishments in the 2013 sample is yet an issue.

[Table 5 near here]

Columns (2) and (3) of the table present results for a smaller set of western European countries in which workplace representation has a long tradition. Although the use of subsets of the full sample of 30 countries has obvious consequences for the size of the estimation sample they offer the prospect of a reduction in unobserved country heterogeneity. In column (2) of the table, we first present results for a subset of 17 western European countries. The results are in line with our priors. That is to say, the findings for 2009 seem to be well established. Indeed, for all the worker representation and labor organization variables appear somewhat stronger than before, although it remains the case that the evidence is considerably weaker for 2013.

Next, in column (3) of Table 5 we follow Blanchard and Philippon (2006) in distinguishing between three types of western European country based on the attitude of the nation state towards early unions (i.e. dating back to the 19th century) in the manner of Crouch (1993). On this basis, 13 countries are divided into three main state traditions: supportive (comprising Germany, the Netherlands, and Austria), hostile (France, Italy, Spain, and Portugal), and neutral (Denmark, Sweden, Finland, the United Kingdom, Ireland, and Belgium). Designating ‘neutral’ as the omitted category, we have the two additional dummy variables shown in column (3). We expect in this case to closely

replicate the results for 2009, both with respect to of columns (1) and (2), and at the same time achieve improved definition of the results pertaining to the impact of works councils and union-dominated works councils in 2013. The former expectation is confirmed, and although the result for union dominated works council is amplified the works council argument itself still lacks statistical significance. Favoring Crouch is the finding that all countries with a more entrenched catholic tradition evince higher strike incidence.

Columns (4) and (5) give the last set of experiments for strike incidence. In column (4), we proxy an *absence* of workplace employee representation by those interviewed establishments that report only the presence of informal representation. Since all the ER-interviewed units have by definition formal employee representation, the results presented thus far lack any comparative track across groups with and without worker representation. The estimates reported in column (4) suggest that both the presence of works councils and the absence of any (formal) employee representation ‘work’ in comparison with the union club case. (Note that the union club is the omitted category as, by construction, we cannot distinguish between union- and nonunion-dominated agencies by informal representation.) The relatively lower statistical significance and magnitude of the works council coefficient imply that in practice neither variant of formal employee representation has a fundamental impact on contestation. In other words, if there is worker representation, whether it is a works council proper or a union club may be of secondary importance – ultimately only the issue of union domination matters. In sum, although we do not want to force the argument and claim that the set of establishments with informal representation in the ER dataset is fully representative of the entire set of establishments without worker representation, these findings do seem to make the point that the strike rate is likely to be lower in the absence of any (formal) employee representation at the workplace.

Finally, in column (5) we examine the effect on strikes of organizational changes at the workplace. These are defined as changes in the preceding three years and can therefore be reasonably assumed to pre-date the strike event(s). As hypothesized in section IV, our expectation is that such changes will be an autonomous source of strike variation. Thus, confirming our priors, changes in the remuneration system do seem to generate higher strike incidence. On the other hand, not only is this not true of the remaining organizational change arguments, but also by 2013 there no longer the suggestion that changes in the remuneration system are associated with higher contestation.

Strike duration, strike frequency and strike intensity

We now present results from an exercise in which the strike incidence dummy is refined to yield three alternative strike indicators, namely strike duration, strike frequency, and strike intensity. These three ordered categorical variables are separate (but not disjoint) measures containing different but complementary information sets, with none of the three indicators having any obvious comparative informational edge. Ideally, we should have full information on the number of days lost but no such measure can be derived from the ECS survey(s).

The main goal of the exercise is therefore to supplement an admittedly arbitrary strike incidence dummy (albeit one used in the literature) by some ordered categorical variable. In all three cases, we generate three disjoint groups; for example, in the strike duration case, group 0 stands for ‘no strikes’, group 1 for ‘strikes for less than one day,’ and group 3 for ‘strikes of one day or more.’ However, as we have seen in section III, the limitation is that it is not possible in practice to implement this exercise without reducing the estimation sample. Indeed, given the structure of the dataset, not all strike events can be uniquely converted into one of our generated categorical groups, the implication being that some establishments with strikes will be dropped from the sample. In terms of the ordered logit, the procedure is likely to imply less clear-cut cutoff points than it would otherwise obtain. Further, the exercise is necessarily confined to 2009 as the variables *strike_N* and *strike_ord* cannot be obtained for 2013.

[Table 6 near here]

The results are given in Table 6 where, in the interests of parsimony, we only report the predicted probabilities of the three possible outcomes Pr0, Pr1 and Pr2 (where 0, 1 and 2 denote groups 1, 2 and 3, respectively) for each strike outcome indicator. We also confine our attention to a comparison of two particular workplace representation types: the union-dominated works council versus the nonunion-dominated works council. Quite apart from economizing on space, in the light of the preceding analysis this focus offers the most clear-cut case. The set of included regressors is the same as in Table 5, column (1), and we note that all the estimated coefficients of the corresponding ordered logit model maintain their sign and statistical significance. Each of the cutoff points is also statistically significant.

Beginning with the strike duration case (Case 1), the first column shows that works council establishments with union domination are clearly less likely to be free of

strikes than their nonunion-dominated counterparts, with probabilities of 0.776 and 0.930, respectively. Conversely, the probability of having strikes for less than one day or strikes for one day or more is visibly higher for union-dominated works councils, at 0.091 versus 0.033, and 0.132 versus 0.035, respectively.

These results carry over to Case 2, where the alternative strike measure is now given by the frequency variable (*strike_N*). Given that in the ‘more than one strike’ case we cannot distinguish between, say, a strike for 2 days from a strike for 5 days, the similarity between Cases 1 and 2 should not be at all surprising. In any event, in looking at the sum of Pr1 and Pr2 (i.e. 0.223 and 0.201, respectively), it seems that union-dominated works councils are very slightly more likely to experience a longer duration of strikes than be involved in a higher number of strikes.

In Case 3, we offer a further refinement, this time in seeking to model strike intensity rather more rigorously. The case entry has four columns in each of which we have groups 0 and 1 defined as ‘none’ and ‘one strike for less than a day,’ respectively; whereas group 3 is differently defined in columns (2), (3) and (4) – as ‘one strike for one day or more,’ ‘more than one strike for less than one day,’ and ‘more than one strike for one day or more,’ respectively – thereby introducing some intensity ordering. In column (1), group 3 is defined as ‘all else,’ which is some amalgamation of the cases defined in columns (2) through (4). As explained in the data section, searching for higher precision in the outcome measure comes at a cost of an even smaller estimation sample, so that the number of establishments in groups 1 and 2 in columns (1) and (4) declines from 417 to 201.

Two main conclusions can be extracted from Case 3. First, there is confirmation that Pr0 is persistently smaller among union-dominated works councils, while Pr1 and Pr2 are always higher. Second, that there is no indication that union-dominated works councils favor ‘more than one strike for one day or more’ (column (4)) over, ‘one strike for one day or more’ (column (2)). Rather, the evidence is to the contrary.

ER survey respondents versus non-respondents

The ER survey provides information on strikes, worker presentation, and labor organization at the workplace, but is conducted for only a subset of the MM interviewed establishments. Based on the MM interviews, we know exactly whether there is a formal or informal (or indeed no) worker representation. However, given that not all establishments with worker representation are actually interviewed, an unsettled issue is

whether the reported results are driven by an unrepresentative set of respondents. By properly combining the two (MM and ER) datasets – that is to say, the sample of respondents and the entire sample of respondents and non-respondents – we are in a position to test for the presence of any obvious non-response bias arising from any unobserved self-selection mechanism that renders the set of ER respondents unrepresentative of the entire population of establishments with a formal employee representation body. As can be seen from Table 7A, the response rate in 2009 and 2013 is 48 and 56 percent, respectively, with a large within and between country dispersion.

(Table 7A near here)

Our test amounts to using a common set of regressors, necessarily extracted from the MM questionnaire(s), and then running an establishment performance model so as to establish the extent to which the non-ER respondents are statistically different from the ER respondents. Note that we prefer to use a behavioral model linking establishment performance to a set of observed establishment characteristics instead of some alternative procedure such as a difference-in-means test. Rather than seek to provide a precise causal model, our main concern here is to determine whether the determinants of performance are seemingly distinct across the two groups of respondents and non-respondents. In particular, our simplified model in Table 7B specifies establishment economic/financial performance as a function of a common set of regressors that includes sector affiliation, establishment size, collective agreement type, single establishment and public sector status, in addition to the prevalent form of employee representation. Establishment performance is a subjective dichotomous measure defined as equal to 1 if the economic/financial situation of establishment is very good or good, 0 otherwise.

[Table 7B near here]

Observe that labor organization arguments cannot be included in the model as information on these institutions is only available in the ER questionnaire. Similarly, as our dissonance indicator is not available for non-respondents, we elect to use the manager-respondent's perception of the quality of industrial relations at the workplace.

For 2009 we introduce the dummy *ERint* to flag the situation where an establishment has actually been interviewed. As can be seen from column (1), this dummy is not statistically significant. We note that by running separate regressions, in columns (2) and (3), the set of statistically significant industry dummies in these two columns have the same sign as in column (1). The same is true of the establishment size variables. In turn, company-level agreements seem to be more favorable to performance in columns

(1) and (3), at the .05 level but not in (1). The model also indicates that, as expected, the climate at the establishment level is a good predictor of establishment performance, as well as the presence of a works council vis-à-vis a union club, although the suggestion in the case of the works council variable is weaker in column (2).

For 2013, the exercise is more daunting as it is not possible to append all the MM variables to the entire ER dataset due to data confidentiality restrictions. We are therefore forced to use a reduced sample of ER respondents, rather than the full set as in 2009. Furthermore, the same data constraints preclude use of the *ERint* dummy, and therefore for 2013 we rely exclusively on the separate regression results in columns (2) and (3). These closely resemble those found for 2009 in the sense that no statistically significant variable changes sign. In particular, the pro-productive effect of works council is found to be statistically significant at the 0.05 level in both the reduced and enlarged samples. In short, assuming that the set of regressors included in the performance model are not too alien to the explanation of the strike event, there is little reason to suppose that the results presented in Tables 4 through 6 have a basis in a particular and biased sample of respondents.

VI. Conclusions

This paper has offered a comprehensive look at strikes in a cross-country setting, using the two most recent waves of the European Company Survey for 2009 and 2013, a unique large-scale representative survey of firms in both the private and public sectors of the European Union covering some 27,000 companies with 10 or more employees.

The themes examined in order of importance were the effects on strike activity of workplace representation (and different types of workplace representation), union organization (and its interaction with workplace representation), the architecture of collective bargaining, and the quality of industrial relations and/or trust. Additional themes examined were nation-state idiosyncrasies and organizational changes within the firm. The main strike indicator used was incidence, although we also reported results for the key workplace representation argument for three other constructs designed to capture strike duration, frequency, and intensity. Results were presented for the two cross sections of the data, and the representativeness of the employee survey, containing the strike data, with respect to the entire sample of establishments in the management survey with a formal workplace representative body was also addressed.

Our main findings can be summarized as follows. Beginning with our baseline model for 2009, the principal finding is that a (prevalent) works council agency is associated with a lower strike incidence than the case in which the workplace representation operates through a union agency. That said, where union dominated, works councils have a higher incidence of strikes than otherwise. On the other hand, union domination is less of an issue where the union club is the prevalent agency. As far as union organization is concerned, the major impact on strikes is direct: union density at the workplace is associated with greater strike incidence, even if union density does not appear to much influence the effect of union domination of either works councils or union clubs. There is also the suggestion that collective bargaining at levels higher than the company level, although not multi-level bargaining, is associated with elevated strike activity. Finally, strikes are higher in the public sector than in the private sector, in larger establishments, and in defined sectors. They are also lower in single establishment firms. These results largely carry through once we allow for random slopes of the public sector and union density arguments.

However, bigger changes are observed when attention shifts to the second wave of the ECS. In 2013, works councils, union dominated works councils, and union density remain statistically significant but only marginally so for all but the union-dominated works council argument. So we see a reduction in the impact of worker representation and union organization over time. Interestingly, company level agreements now evince significantly lower strike activity and the public sector is no longer associated with elevated strike activity. Arguably, therefore, some might see in the pattern of results what might be termed a reduction in the disadvantages of unionism. In any event, these changes are strengthened once we allow for different country slopes for the union density and public sector arguments, such that we can say rather less controversially that the differentiated role of workplace representation through works councils and union agencies is becoming increasingly indistinct.

We next introduced into the baseline model a variable designed to capture the climate of industrial relations based on the perceptions of both sides of the deviation from best practice (the omitted category reflecting mutual agreement that the quality of industrial relations was good). The construction of our three-element inverse measure of climate was designed in large part to accommodate dissonance, while reducing problems of simultaneity. For 2009 it was found that all three ‘dissonance’ components were associated with heightened strike activity, while all previous results for worker

representation and union organization inter al. either remained intact or were strengthened. The results for 2013 were expectedly weaker although a key dissonance indicator remained statistically significant at the 0.01 level.

In subsequent iterations, we reestimated this trust-augmented model (a) over different samples of (western European) countries, (b) to accommodate an ‘absence of workplace representation’, and (c) to reflect of organizational change within the establishment. We reported that a focus on western European countries seemed to be offer a reduction in unobserved country heterogeneity, while still allowing us to identify some long-standing country-differences in industrial relations ‘habitat’; that strike rates are likely to be lower in the absence of formal representation; and that changes in organization are associated with mixed effects on strike incidence.

Our final set of estimations, sought to establish, firstly, whether our focus and indeed that of the literature on strike incidence was idiosyncratic, masking potential differences among alternative strike measures and, secondly, whether our results were contaminated by non-response bias given that not all ER firms participated in the strike survey. In the former case, we were able to offer support for our central finding from the 2009 ECS regarding union dominated councils, such agencies experiencing more strikes, longer strikes, and more intensive strikes than their nonunion-dominated counterparts. In the latter case, estimating firm *performance* equations using data from both the 2009 and 2013 surveys for separate samples of ER respondents and the entire body of ER respondents and non-respondents gave us no grounds to suppose that our earlier results were based on a particular and biased sample of respondents,

A priority for future research is to accommodate changes in bargaining coverage, bargaining structure, and bargaining coordination (see for example Visser, 2013, 2016). We have noted one ambitious attempt by Braakmann and Brandl (2016) to exploit one particular typology based on three key aspects of collective bargaining systems: the level of bargaining (national, sectoral, and company-level), the degree of horizontal coordination, and the degree of vertical governability of bargaining (see Traxler et al., 2001). A key finding finding from this study that there is no single country in which one single system of collective bargaining exists. It will be interesting to determine whether or not particular bargaining structures in such hybrid systems prove stable in terms of economic outcomes and what if anything they have to say about bargaining failures and strike activity.

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1. For studies comparing two countries, however, see Coutrot (1998) and Whitfield, Marginson, and Brown (2004).
2. Although, in a dissenting judgment, Addison and Teixeira (2009) are unable to replicate the Blanchard and Philippon model in an approach that incorporates a number of innovations, including the use of annual strike data and other time-varying institutional variables, and controlling for the endogeneity of strikes.
3. Observe that conceptually this decentralization is one aspect an important change in sectoral and higher-level collective bargaining in recent years: the so-called ‘perforation’ of collective bargaining systems. We know of only one strikes study that has examined this process in any detail. In using the ECS to investigate the determinants of productivity growth 2010-2013, Braakmann and Brandl (2016) offer a comprehensive 12-element categorization of collective bargaining systems. That is, the authors seek to capture the national degree of integrative interaction between bargaining units at different levels and domains. Support is adduced for the once *recherché* notion that coordinated sector and multi-level systems outperform company-level and individual bargaining regimes in their productivity growth.
4. For 2013, all these national institutions are documented in the file *7735_reports.pdf*, pp. 259-263; for 2009, the information is taken from the *6568english_questionnaires*, pp. 86-96.
5. To preserve confidentiality, the coding exercise has been disclosed in a separate data appendix to the Editor.
6. A second and broader measure of incidence can be given by contrasting any type industrial action (i.e. including ‘refusal to work overtime’ and ‘other actions’) with no action at all. In this case, the corresponding 1/0 dummy is equal to 1 whenever at least one the eight possible scenarios is observed. Jansen (2014: 4) reports that this alternative offers similar results to the first measure, and we do not therefore further address this added measure of strike incidence.
7. Note that if, for example, we observe both (*_b, _1*) and (*_b, _3*), we do not know whether there were, say, two strikes/stoppages of less than one day and one refusal to work overtime as opposed to one stoppage/strike of less than one day and one (or more) refusal to work overtime; and that if the respondent reports both (*_b, _1*) and (*_b, _2*), then the corresponding observations must be dropped even if no ‘refusal to work overtime’ or ‘other actions’ are reported, the reason being that it is not possible to know in these circumstances whether there occurred more than one stoppage/strike of less than one day, more than one strike for one day or more, or both.
8. Note that the interpretation of labor disputes as a costly means of communicating the private information of employers or as an equilibrating mechanism employed by union leadership as a means of eroding the unrealistically high wage aspiration of the membership until they coincide with what the firm is prepared to pay provide explanations for the frequent occurrence of disputes. The former argument is a key feature of noncooperative bargaining theory and the latter of a political model of strikes (see, respectively, Cramton and Tracy, 2003, Ashenfelter and Johnson, 1969.)

9. Although not described subsequently, these results carry over to 2013. However, reflecting changes in sector aggregation, it is no longer possible to confirm any continued importance of the Education sector in strikes. Results are available upon request.

10. From Appendix Table 2 it can be seen that the mean union density of 46% for the 2013 sample is almost 20 percentage points lower than in 2009. Mean union density in the original (unmatched) 2013 ER dataset is 48%.

11. Column (3) is not strictly comparable with column (1) given that the reported estimates, due to convergence problems, are obtained through a different estimation procedure; see the notes to Table 4.

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TABLE 1: Types of Union and Non-union Employee Workplace Representation, Unweighted Data for 2009 and 2013 (in percent)

Country	Union representation only (1)		Works council representation only (2)		Both union and works council representation (3)		Formal employee representation (4)		Employee representation present (5)	
	2009	2013	2009	2013	2009	2013	2009	2013	2009	2013
BE	8	12	14	6	25	37	47	55	65	69
BG	10	3	22	25	13	11	45	39	45	43
CZ	28	23	3	3	3	2	34	28	35	28
DK	20	15	8	11	46	54	74	80	76	88
DE	0	0	47	32	0	0	47	32	61	40
EE	2	5	17	30	6	7	25	42	25	42
IE	17	12	10	18	16	15	43	45	45	46
EL	6	10	2	2	5	8	13	20	13	22
ES	0	8	63	12	0	41	63	61	68	71
FR	5	2	21	29	45	38	71	69	74	69
HR	19	15	6	5	27	20	52	40	52	40
IT	2	14	5	22	56	11	63	47	63	47
CY	42	38	0	0	0	0	42	38	41	38
LV	7	4	15	8	19	8	41	20	44	18
LT	19	13	16	19	4	4	39	36	40	68
LU	0	0	59	69	0	0	59	69	60	69
HU	7	3	11	11	20	21	38	35	39	35
MT	19	21	0	0	0	0	19	21	20	21
NL	1	0	55	71	9	0	65	71	68	71
AT	0	0	42	46	0	0	42	46	44	47
PL	19	24	15	11	19	13	53	48	55	47
PT	8	6	2	5	3	2	13	13	13	19
RO	8	10	42	51	18	11	68	72	68	70
SI	23	14	3	11	29	35	55	60	56	58
SK	23	17	22	27	12	7	57	51	56	48
FI	31	11	2	45	41	32	74	88	79	88
SE	75	69	0	0	0	0	75	69	80	69
UK	7	8	16	12	13	10	36	30	33	28
MK	36	21	0	5	0	4	36	30	36	30
TR	14	30	0	2	0	9	14	41	15	41
All	14	15	18	19	16	14	48	48	50	51

Notes: Column (4) is defined as (4) = (1) + (2) + (3). Column (3) flags the cases in which union and works council representation coexist at the workplace. Column (5) gives the percentage of all establishments with a workplace employee representation body (formal or informal). Country acronyms are given in Appendix Table 1.

Sources: Authors' computations using the second (2009) and third (2013) European Community Surveys.

TABLE 2: Prevalent Employee Workplace Representation Categories, Unweighted Data for 2009 and 2013 (in percent)

Country	Union representation prevalent		Works council representation prevalent	
	2009	2013	2009	2013
BE	8	12	39	43
BG	22	14	22	25
CZ	31	25	3	3
DK	66	70	8	11
DE	0	0	47	32
EE	8	12	17	30
IE	33	27	10	18
EL	11	17	2	2
ES	0	49	63	12
FR	5	2	66	67
HR	45	35	6	5
IT	28	14	35	34
CY	42	38	0	0
LV	26	11	15	8
LT	23	16	16	19
LU	0	0	59	69
HU	27	24	11	11
MT	19	21	0	0
NL	1	0	63	71
AT	0	0	42	46
PL	38	37	15	11
PT	11	9	2	4
RO	26	21	42	51
SI	52	49	3	11
SK	35	24	22	27
FI	72	43	2	45
SE	75	69	0	0
UK	19	19	17	12
MK	36	24	0	5
TR	14	38	0	2
All	24	25	24	23

Notes: The prevalent union (works council) representation variable is a mutually exclusive dummy defined as 1 if a union or a prevalent union (works council) representation is present. The union (works council) presence is prevalent if the union and works council agencies coexist at the workplace and the employee representative respondent is from the union (works council).

TABLE 3: Union Dominance in Works Councils and Union Clubs, Unweighted Data for 2009 and 2013 (in percent)

	Union representation only	Works council representation only	Both union and works-council type representation		All establishments with a formal employee representation
			Prevalent union representation	Prevalent works council representation	
2009					
Union dominated	78	35	72	56	60
2013					
Union dominated	36	60	35	75	40

Note: In 2013, the raw variable ‘number of trade union members at the employee representation body’ is missing in approximately 60 percent of the cases.

TABLE 4: The Effect of Workplace Employee Representation on Strike Incidence, 2009 and 2013

	Baseline model (1)	Baseline model with a random slope for the public sector (2)	Baseline model with a random slope for union density (3)
(a) 2009			
Worker representation/Labor organization:			
Union density	0.013+++ (0.003)	0.013+++ (0.003)	0.0007+ (0.0003)
Works council	-0.879+++ (0.239)	-0.846+++ (0.245)	-0.051+++ (0.019)
Union-dominated works council	1.163+++ (0.220)	1.116+++ (0.220)	0.123+++ (0.021)
Union-dominated union club	0.304 (0.285)	0.252 (0.287)	0.042 (0.026)
Union-dominated works council * Union density	-0.006 (0.004)	-0.005 (0.004)	-0.0006 (0.0004)
Union-dominated union club * Union density	-0.009+ (0.005)	-0.008+ (0.005)	-0.0008+ (0.0004)
Collective agreement type:			
Company level	0.251 (0.191)	0.264 (0.196)	0.007 (0.014)
Higher than company level	(0.437++ (0.189)	0.454++ (0.194)	0.019 (0.014)
Mixed	-0.059 (0.265)	-0.032 (0.270)	-0.017 (0.020)
Public sector	0.735+++ (0.155)	0.734+++ (0.261)	0.062+++ (0.012)
Single establishment	-0.343+++ (0.108)	-0.335+++ (0.110)	-0.027+++ (0.009)
Other variables: Industry (11) and establishment size (10) controls. Random intercepts for 30 countries			
n	5,388	5,388	5,388
Log likelihood	-1,510.8	-1,497.7	-1,020.3
$\hat{\sigma}_{u0}^2$ (s.e.) [random intercept]		1.777 (0.568)	0.007 (0.003)
$\hat{\sigma}_{u1}^2$ (s.e.) [random slope]	1.860 (0.570)	0.899 (0.416)	1.94e-06 (7.25e-07)
LR test [p-value]	417.6 [0.000]	443.9 [0.000]	555.9 [0.000]
(b) 2013			
Worker representation/Labor organization:			
Union density	0.010+ (0.006)	0.010+ (0.006)	0.0002 (0.0005)
Works council	-0.763+ (0.483)	-0.818+ (0.487)	-0.048 (0.033)
Union-dominated works council	0.995++ (0.497)	0.972+ (0.500)	0.059+ (0.034)
Union-dominated union club	0.940 (0.919)	0.990 (0.920)	-0.001 (0.059)
Union-dominated works council * Union density	0.006 (0.008)	0.006 (0.008)	0.0017++ (0.0006)
Union-dominated union club * Union density	-0.011 (0.011)	-0.012 (0.011)	0.0003 (0.0008)
Collective agreement type:			
Company level	-1.036++ (0.516)	-1.051++ (0.521)	-0.051+ (0.026)

Higher than company level	-0.002 (0.417)	-0.044 (0.424)	0.004 (0.025)
Mixed	0.032 (0.419)	0.030 (0.423)	0.012 (0.026)
Public sector	-0.107 (0.311)	-0.069 (0.478)	+0.010 (0.022)
Single establishment	-0.482++ (0.214)	-0.499++ (0.216)	-0.031++ (0.015)
Other variables: Industry (6) and establishment size (3) controls. Random intercepts for 30 countries			
n	1,418	1,418	1,418
Log likelihood	-359.3	-358.80	-201.9
$\hat{\sigma}_{u1}^2$ (s.e.) [random slope]		0.743 (1.052)	2.49e-06 (1.33e-06)
$\hat{\sigma}_{u0}^2$ (s.e.) [random intercept]	1.693 (0.748)	1.656 (0.748)	0.004 (0.002)
LR test [p-value]	96.7 [0.000]	99.90 [0.000]	159.6 [0.000]

Notes: Model specification for column (1) is given by equation (1) in the text, while columns (2) and (3) are based on equation (2). Strike incidence is the dependent variable, and the coefficients are estimated using *melogit* in Stata 13.1, except in column (3), where the *meglm* command is used to achieve convergence. . ⁺⁺⁺, ⁺⁺, and ⁺ indicate statistical significance at the 0.01, 0.05, and 0.10 levels, respectively.

TABLE 5: Effect of Workplace Employee Representation on Strike Incidence, with Control for Dissonance in the Perceived Quality of Industrial Relations at the Establishment in Selected Subsamples, 2009 and 2013

	Baseline model (1)	Western European countries (2)	Crouch countries (3)	Establishments with formal and informal workplace representation (4)	Baseline model with organizational changes (5)
(a) 2009					
Worker representation/Labor organization:					
Union density	0.013+++ (0.003)	0.014+++ (0.004)	0.013+++ (0.004)	0.012+++ (0.001)	0.015+++ (0.003)
Works council	-0.875+++ (0.243)	-0.940+++ (0.294)	1.170+++ (0.240)	-0.3456+ (0.1882)	-0.90+++ (0.248)
No formal workplace representation				-1.227++ (0.545)	
Union-dominated works council	1.208+++ (0.222)	1.222+++ (0.237)	-0.927+++ (0.306)		1.215+++ (0.224)
Union-dominated union club	0.384 (0.287)	0.504 (0.390)	0.454 (0.407)		0.378 (0.291)
Union-dominated works council * Union density	-0.0076+ (0.0044)	-0.0094+ (0.0049)	-0.0088+ (0.0051)		-0.0082+ (0.0044)
Union-dominated union club * Union density	-0.0097++ (0.0045)	-0.012++ (0.005)	-0.0135++ (0.0062)		-0.010++ (0.004)
Collective agreement type:					
Company level	0.3203 (0.1963)	0.164 (0.279)	0.445 (0.303)	0.379++ (0.190)	0.348+ (0.199)
Higher than company level	0.503+++ (0.194)	0.390 (0.264)	0.584++ (0.288)	0.608+++ (0.188)	0.517+++ (0.197)
Mixed	0.052 (0.268)	-0.198 (0.337)	-0.027 (0.360)	0.144 (0.261)	0.109 (0.271)
Public sector					
Public sector	0.766+++ (0.157)	0.825+++ (0.186)	0.856+++ (0.194)	0.761+++ (0.153)	0.733+++ (0.159)
Single establishment	-0.344+++ (0.109)	-0.311++ (0.122)	-0.308++ (0.124)	-0.397+++ (0.106)	-0.351+++ (0.110)
Dissonance:					
Dissonance_1	0.641+++ (0.198)	0.489++ (0.227)	0.490++ (0.230)	0.654+++ (0.192)	0.629+++ (0.201)
Dissonance_2	0.686+++ (0.139)	0.656+++ (0.165)	0.565+++ (0.175)	0.647+++ (0.134)	0.717+++ (0.141)
Dissonance_3	0.338++ (0.130)	0.343++ (0.156)	0.350++ (0.158)	0.317++ (0.127)	0.329++ (0.133)
Crouch proxies for state attitude toward unions:					
Hostile			1.776+++ (0.663)		
Supportive			-0.086 (0.746)		
Organizational changes:					
Changes in the remuneration system					0.273++ (0.114)
Changes in the work process					-0.092 (0.113)
Changes in the working time					-0.228+ (0.124)
Restructuring measures					0.004 (0.116)
Other variables: Industry (11) establishment size (10), public sector and single establishment. Random intercepts for 30 countries					
n	5,341	3,548	3,315	5,577	5,245
Log likelihood	-1,483.5	-1,042.3	-973.9	-1,558.2	-1,454.9
$\hat{\sigma}_u^2$ (s.e.)	1.795 (0.533)	1.979 (0.760)	0.842 (0.386)	1.960 (0.598)	1.817 (0.561)

LR test [p-value]	388.5 [0.000]	295.8 [0.000]	108.9 [0.000]	451.9 [0.000]	374.1 [0.000]
(b) 2013					
Worker representation/Labor organization:					
Union density	0.0103+ (0.0062)	0.015++ (0.007)	0.016++ (0.008)	0.016+++ (0.002)	0.009 (0.006)
No formal workplace representation				-0.630+ (0.404)	
Works council	-0.771+ (0.490)	-0.541 (0.552)	-0.591 (0.572)	-0.216 (0.188)	-0.807 (0.496)
Union-dominated works council	0.827+ (0.507)	1.083+ (0.569)	1.156++ (0.589)		0.814 (0.512)
Union-dominated union	0.950 (0.918)	0.538 (1.416)	0.573 (1.430)		0.867 (0.917)
Union-dominated works council * Union density	0.008 (0.008)	0.003 (0.009)	0.002 (0.009)		0.008 (0.008)
Union-dominated union club * Union density	-0.011 (0.011)	-0.004 (0.016)	-0.005 (0.016)		-0.010 (0.011)
Collective agreement type:					
Company level	-1.178++ (0.525)	-1.185+ (0.653)	-0.887 (0.724)	-0.370 (0.262)	-1.139++ (0.539)
Higher than company level	-0.189 (0.426)	-0.391 (0.531)	-0.163 (0.611)	-0.057 (0.247)	-0.105 (0.440)
Mixed	-0.090 (0.425)	-0.251 (0.541)	-0.017 (0.619)	-0.005 (0.246)	-0.028 (0.441)
Public sector	+0.002 (0.321)	-0.074 (0.359)	-0.151 (0.369)	+0.805+++ (0.182)	+0.008 (0.329)
Single establishment	-0.511++ (0.219)	-0.457++ (0.231)	-0.459+ (0.234)	-0.427+++ (0.133)	-0.537++ (0.222)
Dissonance:					
Dissonance_1	0.993 (0.656)	0.276 (0.805)	0.312 (0.822)	0.679++ (0.336)	0.996 (0.662)
Dissonance_2	1.773+++ (0.356)	1.476+++ (0.388)	1.345+++ (0.391)	1.114+++ (0.221)	1.832+++ (0.366)
Dissonance_3	0.030 (0.260)	-0.104 (0.283)	-0.068 (0.286)	0.089 (0.165)	0.079 (0.264)
Crouch proxies for state attitude toward unions:					
Hostile			1.901++ (0.834)		
Supportive			-0.199 (0.822)		
Organizational changes:					
Changes in the remuneration system					0.041 (0.246)
Changes in the work process					0.088 (0.239)
Changes in the working time					-0.266 (0.249)
Restructuring measures					-0.028 (0.235)
Fixed effects: Industry (6), establishment size (3) public sector, and single establishment. Random intercepts on 30 countries					
n	1,409	1,029	928	3,065	1,368
Log likelihood	-346.4	-293.5	-281.0	-874.5	-339.3
$\hat{\sigma}_u^2$ (s.e.)	1.692 (0.750)	1.693 (0.864)	0.817 (0.499)	3.130 (0.975)	1.642 (0.735)
LR test [p-value]	93.9 [0.000]	78.7 [0.000]	22.4 [0.000]	538.92 [0.000]	88.4 [0.000]

Note: See notes to Table 4.

TABLE 6: Predicted Probabilities of Strike Duration, Strike Frequency, and Strike Intensity by Selected Workplace Employee Representation, 2009

Workplace employee representation type	CASE 1 Strike duration (Dependent variable: strike_dur) [0 for 'None'; 1 for 'less than one day'; 2 for 'one day or more']			CASE 2 Strike frequency (Dependent variable: strike_N) [0 for 'None'; 1 for 'one strike'; 2 for 'more than one strike']								
	Pr0	Pr1	Pr2	Pr0	Pr1	Pr2						
Union-dominated works council	0.776	0.092	0.132	0.798	0.119	0.083						
Nonunion-dominated works council	0.930	0.034	0.036	0.940	0.040	0.020						
	CASE 3 Strike intensity											
	(Dependent variable: strike_ord) [0 for 'None'; 1 for 'one strike for less than a day'; 2 for 'all else'] (1)			(Dependent variable: strike_ord) [0 for 'None'; 1 for 'one strike for less than a day'; 2 for 'one strike for one day or more'] (2)			(Dependent variable: strike_ord) [0 for 'None'; 1 for 'one strike for less than a day'; 2 for 'more than one strike for less than one day'] (3)			(Dependent variable: strike_ord) [0 for 'None'; 1 for 'one strike for less than a day'; 2 for 'more than one strike for one day or more'] (4)		
	Pr0	Pr1	Pr2	Pr0	Pr1	Pr2	Pr0	Pr1	Pr2	Pr0	Pr1	Pr2
Union-dominated works council	0.859	0.051	0.090	0.903	0.046	0.051	0.908	0.068	0.024	0.913	0.067	0.020
Nonunion-dominated works council	0.955	0.018	0.027	0.964	0.018	0.018	0.975	0.019	0.006	0.977	0.018	0.005

Notes: The predicted probabilities are obtained using the postestimation command in *meologit* in Stata 13.1. For strike duration in Case 1, for example, Pr0, Pr1, and Pr2 give the probability of an establishment having no strikes, at least one strike of less than a day, and at least one strike of a day or more, respectively, conditional on the set of included variables. Accordingly, the first top-left cell entry on the left top (i.e. 0.776) gives the mean probability of an establishment with a union-dominated works council having no strikes over a period of one year. The set of included regressors is the same as in Table 5, column (1). Full descriptions of the variables strike_dur, strike_N and strike_ord are given in the data section.

TABLE 7A: Response Rate in the ER Survey, 2009 and 2013 (in percent)

2009				2013			
BE	44	LU	54	BE	51	LU	56
BG	58	HU	45	BG	44	HU	71
CZ	69	MT	34	CZ	63	MT	69
DK	50	NL	37	DK	56	NL	54
DE	61	AT	46	DE	44	AT	68
EE	57	PL	45	EE	60	PL	76
IE	41	PT	30	IE	37	PT	54
EL	57	RO	40	EL	55	RO	63
ES	36	SI	51	ES	42	SI	74
FR	40	SK	34	FR	40	SK	65
HR	62	FI	72	HR	82	FI	65
IT	34	SE	68	IT	40	SE	75
CY	29	UK	33	CY	81	UK	35
LV	65	MK	69	LV	63	MK	80
LT	57	TR	29	LT	43	TR	41
Total	48			Total	56		

Note: For each country, the response rate is computed dividing the number of establishments with a valid ER survey response by the number of establishments in the MM survey reporting that they have an employee representation body at the workplace.

TABLE 7B: An Analysis of Non-Response Bias

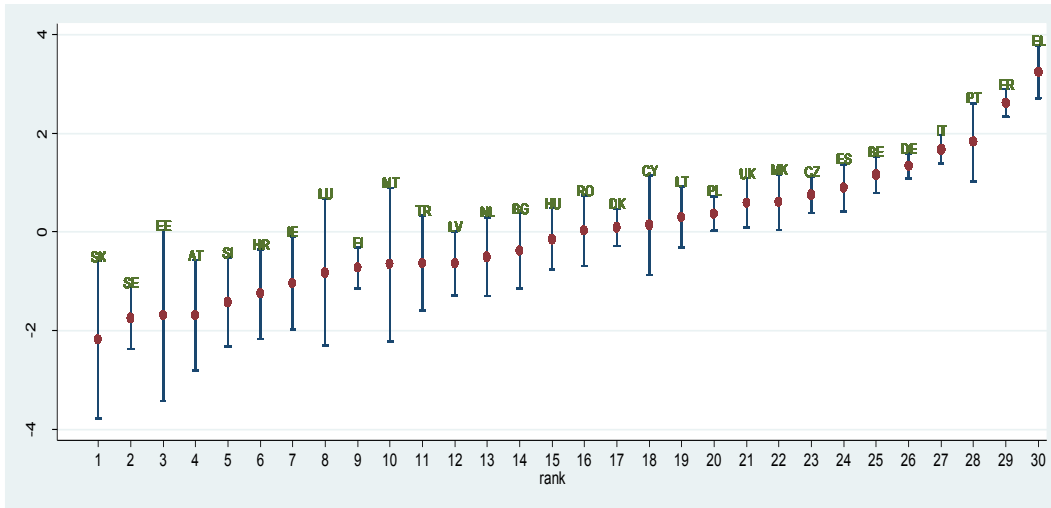
	All establishments with a formal employee representation (1)	Separate regressions	
		Establishments with a valid ER survey response (2)	All establishments with a formal employee representation (3)
Sector:			
Construction	0.384+++	0.464+++	0.385+++
Wholesale, retail, and vehicles	0.256+++	0.173+	0.256+++
Hotels and restaurants	0.244+	0.265	0.245+
Transport and communication	0.248++	0.339++	0.249++
Financial intermediation	1.261+++	1.275+++	1.261+++
Real estate	0.504+++	0.474+++	0.505+++
Public administration	0.039	0.105	0.037
Education	0.089	-0.037	0.016
Health	0.081	0.112	0.099
Other	0.291+++	0.331++	0.290+++
Establishment size:			
20-49	0.135+	0.021	0.134+
50-99	0.106	0.104	0.105
100-149	0.317+++	0.273++	0.315+++
150-199	0.123	0.056	0.121
200-249	0.283++	0.156	0.281++
250-299	-0.002	-0.284+	-0.0029
300-399	0.320+++	0.163	0.318+++
400-499	-0.027	-0.294+	-0.029
500+	0.143+	-0.032	0.142+
Collective agreement type:			
Company level	0.138++	0.043	0.137++
Higher than company level	0.084	-0.025	0.083
Mixed	0.130	0.1221668	0.129
Works council	0.179+++	0.1590922+	0.181+++
IR quality/Management view	1.432+++	1.443933+++	1.433+++
Public sector	-0.146	-0.25772+++	-0.147++
Single establishment	0.0654+	0.0752716	0.065
ERint	-0.016		
n	11,886	6,023	11,886
Log likelihood	-7,488.245	-3,792.411	-7,488.325
$\hat{\sigma}_u^2$ (s.e.)	0.243 (0.069)	0.224 (0.070)	0.243 (0.069)
LR test [p-value]	354.68 [0.000]	137.82 [0.000]	355.10 [0.000]
2013			
Sector:			
Construction		-0.073	-0.109
Commerce and hospitality		0.132	0.030

Transport and communication		-0.250+	-0.296+++
Financial services and real estate		0.612+++	0.455+++
Other services		-0.074	-0.157+++
Establishment size:			
50-249		0.042	0.141+++
250+		0.371+++	0.351+++
Collective agreement type:			
Company level		0.191	0.091
Higher than company level		-0.012	-0.010
Mixed		0.164	0.095
Works council		0.231++	0.143++
Single establishment		-0.069	-0.117++
Public sector		-0.200+	-0.394+++
IR quality/Management view		1.549+++	1.571+++
n		3,066	11,401
Log likelihood		-1,838.268	-6,644.375
$\hat{\sigma}_u^2$ (s.e.)		0.159 (0.059)	0.175 (0.050)
LR test [p-value]		42.67 [0.000]	191.25 [0.000]

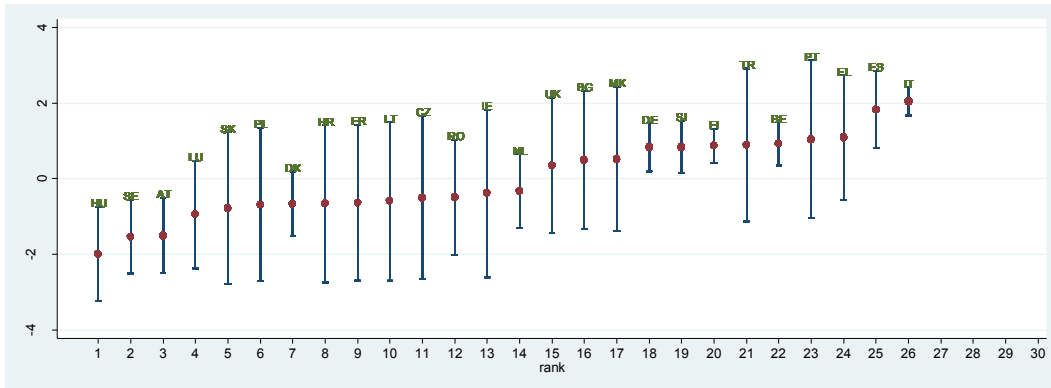
Notes: The reported coefficients in columns (1)-(3) are obtained by using a two-level mixed-effects logistic model similar to model (1) in the text. The dependent variable Y_{ij} is given by the performance dummy variable *economic/financial situation*, defined as 1 if the economic/financial situation of the establishment is very good or good, 0 otherwise. This variable, as well as all the selected regressors (including the indicator of industrial relations quality at the workplace) are extracted from the MM survey. The relevant sample in 2013, column (2), is based on the matching procedure described in the data section. Full description of 2009 sector dummies is given in Appendix Table 2. +++, ++, and + indicate statistical significance at the 0.01, 0.05, and 0.10 levels, respectively. For parsimony we omit the corresponding standard errors from the table.

Figure 1: Country Random Intercepts by increasing order, 2009 and 2013

(a) 2009



(b) 2013

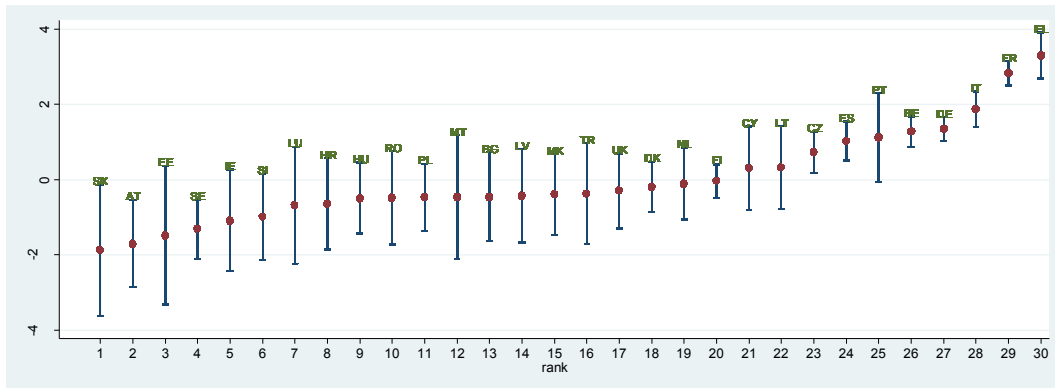


Notes: Country (random) intercepts were derived from the model specification in Table 4, column (1). For each country, the vertical bar gives the 95% confidence interval. Country acronyms are given in Appendix Table 1.

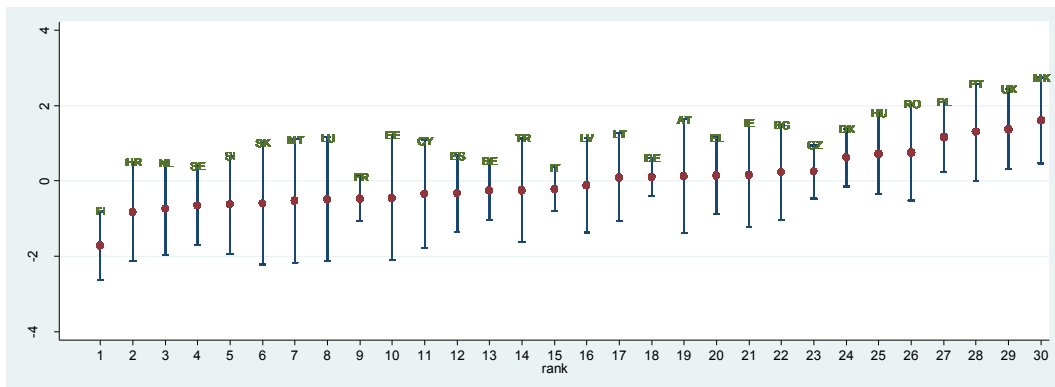
Figure 2: Country Random Intercepts and Random Slopes for the Public Sector Variable Case, 2009 and 2013

(a) 2009

(i) Intercepts

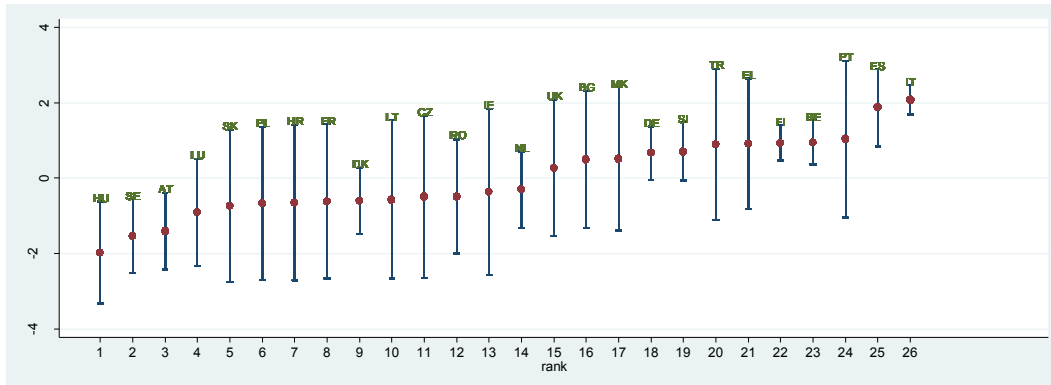


(ii) Slopes

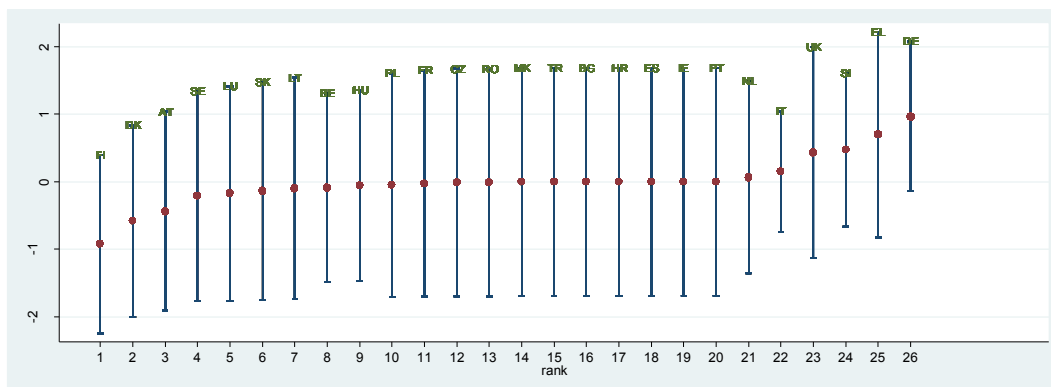


(b) 2013

(i) Intercepts



(ii) Slopes

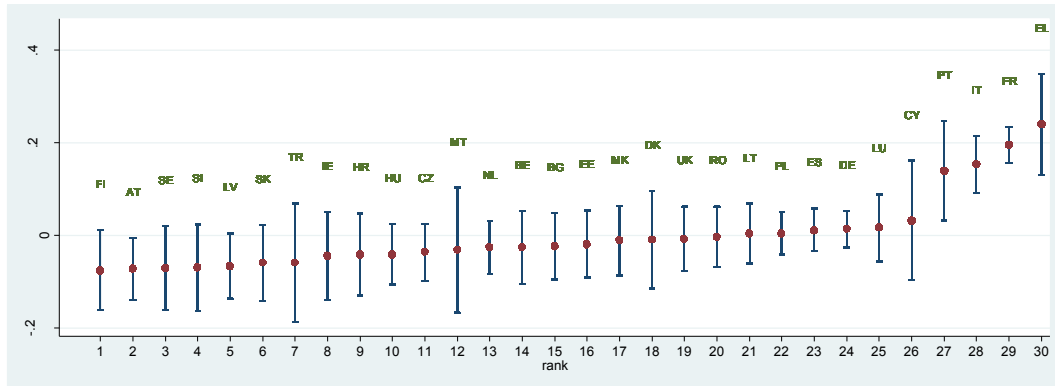


Notes: Country coefficients were derived from Table 4, column (2). See notes to Figure 1.

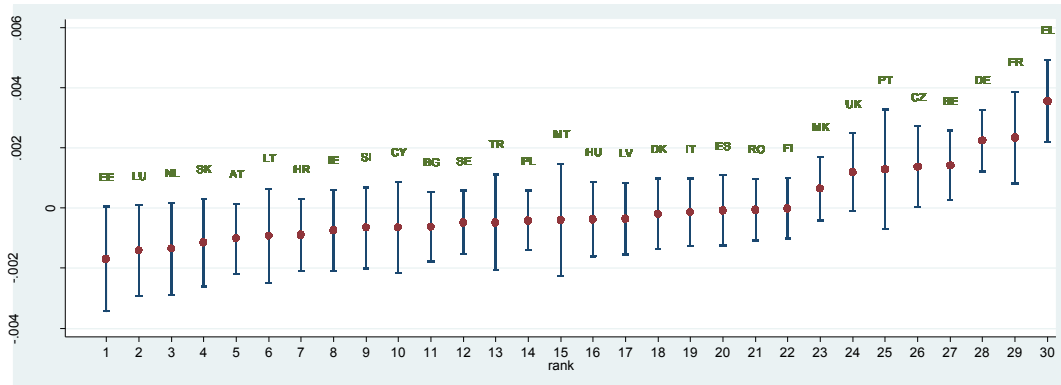
Figure 3: Country Random Intercepts and Random Slopes for the Union Density Variable Case, 2009 and 2013

(a) 2009

(i) Intercepts

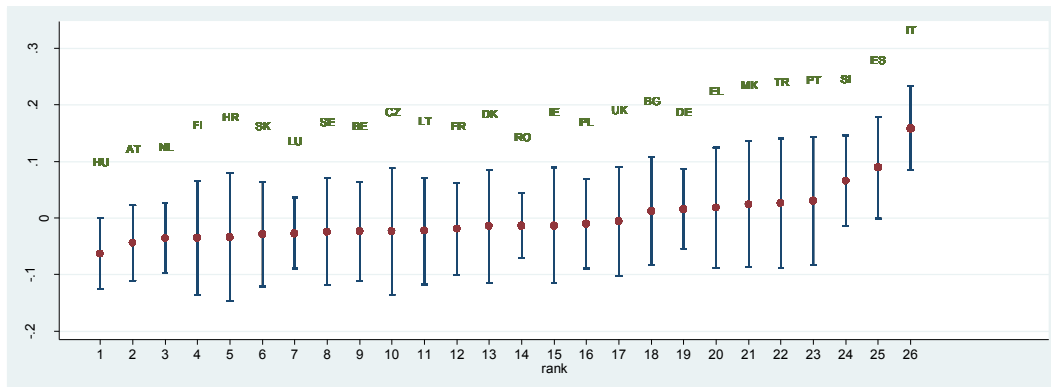


(ii) Slopes

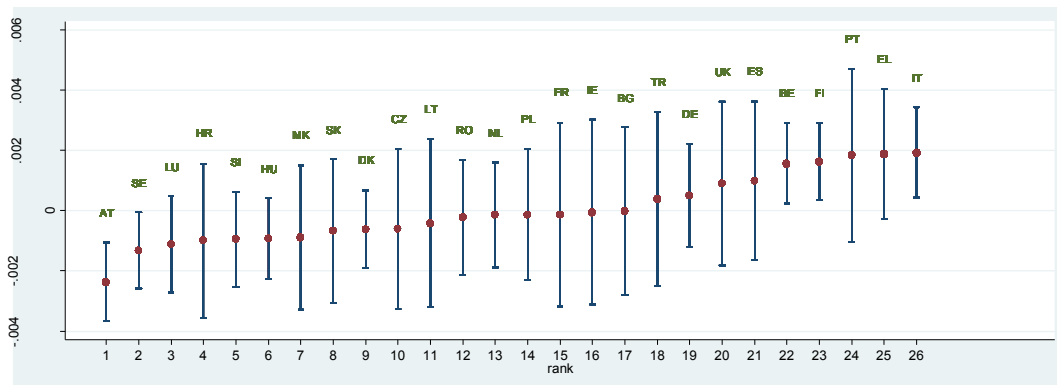


(b) 2013

(i) Intercepts



(ii) Slopes



Notes: Country coefficients were derived from Table 4, column (3). See notes to Figure 1.

APPENDIX TABLE 1: Mapping Workplace Formal Employee Representation to Establishments and Countries, 2009 and 2013

Country	Trade union representation	Works council type of representation		Identity of workplace employee representation respondent
		2009	2013	
BE Belgium	Délégation syndicale	Comité d'entreprise (MM650_2) Comité de négociation particulier ou de base (MM650_3)	Conseil d'entreprises (ERTYPE_B) Comité pour la prévention et de la protection au travail (ERTYPE_E)	A member of the works council
BG Bulgaria	Синдикална организация	Представители за информиране и консултиране на работниците (MM650_2)	ERTYPE_D	A member of the trade union
CZ Czech Rep.	Odborová organizace	Rada zaměstnanců (MM650_2)	Rada zaměstnanců (ERTYPE_B)	A member of the trade union
DK Denmark	Tillidsrepræsentant	Samarbejdsudvalg (MM650_2) MED-udvalg (MM650_3)	Samarbejdsudvalg (ERTYPE_B)	A member of the trade union
DE Germany	No trade union representation	Betriebsrat (MM650_2) Personalrat (MM650_3)	Betriebsrat (ERTYPE_B) Personalrat (ERTYPE_F)	A member of the works council
EE Estonia	Ametiühing	Töötajate usaldusisik (MM650_2) Euroopa Tööõukogu (MM650_3)	Töötajate usaldusisik (ERTYPE_D)	A member of the trade union
IE Ireland	Workplace trade union representative	Statutory employee representative forum (MM650_2)	Statutory employee representative (ERTYPE_B) Joint consultative committee (ERTYPE_C)	A member of the trade union
EL Greece	Επιχειρησιακό σωματείο	Συμβούλιο εργαζομένων (MM650_2)	Συμβούλιο εργαζομένων (ERTYPE_B)	A member of the trade union
ES Spain	No trade union representation in 2009 Sección sindical in 2013	Comité de empresa (MM650_2) Junta de personal (MM650_3)	Comité de empresa (ERTYPE_B)	A member of the trade union in 2013
FR France	Délégué syndical	Comité d'entreprise (MM650_2)	Comité d'entreprise (ERTYPE_B) Délégué du personnel (ERTYPE_D)	A member of the works council
IT Italy	Organizzazione sindacale in 2009; Rappresentanza sindacale aziendale in 2013	Rappresentanza sindacale unitaria (RSU) (MM650_2) Rappresentanza sindacale aziendale (RSA) (MM650_3)	Rappresentanza sindacale unitaria (ERTYPE_B)	A member of the trade union or works council in 2009; a member of the works council in 2013
CY Cyprus	Συνδικαλιστική Εκπροσώπηση	No works council-type representation	No works council-type representation	A member of the trade union
LV Latvia	arodbiedrība	Darbinieku pilnvarotie pārstāvji (MM650_2) Darba padome (MM650_3)	Darbinieku pilnvarotie pārstāvji (ERTYPE_D)	A member of the trade union
LT Lithuania	Profesinė sąjunga	Darbo taryba (MM650_2)	Darbo taryba (ERTYPE_B)	A member of the trade union
LU Luxembourg	No trade union representation	Comité mixte de entreprise (MM650_2) Délégation du personnel (MM650_3)	Comité mixte (ERTYPE_B) Délégation du personnel (ERTYPE_E)	A member of the works council
HU Hungary	Szakszervezet (bizalmi)	Üzemi tanács (MM650_2) Üzemi megbízott (MM650_2)	Üzemi tanács (ERTYPE_B) Üzemi megbízott (ERTYPE_E)	A member of the trade union
MT Malta	Shop steward (recognized union representative)	No works council-type representation	No works council-type representation	A member of the trade union
NL Netherlands	Bedrijfsledengroep in 2009 No trade union representation in 2013	Ondernemingsraad (MM650_2)	Ondernemingsraad (ERTYPE_B) Personeelsvertegenwoordiging (ERTYPE_E)	A member of the works council
AT Austria	No trade union representation	Betriebsrat (MM650_2) Personalvertretung (MM650_3)	Betriebsrat (ERTYPE_B)	A member of the works council
PL Poland	Zakładowa organizacja związkowa	Rady pracowników (MM650_2)	Rada pracowników (ERTYPE_B)	A member of the trade union

		Przedstawiciele załóg w radach nadzorczych (MM650_3)		
PT Portugal	Comissão sindical or Comissão intersindical	Comissão de trabalhadores (MM650_2)	Comissão de trabalhadores (ERTYPE_B)	A member of the trade union
RO Romania	Sindicat	Reprezentanții salariaților (MM650_2)	Reprezentanții salariaților (ERTYPE_E)	A member of the trade union
SI Slovenia	Sindikalni zaupnik	Svet delavcev (MM650_2)	Svet delavcev (ERTYPE_B) Delavski zaupnik (ERTYPE_D)	A member of the trade union
SK Slovakia	Základná organizácia odborového zväzu in 2009; Odborová organizácia in 2013	Zamestnaneckárada (MM650_2)	Zamestnaneckárada (ERTYPE_B) Zamestnanecky dôverník (ERTYPE_D)	A member of the trade union
FI Finland	Ammattiosasto	YT-toimikunta (MM650_2)	YT-toimikunta (ERTYPE_B) Henkilöstön edustaja (ERTYPE_E)	A member of the trade union
SE Sweden	Facklig förtroendeman	No works council representation	No works council representation	A member of the trade union
UK	Recognised shopfloor trade union representation	Joint consultative committee, employee forum or equivalent body (MM650_2)	Joint consultative committee (ERTYPE_C)	A member of the trade union
HR Croatia	Sindikrat	Radnicko vijeće (MM650_2) Predstavnik (MM650_3)	Radnicko vijeće (ERTYPE_B)	A member of the trade union
MK Macedonia	Recognised shop floor trade union organization in 2009; Синдикат/Sindikate in 2013	No works council-type representation	Работнички совет/ Këshill i punëtorëve (ERTYPE_B)	A member of the trade union
TR Turkey	Sendika İşyeri Temsilciliği in 2009; Ticaret Birlikleri in 2013	No works council-type representation	İş Konseyi (ERTYPE_B)	A member of the trade union

Notes: The mapping is based on the available raw MM variables. Supplementary information was taken from the 2009 and 2013 ECS technical reports. The last column serves to generate the mutually exclusive dummy variables for union and works council representation, as defined in the text. In both survey years, the datasets include 7 raw employee representation groups. Typically, group 1 flags a formal union representation, while groups 2 and 3 identify formal works council-type agencies. In general, groups 4-7 comprise informal union and non-union worker representation. In practice, in 2009 and 2013 union workplace representation is exclusively based on the raw dummy variables MM650_1 and ERTYPE_A, respectively. The basis for the construction of the works council dummy is given by the raw variables MM650_2 and ERTYPE_B, respectively. In some countries these variables were supplemented by the information based on variables MM650_3-MM650_7 and ERTYPE_C-ERTYPE_F. In this case, no general rule could be adopted as the codes vary from country to country and over time. We also note that due to the fact that the raw MM650_3-MM650_7 and ERTYPE_C-ERTYPE_F variables do not have exactly the same meaning across countries, finding a consistent measure of a formal ER body is fraught. To reduce the margin of error, in all cases in which we were not sure whether the works council-type agency was a formal employee representation body, we exclusively used the variables MM650_B and ERTYPE_B as the basis for the trade union and works council-type representation. The variables MM650_1 and MM650_2 and ERTYPE_A through ERTYPE_F are documented in the files *6568english_questionnaires* (pp. 86-96) and *7735_reports.pdf* (pp. 259-263), respectively, available at the U.K. Data Service site.

Sources: the second (2009) and third (2013) European Community Surveys and corresponding technical reports.

APPENDIX TABLE 2: Variable definition and estimation sample means of selected variables

Variable	Mean 2009	Mean 2013	Mean 2013	Definition
Strike incidence	12	15	11	1/0 dummy: 1 if there has been a stoppage or strike in the establishment in the last 12 months
Workplace representation:				
Union only	35	34	11	1/0 dummy: 1 if the union is the single formal ER body present at the workplace
Works council only	31	34	57	1/0 dummy: 1 if the works council is the single formal ER body present at the workplace
Both a union and a works council	34	32	32	1/0 dummy: 1 if both the union and the works council are present at the workplace
Prevalent union	60	60	37	1/0 dummy: 1 if a union or a prevalent union representation is present.
Prevalent works council	40	40	63	1/0 dummy: 1 if a works council or a prevalent works council is present
Union organization:				
ER union density	65	n.a.	46	Union membership of the employee representation body. In 2013, the variable is only available for the reduced subset of 1,409 establishments.
Establishment union density	53	46	44	Union membership at the establishment
Union-dominated union	47	19	19	1/0 dummy: 1 if a union or a prevalent union representation is present and the majority of representatives are trade union members
Union-dominated works council	16	26	26	1/0 dummy: 1 if a works council or a prevalent works council is present and the majority of representatives are trade union members
Collective agreement:				
No collective agreement	14	19	16	No collective agreement
Company level	34	26	19	Company level
Higher than company level	45	30	39	Higher than company level
Mixed	7	25	26	Mixed (i.e. company level and higher than company level). In 2013, this group comprises sector, national and <i>occupation</i> . Agreements negotiated for given occupation were not defined in 2009.
IR quality:				
General work climate: Workers' representative view	83	91	93	(IR_quality_ER)1/0 dummy: 1 if the relationship between management and employee representation can best be described as hostile (disagree or strongly disagree)
General work climate: Management view	77	79	79	(IR_quality_MM)1/0 dummy: 1 if the general work climate in the establishment is very good or good
Dissonance:				
Deviation/Dissonance 1	5	2	2	1/0 dummy: 1 if IR_quality_MM = 0 and IR_quality_ER = 0
Deviation/Dissonance 2	12	6	5	1/0 dummy: 1 if IR_quality_MM = 1 and IR_quality_ER = 0
Deviation/Dissonance 3	18	19	19	1/0 dummy: 1 if IR_quality_MM = 0 and IR_quality_ER = 1
Deviation 4	64	73	74	1/0 dummy: 1 if IR_quality_MM = 1 and IR_quality_ER = 1
Changes in organization:				
Changes in the remuneration system	30	37	34	1/0 dummy: 1 if major changes in the remuneration system were introduced in the past three years. In 2013 the variable is defined simply as 'changes' in the remuneration system.
Changes in the work process	45	43	45	1/0 dummy: 1 if changes in the organization of the work process were introduced in the past three years. In 2013 the variable is defined as changes in 'ways to coordinate and allocate the work to employees.'
Changes in the working time	26	25	29	1/0 dummy: 1 if changes in the working time arrangements were introduced in the past three years

Restructuring measures	37	52	55	1/0 dummy: 1 if restructuring measures were introduced in the past three years. In 2013 the variable is defined as changes in the 'use of technology.'
Single establishment	64	59	53	1/0 dummy: 1 if single independent company or organization
Public sector	38	20	15	1/0 dummy: 1 if establishment belongs to the public sector
Sector:				
Industry	33	37	37	Industry [code 1 in 2013; code CDE (Manufacturing and energy) in 2009]
Construction	6	8	9	Construction [code 2 in 2013; code F (Construction) in 2009]
Commerce and hospitality	11	15	15	Commerce and hospitality [code 3 in 2013; code G (Wholesale and retail trade; repair of motor vehicles, motorcycles, and personal and household goods); and code H (Hotels and restaurants) in 2009]
Transport and communication	4	10	9	Transport and communication [code 4 in 2013; code I (Transport, storage and communication) in 2009]
Financial services and real estate	2	10	10	Financial services and real estate [code 5 in 2013; code J (Financial intermediation); and code K (Real estate, renting and business activities) in 2009]
Other services	44	20	20	Other services [code 6 in 2013; code L (Public administration and defense; compulsory social security), M (Education), N (Health and social work); and code O (Other community, social and personal service activities) in 2009]
Establishment size:				
10 to 49 employees	31	26	23	
50 to 249 employees	33	49	52	
More than 250 employees	35	25	25	
Number of observations:	5,347	2,964	1,409	

Notes: The estimation sample is generated by the model specified in column (1) of Table 5. Means are given in percentage points. See the data section for full description of the variables.