

# DISMISSAL REGULATION AS A DISCIPLINE DEVICE? EVIDENCE FROM ESTABLISHMENT-LEVEL INDUSTRIAL ACTIONS\*

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## **Abstract**

Using data on a large sample of EU establishments, I analyze the relationship between discharge regulation and industrial actions. I introduce a simple theoretical framework allowing for both positive and negative effects of dismissal constraints on the occurrence of labor disputes, and empirically answer the question as whether stricter dismissal laws make EU establishments experience more frequent and intense industrial actions (work-to-rule, strikes and occupation). I find that a change from employment at-will to a regime with very strict dismissal constraints is associated with an increase in the likelihood of observing an industrial action at the establishment-level ranging between 10.5 and 14.8 percentage points, and that this effect reduces to around 6.7 percentage points when only company-specific industrial actions are considered. This result is shown to be robust to possible endogeneity. Discharge constraints effects on industrial actions are then confirmed through a difference-in-differences analysis, by exploiting quasi-experimental variations in national dismissal regulations. My findings show that weaker discharge regulations moderate labor conflicts in EU establishments, by disciplining workers and restraining unions' activism.

**Keywords:** industrial action, dismissal regulation, hold-up, European Company Survey.

**JEL classification:** J52, J58, K31

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# 1 Introduction

Dismissal regulation has been the focus of increased policy concern in the EU, notably in Southern European countries, mainly due to its potential influence on a number of national economic aggregates (such as employment levels and economic growth). In particular, since the seminal work of Botero *et al.* (2004), a bunch of empirical studies have reported evidence of an impact of employment protection legislations on productivity (Autor *et al.*, 2007; Bassanini *et al.*, 2009; Bird and Knopf, 2009; Cingano *et al.*, 2010, 2015), job reallocation (Messina and Vallanti, 2007; Caballero *et al.*, 2013), technological innovation (Griffith and Macartney, 2014; Acharya *et al.*, 2013, 2014), worker flows and unemployment (Nickell *et al.*, 2005; Griffith *et al.*, 2007; Garibaldi and Violante, 2007; MacLeod and Nakavachara, 2007).<sup>1</sup>

Surprisingly, the effect of dismissal regulation on industrial actions and labor disputes, which may involve a wide range of issues (including work safety, wages and investments), relevant at a firm and country-level, so far has received no attention.

While, in general, worker friendly institutional frameworks should address employees' grievances that would otherwise be channeled off into industrial conflict (there is less need of industrial actions to defend workers' interests when the labor law is more protective), descriptive empirical evidence on dismissal regulation seems to suggest quite an opposite and puzzling pattern. Figure 1 shows the cross-country relationship between discharge constraints and industrial action in Europe, averaged over the 2009-2013 period. Countries that exhibit relatively stricter dismissal regulations also show a relatively larger loss of days-worked due to industrial action.

*[insert Figure 1 about here]*

This aggregate picture may be showing a spurious correlation. However, in line with bargaining

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<sup>1</sup>That employment regulations have significant effects on labor market outcomes is questioned by a number of authors (see, e.g., Betcherman (2012) and Deakin *et al.* (2014)).

theory (e.g. Binmore *et al.*, 1986), it may also suggest that a greater employer discretion on firing affects bargaining powers in the labor market, weakening workers' incentive and capability to challenge employers with industrial disputes.

In this paper, I will introduce a simple theoretical framework allowing for both positive and negative effects of dismissal regulation on the occurrence of industrial actions. On the one side, the model allows dismissal constraints to weaken the firing threat on workers thereby increasing unions' power and activism (hold-up effects). On the other side, it also accounts for possible negative labor market effects, in terms of slower cross-firm job flows and reduced outside options for fired employees, as suggested by traditional search and matching models (Pissarides, 2000). In particular, risk averse workers may decide not challenge employers when they are at risk of remaining trapped in long-term unemployment due to rigid regulation.

Then, I will test whether the relationship shown in Figure 1 is robust to a systematic econometric study, using establishment-level data from the last two waves of the European Company Survey (ECS, 2009, 2013), covering more than 30000 companies over 24 European countries, matched with the last release of the Labour Regulation Index Dataset (Armour *et al.*, 2016), which collects worldwide information on labor laws, including both substantial and procedural dismissal constraints. Specifically, I aim to answer the question as whether stricter dismissal regulations make EU establishments experience more frequent and intense official industrial actions (work-to-rule, strikes, blockade and occupation). In doing so, I will employ an econometric model in which cross-national, cross-sector and cross-firm variation is allowed. This is crucial, to the extent that company-level characteristics, possibly correlated with country-level labor laws, may influence establishment-specific industrial disputes. I will show that, after controlling for a number of covariates, a change from employment at-will to a regime with very strict dismissal constraints is associated with an increase in the likelihood of observing an industrial action at the establishment-level ranging between 10.5 and 14.8 percentage points, and that this effect reduces

to around 6.7 percentage points when only company-specific industrial actions are considered. This result will be shown to be robust to possible endogeneity due to reverse causality (addressed by means of an instrumental variable strategy and by restricting the sample to company-specific industrial actions) and to both country-sector and establishment-level heterogeneity. I will also run a difference-in-differences analysis, by exploiting quasi-experimental variations in dismissal regulation, driven by employment protection reforms implemented in a small group of EU countries in the 2009-2013 period and having an expected differential impact on discharge constraints in eligible establishments. Difference-in-differences estimates will confirm the presence of a causal link between dismissal regulation and industrial actions in EU firms.

Besides contributing to the understanding of some of the consequences of dismissal regulations, I also provide new evidence in the debate on the determinants of industrial actions. An extensive literature on strike activity has explored the role of business cycle, employment fluctuations and labor market tightness (Schor and Bowles, 1987; Harrison and Stewart, 1989, 1994; Kennan, 1985; Tracy, 1986; Vroman, 1989; McConnell, 1990; Cramton and Tracy, 1992, 1994a), information asymmetries (Hayes, 1984; Card, 1990; Gunderson *et al.*, 1986), behavioral factors (Godard, 1992), unionization (Gramm, 1986; Jansen, 2014; Addison and Teixeira; 2017) and a number of legislative policy variables, such as mandatory strike votes, dues checkoff, cooling-off periods, re-opener requirements, compulsory conciliation and prohibition on replacement workers (Gunderson *et al.*, 1989; Gunderson and Melino, 1990; Budd, 1996; Cramton *et al.*, 1999). None of these studies, however, deals with the general dismissal regulation. While dismissal legislations are not designed specifically to affect unions behavior and the labor relations climate, they could have indirect, perhaps unintended, effects on labor conflicts. Differently from replacement bans on striking workers, dismissal constraints have a not obvious influence on industrial actions, as they affect both hold-up powers of possibly opportunistic contracting parties within the labor relationship and the external outside options available in the labor market. With this analysis, I

shed light on these effects. More generally, thanks to a large-scale international coverage, the ECS data used in this paper provide a unique opportunity to study the relationship between industrial actions and cross-country labor regulation heterogeneity, while previous studies of labor disputes have been hampered by small samples of firms, mostly belonging to a single country.

Having clarified what I do discuss in this paper, it is worth emphasizing what I do not. Because previous literature proposes several attempts to measure both equity and efficiency effects of industrial actions (see, e.g., Cramton *et al.* (1999) and Cramton and Tracy (2003)) and, more recently, also the external costs for non-involved third parties (Krueger and Mas 2004; Mas, 2008; Bauernschuster *et al.*, 2017), I do not undertake a welfare analysis here. Although simple methodologies to estimate the economic implications of policy-driven labor disputes are available (Currie and McConnell, 1991), given data constraints this quantification remains outside the scope of the present study.

The remaining of the paper proceeds as follows: section 2 briefly describes how dismissal restrictions are structured and implemented in EU countries; section 3 summarizes the main insights from the related literature; section 4 presents a simplified model of wage bargaining; section 5 introduces the data used in empirical study; section 6 presents my basic estimation results, whose robustness is checked in section 7; section 8 concludes.

## **2 Dismissal regulation in Europe**

The legislation regulating employee dismissal consists of rules and procedures, mainly provided through labor law, that define the limits to the faculty of employers to hire and fire employees. The rationale of limiting employers' discretion in the firing process is to address the risks for workers associated with the dismissal through a series of requirements.

With respect to termination of regular employment, the dismissal legislation provides sub-

stantial and procedural constraints. Substantive constraints concern the difficulty of dismissal, that is legislative provisions setting conditions under which a dismissal is “justified” or “fair”. Procedural constraints concern the procedural obligations to be respected by the employer when starting the dismissal process. Thus, while the substantive provisions of the dismissal regulation set the conditions under which it is possible for an employer to dismiss an employee, by defining legitimate reasons for the termination of an employment relationship (and the sanctions applicable to the employer in case of wrongful and unfair dismissals), procedural provisions may give the opportunity to the employee to challenge the dismissal decision at an early stage of the firing process, possibly involving a third party (such as the competent labor authority). In case of wrongful or unfair dismissal, however, court interpretations of legal provisions may constitute a major source of uncertainty for workers. In several countries, when appealing to the court, workers are not in a particularly favourable situation, as the judicial procedure may be very long, from six months to more than one year (OECD, 2004). Thus, where regulations do not provide restrictive constraints to dismissal, the uncertainty over the court ruling and the length of the procedure may play an additional threatening role for employees.

EU has adopted a number of labor law directives setting minimum requirements and country regulations appear highly heterogeneous in the regime for individual dismissals on regular contracts, both in terms of stringency and instruments to protect workers against dismissal. Where dismissal regulations differ the most across European countries is the definition of fair and unfair dismissal. In some countries (e.g. Finland, France, Slovenia) dismissals are unlawful if they are not based on an effective and relevant reason. In some others (e.g. Belgium, Czech Republic, Denmark, Greece, Hungary, Italy) the definition of fair dismissal is not restrictive and unfair dismissals are limited to cases of discrimination and cases which cannot be justified by economic reasons. In still other countries (e.g. the Anglo-Saxon ones) no need exist to justify an economic dismissal as such.

It is worth noting that European countries experienced an increased frequency of reforms addressing the dismissal regulation for permanent contracts since 2006. Starting from 2009, the incidence of measures reducing regulation restrictiveness increased, especially in Southern and in some Eastern European countries. Reform activity in the domain of dismissal legislation continued to be intense after 2012, in particular in countries with relatively stringent legislation before the crisis, notably Spain, Italy and France (European Commission, 2017). Overall, the EU average value of the OECD indicator of strictness of employment protection against individual and collective dismissals for workers with a regular contract decreased from 2.58 in 2008 to 2.47 in 2013, with lower values (weaker regulation) in United Kingdom (1.66), Ireland (2.07), Estonia (2.07) and Hungary (2.07) and higher values (stricter regulation) in Belgium (2.99), the Netherlands (2.94), Italy (2.89) and France (2.84).

### **3 Motivation and literature background**

From a theoretical perspective, the overall impact of dismissal regulation on industrial actions is ambiguous. Different strands of study, in the literature on labor market regulation and institutions, suggest the possibility of effects with opposite sign.

A direct channel through which firing constraints may rise both the incidence and intensity of industrial actions is their link with unions' bargaining power. Almost always, labor contracts are incomplete (and often also partly implicit, see Bull (1987)), i.e. the contract does not specify each party's obligations in every possible state of the world, because individuals are not able to foresee all contingencies and contracting for details of every conceivable eventuality may be too costly. In a context of incomplete contracts, disagreement between employees and employers may emerge on issues involved in the labor relationship and, where relationship-specific investments are undertaken, parties may have the incentive to deviate from the contractual agreement to

extract undue rents, so generating an hold-up problem (Williamson, 1985).

On the one side, after the employer has undertaken a sunk investment (such as a location-specific investment in fixed capital), the union may demand a higher wage to reap a larger share of the surplus at the expenses of the employer. If workers are protected by stronger employment protection regulation, then they can bargain more actively, as their opportunistic behavior is more difficult to be punished. Building on the seminal insights of Grout (1984), an extensive literature has shown that union power is positively associated with rent-seeking (e.g., Cardullo *et al.* (2015)). From this point of view, stricter dismissal constraints, which impede employers' reaction to workers' opportunism, may boost union claims and activism.

On the other side, hold-up risks may be faced also by employees who have contributed to the development of firm-specific human capital with their effort, when the employer is able to act strategically by threatening to dismiss the workers. For example, under at-will employment, the employer may later decrease the wage back to the competitive (or to a even lower) level, taking advantage from the fact that the workers have already made their relationship-specific investment (Acharya *et al.*, 2013, 2014). Phrased differently, employers may have incentives to expropriate rents by demanding lower wage renegotiations, inasmuch as they have the power to discharge workers who do not agree with the wage reduction. Thus, stronger firing constraints, particularly those that protect employees for termination in bad faith, may be positively associated to industrial actions where such actions are a response to employer opportunism.

In both cases, i.e. in the presence of employee and employer opportunistic bargaining, employment protection has a positive effect on the occurrence of labor disputes, by boosting union “pro-activism” and “re-activism”, respectively. This is consistent with the joint-cost perspective on strikes (introduced by Kennan (1980) and Reder and Neumann (1980)), according to which industrial actions, whatever their purpose, are used by unions more than other mechanisms, such as joint committees and voluntary arbitration, when their costs is relatively lower for the workers,



all else being equal. Dismissal constraints, that make firing more difficult for the employer, reduce such costs, as they moderate the employee's risk of being discharged.

According to these insights, stricter dismissal regulations should make companies experience *more* frequent and intense industrial actions.

Nonetheless, a negative impact of dismissal regulation on industrial actions is also possible. That more stringent firing laws reduce labor disputes may follow from traditional search and matching models of job flow dynamics in regulated labor markets.<sup>2</sup> In a framework with employment protection modeled as a firing tax, dismissal restrictions may both increase and reduce the union incentives to conflict with employers. On the one hand, protected workers face a lower probability of being fired, and this strengthens the bargaining power of insiders. On the other, however, firing restrictions also reduce job-to-job transitions and worker outside options, thereby increasing the length and the costs of unemployment which may follow from prolonged industrial actions. Overall, stricter firing regulations may weaken the union incentives to challenge employers, to the extent that, for the employee, the increase in the costs of being fired is higher than the benefits associated with a stronger dismissal protection, also depending on the attitude of workers toward risk. The reduction in the probability of finding new jobs due to a stricter employment protection is corroborated by a number of studies. Garibaldi (1998) proposes a stochastic search model with endogenous job separations and shows that firing restrictions lower the job hiring rate and negatively affect job reallocation. The distinctive prediction of the model is that stricter firing provisions reduce the job finding rate. Messina and Vallanti (2007) study the impact of more stringent firing laws on job flow dynamics across 14 European countries. Their empirical results indicate that firing restrictions slow down labor reallocation. When firing is costly and time consuming, firms respond by smoothing employment reshuffle. Similar findings are provided by Caballero *et al.* (2013). This is the reason, according to several authors, why dismissal con-

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<sup>2</sup>For a comprehensive discussion of search and matching models see Pissarides (2000).

straints contribute to increase unemployment rates (Autor *et al.*, 2006; Bertola *et al.*, 2007; Kahn, 2007).

In addition, stronger dismissal protection may restrict the ground for industrial conflict by improving the quality of the employment relation. MacLeod and Nakavachara (2007) formally illustrate how employment protection regulation improves the quality of the employment contract using a model of subjective evaluation in a standard principal-agent framework. In this model, employment protection laws require the firm to provide a valid reason for the dismissal and therefore create an incentive for the employer to reduce legal liability by collecting more accurate and verifiable information regarding employee performance, so lowering the cost of eliciting worker effort. A more objective evaluation of employee performance, in turn, decreases the perceived bias in the employment relationship (and hence the contract enforcement costs), which increases performance. MacLeod and Nakavachara (2007), in summary, find that increased employment protection may increase the level of effort and wages, in particular in jobs with higher levels of relationship-specific investments. If industrial actions originate from disagreement on effort and wages, then stricter dismissal constraints may reduce the number and the intensity of labor disputes, by reducing information asymmetries and uncertainty.

These arguments suggest that stricter dismissal regulations should make companies experience *less* frequent and intense industrial actions.

## **4 A simplified model of wage bargaining**

Most of the insights introduced in the previous section can be formalized in a simple framework of wage bargaining, with outside options being endogenous to the labor regulation and where, as in Schor and Bowles (1987), the union's decision to call for an industrial action crucially depends on the expected utility loss associated with an employment termination.

A union and a firm are bargaining over the wage to be paid during a contract of duration  $T$ . As in standard strategic models of strike threats (e.g., Cramton and Tracy (1994a, 1994b)), to keep things simple, I assume that the union and the firm are both concerned with a single contract negotiation and that the contract specifies only the wage (other issues, such as employment levels and investments are exogenous with respect to the contract). There is no inflation. Depreciation and taxes are also ignored. Let  $w_0$  denote the wage under an initial labor agreement, negotiated in  $t_0$ .

Under the initial labor agreement, the final payoff of the union and the firm would be, respectively,  $U_u^0 = w_0 - f_u$  and  $U_f^0 = R - w_0 - f_f$ , where  $R$  indicates the revenues,  $f_u$  the fixed costs of workers (for example, sunk investments in firm-specific human-capital and effort) and  $f_f$  the fixed costs of the firm (such as investments in location-specific physical assets and investments in the training of the workers). Suppose that in  $t_0$  the union and the firm agreed on a wage level such that  $U_u^0 = U_f^0$ , i.e:

$$\begin{aligned} w_0 - f_u &= R - w_0 - f_f \\ w_0 &= \frac{R - f_f + f_u}{2} \end{aligned} \tag{1}$$

Now, assume that the labor contract is incomplete and that, therefore, both the union and the firm can ask for wage renegotiation. The timing is as follows. In  $t_1$ , the two parties may decide to continue their labor relationship under the  $t_0$  contract or one of the two parties asks for renegotiation and makes a wage offer. If a party asked for a renegotiation, in  $t_2$ , the counterpart can either accept the offer or reject it. If it accepts the initial offer, an immediate settlement takes place at the proposed wage level without a dispute. If the offer is rejected, a labor dispute begins. During the dispute, in  $t_3$ , the party which has made the initial offer reviews its offer and proposes a new wage level. In  $t_4$ , the counterpart either accepts the reviewed offer or reject it. If it rejects

the reviewed offer, the workers are fired and substituted with others, having a productivity level that is some fraction  $\alpha \in (0, 1)$  of the productivity of the union workers and who are paid a lower (nonunion) wage  $w_r$ , which is common knowledge. I am assuming that, during the negotiation, workers cannot be substituted, due to replacement bans, and that new workers can be hired by the firm only after the dispute's end and once previous employees are dismissed.

***The union is the first mover.***

If the union asks for a renegotiation in  $t_1$ , its wage offer is  $\bar{w} > w_0$ . If the firm accepts the offer, the final payoffs are  $\bar{U}_u = \bar{w} - f_u$  and  $\bar{U}_f = R - \bar{w} - f_f$  for the union and the firm respectively.

If the firm rejects the offer, an industrial action takes place, with a cost  $c_u$  for the union (lost wages) and  $c_f$  for the firm (lost profits). During the dispute, the union reviews its offer and proposes  $\bar{w}' \in [w_0, \bar{w}]$ . In  $t_4$ , if the firm accepts the new offer, the final payoffs are:

$$\bar{U}_u' = \bar{w}' - f_u - c_u \quad \text{and} \quad \bar{U}_f' = R - \bar{w}' - f_f - c_f \quad (2)$$

If the firm rejects the new offer, the firm dismisses the workers and hire replacements. In this case, final payoffs are:

$$\bar{U}_u'' = w_r h(d) - f_u - c_u \quad \text{and} \quad \bar{U}_f'' = (\alpha R - w_r) h(d) - f_f - c_f - d \quad (3)$$

where  $d$  is the cost of dismissal (as a tax on firing),  $w_r$  is the nonunion wage (i.e., for fired workers, the wage under alternative employment),  $h$  is the probability that a fired worker finds a new job and that a vacancy is filled, with  $\partial h / \partial d < 0$  (i.e., dismissal costs reduce hiring), and where  $w_r h(d) < w_0$ . Thus, once the union has made its reviewed wage offer  $\bar{w}'$ , the firm will accept the

offer only if  $(\alpha R - w_r)h(d) - f_f - c_f - d < R - \bar{w}' - f_f - c_f$ , i.e. if:

$$\bar{w}' < R + d - \alpha R h(d) + w_r h(d) \quad (4)$$

An increase of the dismissal costs  $d$ ,  $\bar{w}'$  being equal, has both a direct positive effect on the probability that the firm accepts the reviewed offer during the dispute, because it increases the direct costs of exit for the firm, and an ambiguous indirect effect due to the decrease of  $h(d)$ . The direct effects dominate when:

$$\left| 1 - \alpha R \frac{\partial h}{\partial d} \right| > \left| w_r \frac{\partial h}{\partial d} \right| \quad (5)$$

If the condition (4) holds (so that  $\bar{U}_f' > \bar{U}_f''$ )<sup>3</sup>, working backward to solve the problem and under the assumption that the firm is able to anticipate in  $t_1$  both  $\bar{U}_f'$  and  $\bar{U}_f''$ , the firm will accept the  $t_1$  offer  $\bar{w}$  if  $R - \bar{w} - f_f > R - \bar{w}' - f_f - c_f$ , i.e. if:

$$\bar{w} - \bar{w}' < c_f \quad (6)$$

As a result, if the condition (4) holds and if the union's offers  $\bar{w}$  and  $\bar{w}'$  are independent of  $d$ , then  $d$  does not affect the probability of observing an industrial action. The intuition is the following. If the reviewed union's wage offer  $\bar{w}'$  (or the productivity of the new workers) is low enough as to make the firm's utility from accepting the reviewed offer higher than the utility of dismissing the workers (condition (4)) and if the union has no information on the firm's variables (including both the distribution and the realization of  $R$ ,  $c_f$  and  $f_f$ ) so that  $\bar{w}$  and  $\bar{w}'$  are independent of  $d$ , an increase in the dismissal costs affects only  $\bar{U}_f''$  while it leaves unchanged

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<sup>3</sup>Condition (4) always holds if the union is rational. Given that  $w_r h(d) < w_0 \leq \bar{w}'$ , then  $\bar{U}_u' > \bar{U}_u''$ , i.e., in  $t_4$ , for the union a settlement is preferable than the dismissal of the employees. Thus, the union will always make a reviewed offer  $\bar{w}'$  such that  $\bar{U}_f' > \bar{U}_f''$ , in order to avoid firing.

both the firm's utility from negotiating with the union for  $\bar{w}'$  and the utility of the firm when it accepts  $\bar{w}$ .

Nevertheless, the union may be able to observe the costs of the firm at the various stages of the negotiation process and arguably it is able to formulate some prediction of the firm's utility levels. In particular, suppose that the union knows that both  $f_f$  and  $R$  are drawn from the distributions  $q_f$  and  $p$  with positive density on the interval  $[f_f^L, f_f^H]$  and  $[R^L, R^H]$  respectively, and suppose that the values  $f_f$  and  $R$  are known only to the firm.

**Proposition 1.** *In the case of the union asking for renegotiation (union opportunism), if the condition (4) holds and if the distribution of the firm's variables  $f_f$  and  $R$  is common knowledge, then  $d$  affects the probability of observing an industrial action.*

Suppose that the union has some information on the firm's variables and that, in particular, it can reasonably predict how the difference between  $\bar{U}_f'$  and  $\bar{U}_f''$  is affected by variations of  $d$ . Under condition (5), an increase of  $d$  reduces  $\bar{U}_f''$ . Thus, the union can increase its reviewed wage offer  $\bar{w}'$  while keeping  $\bar{U}_f'' < \bar{U}_f'$ . If  $\bar{w}$  remain unchanged and  $\bar{w}'$  increases, then the probability that the firm accepts  $\bar{w}$  in  $t_1$  increases (that  $\bar{U}_f > \bar{U}_f'$  becomes more likely) and the probability of observing an industrial action decreases (see condition (6)). If, as  $d$  increases, the union also increases  $\bar{w}$  and if  $\bar{w}$  rises more than  $\bar{w}'$ , then the probability that the condition (6) continues to hold declines and the probability of observing an industrial action increases.

***The firm is the first mover.***

If, in  $t_1$  the firm asks for renegotiation, the bargaining process develops symmetrically to the case of the union as the first mover.

In  $t_1$ , the firm makes the initial wage offer  $\underline{w} < w_0$ . If the union accepts the offer, the final payoffs are  $\underline{U}_f = R - \underline{w} - f_f$  and  $\underline{U}_u = \underline{w} - f_u$  for the firm and the union respectively. However, the union may reject the offer and call for an industrial action. During the negotiation, the firm

can review its offer, proposing  $\underline{w}' \in [\underline{w}, w_0]$ . If the union accepts the new offer, the final payoffs are:

$$\underline{U}_u' = \underline{w}' - f_u - c_u \quad \text{and} \quad \underline{U}_f' = R - \underline{w}' - f_f - c_f \quad (7)$$

If the union rejects  $\underline{w}'$ , again, the firm dismisses the workers and hire replacements. Final payoffs will be:

$$\underline{U}_u'' = w_r h(d) - f_u - c_u \quad \text{and} \quad \underline{U}_f'' = (\alpha R - w_r) h(d) - f_f - c_f - d \quad (8)$$

The union will accept the offer only if  $w_r h(d) - f_u - c_u < \underline{w}' - f_u - c_u$ , i.e. if:

$$w_r h(d) < \underline{w}' \quad (9)$$

An increase of the dismissal costs  $d$ ,  $\underline{w}'$  being equal, reduces  $w_r h(d)$  and therefore increases the probability that the union will accept  $\underline{w}'$ . If the condition (9) holds (i.e.,  $\underline{U}_u' > \underline{U}_u''$ ), working backward to solve the problem and under the assumption that the union is able to anticipate in  $t_1$  the firm's reviewed offer  $\underline{w}'$ , the union will accept the initial offer  $\underline{w}$  if  $\underline{w} - f_u > \underline{w}' - f_u - c_u$ , i.e. if:

$$\underline{w} > \underline{w}' - c_u \quad (10)$$

Therefore, under condition (9), if the firm's offers  $\underline{w}$  and  $\underline{w}'$  are independent of  $d$ ,  $d$  does not affect the probability of observing an industrial action. The intuition is straightforward. If the reviewed wage offer  $\underline{w}'$  made by the firm is higher than the expected nonunion wage, given that  $\underline{w}' \leq \underline{w}$ , then the dismissal costs do not influence the probability that the initial wage offer is

rejected by the union.

Again, however, the first mover (i.e. the firm, in this case) may be able to observe the costs born by the workers at the various stages of the negotiation process (in particular, suppose that the firm knows that  $f_u$  is drawn from a distribution  $q_u$  with positive density on the interval  $[f_u^L, f_u^H]$ ) and arguably it may be able to formulate some prediction of the union's utility levels under different levels of  $d$ .

**Proposition 2.** *In the case of the firm asking for renegotiation (firm opportunism), if the firm knows the distribution of  $f_u$ , so that it is able to formulate predictions of the union's payoffs, then  $d$  affects the probability of observing an industrial action.*

If the distribution (but not the value) of  $f_u$  is known to the firm (and given that  $c_u$  is common knowledge, it being lost wages), as  $d$  increases (i.e.,  $w_r h(d)$  decreases), the firm may reduce both its  $t_1$  ( $\underline{w}$ ) and  $t_2$  ( $\underline{w}'$ ) offers. If the firm reduces  $\underline{w}$  relatively more than  $\underline{w}'$ , the probability that the condition (10) is violated increases, and the probability of observing an industrial action increases too.

Proposition 1 and Proposition 2 have key implications. First, they say that, under reasonable assumptions (in particular, both the union and the firm have some information on the revenues generated by the firm and on the costs characterizing the utility function of the counterpart), the dismissal costs influence the likelihood of having an industrial action at the establishment-level. Second, both in the cases in which the firm is the first mover and in which the first mover is the union, an increase of the dismissal costs decreases the payoff of the exit option for both the firm  $((\alpha R - w_r)h(d) - f_f - c_f - d)$  and the workers  $(w_r h(d) - f_u - c_u)$ . Thus, as  $d$  increases, the probability of a dispute also increases if the first mover (firm/union) changes (decreases/increases) its initial offer accordingly, in an attempt to extract a larger share of the surplus at the expenses of the counterpart. In order for this effect to hold, one needs to assume that the first mover



changes its initial offer in response to a variation of  $d$  to a larger extent than it changes its reviewed offer during the dispute. This assumption, however, is reasonable as far as, during a dispute, the ability of the parties to review their offers in response to exogenous disturbances may be more limited. Third, an increase of the dismissal costs reduces the likelihood of having an industrial action if its indirect (labor market) effects on the probability of matching unemployed and vacancies are relatively very strong (see, in particular, condition (5) in the case of the union being the first mover). Moreover, dismissal costs may negatively impact on labor disputes also if workers are strongly risk averse. In this case, the union may decide not to ask for renegotiation in  $t_1$  if the expected nonunion wage  $w_r h(d)$  of the workers is strongly reduced by an increase in  $d$  and the union wants to minimize the risk of dismissal. Symmetrically, risk averse firms may prefer avoiding a dispute, by accepting the initial union's wage offer, if the costs of dismissing and replacing workers (i.e.,  $d - (\alpha R - w_r)h(d)$ ) or the costs of an industrial action ( $c_f$ ) are high.

## 5 Data and variables

With the empirical analysis, I aim to answer the question as whether stricter dismissal constraints make EU establishments experience more or less frequent and intense industrial actions, controlling for all other variables possibly correlated with both industrial actions and dismissal regulation. To do so, I use data from different sources.

Information on industrial actions at the establishment-level are obtained from the last two waves of the European Company Survey (ECS, 2009, 2013), covering more than 30000 companies over 24 European countries. The European Company Survey is conducted by interviewing managers and employee representatives (generally, the most senior employee representative, representing the largest proportion of employees) in public and private European establishments with 10 or more employees over approximately all sectors of activity, including industry, construction,

wholesale, retail, food and accommodation, transport, financial services and real estate, and other services. Agriculture and extraterritorial organizations are not covered by the ECS. In my basic regression analysis, I record the incidence of industrial actions by using the answers to the question as whether an industrial action occurred at the establishment-level in the yearly-basis period covered by a ECS wave, that I code as a dummy variable (1 = an industrial action took place, 0 = otherwise).<sup>4</sup> Moreover, if an industrial action occurred, I measure the intensity of the industrial action through the answers to the question as whether the type of the action was: “work-to-rule” (employees do no more than the minimum required by the rules of their contract, and follow regulations to the letter; it also includes refusal to do overtime), “short strike” (work stoppage or strike for less than a day), “long strike” (strike of a day or more), or “occupation”.<sup>5</sup> Where more than one industrial action occurred in the period covered by an ECS wave, I refer to the type of the most severe action according to the following ascending order: work-to-rule, short-strike, long-strike, and (for 2013 only) occupation.

I measure firing regulations taking information from the last release of the Labour Regulation Index Dataset (Armour *et al.*, 2016), which collects worldwide data on labor laws, including both substantial and procedural dismissal constraints. The Labour Regulation Index Dataset provides data on labor laws in 117 countries for the period from the 1970s to (in most cases) 2015. In particular, I use data for the 24 countries covered by the 2009 and 2013 ECS waves. I construct an indicator of the strictness of the dismissal regulation (*Dismissal constraints*), by averaging for each country and year a sub-index of procedural constraints on dismissal and a sub-index of substantive constraints on dismissal, both provided in the Labour Regulation Index Dataset. The sub-index on procedural constraints equals 1 if a dismissal is necessarily unjust if the employer fails to follow procedural requirements prior to dismissal, 0.67 if failure to follow procedural requirements will

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<sup>4</sup>In the ECS, employee representatives are contacted and interviewed only in those establishments where an employee representation structure is present. As a result, ECS data cover only official industrial actions (i.e. actions called by a union), while unofficial industrial actions (unlawful in most countries) are not registered.

<sup>5</sup>Information on worker occupation is available only in the 2013 wave of the ECS.

normally lead to a finding of unjust dismissal, 0.33 if failure to follow procedural requirement is just one factor taken into account in unjust dismissal cases, and 0 if there are no procedural requirements for dismissal. The sub-index on substantive constraints equals 1 if dismissal is only permissible for serious misconduct or fault of the employee, 0.67 if dismissal is lawful according to a wider range of legitimate reasons (misconduct, lack of capability, redundancy, etc.), 0.33 if dismissal is permissible if it is “just” or “fair” as defined by case law, and 0 if employment is at-will (i.e., no cause dismissal is normally permissible). Thus, also the final *Dismissal constraints* index ranges from 0 (no employee protection) to 1 (maximum protection). It is worthwhile noting that: the coding strategy of the Labour Regulation Index Dataset takes into account both mandatory and default rules (with a reduction in the score to indicate their non-binding nature; in particular, where opting out is straightforward, a score closer to 0.5 or below is given); the dataset codes for the law as it applies to an indeterminate (or “permanent”) employment relationship; where laws differ in their effects according to the location or the size of the company, the coding is based on the rules which apply in the default or standard case; finally, where different standards are set for different groups of workers, such as white-collar and blue-collar employees, the dataset codes for the minimal or less protective standards.

As for the control variables, I consider a number of establishment-, sector- and country-level characteristics.

At the establishment-level, following Jansen (2014) and Addison and Teixeira (2017), I control for unionization, company size and establishment status (i.e. headquarter, independent or subsidiary). Moreover, in line with the literature on strike and information asymmetries (Hayes, 1984; Card, 1990; Gunderson *et al.*, 1986), I also include a measure of information sharing between the management and employee representative bodies. Specifically, *Establishment’s unionization rate* (ranging from 0 to 1) measures the proportion of employees in the establishment who are member of a trade union. *Establishment’s size* is coded by means of three dummies, which classify the

company into the 10-49, 50-249 or 250+ employees class. The establishment status is measured with the *Establishment's type* dummy, which equals 1 if the establishment is a headquarter or an independent company and 0 if it is a subsidiary. *Establishment's information sharing*, finally, is a dummy variable, which equals 1 if, at least once in the year preceding the survey, the management provided the employee representative body with any information on the economic, financial and employment situation of the establishment and if the disclosed information (in the opinion of the employee representative) was satisfactory and sufficiently detailed, and 0 otherwise. All the establishment-level controls are obtained from the ECS (2009, 2013).

At a sectoral level, I control for the tightness of the labor market. Several studies show that strike activity may be strongly correlated with the business cycle and employment fluctuations (e.g., Kennan, 1985; Tracy, 1986; McConnell, 1990; Cramton and Tracy, 1992, 1994a). Given data availability constraints on the sectoral number of vacancies and the impossibility to measure unemployment at a sectoral level, I include a variable (*Sector-level job saturation index*), constructed as the standardized value of the ratio between the sectoral employment share and the sectoral GDP share at a country-sector-year level (data are obtained from the OECD Structural Analysis Database (OECD, 2016)). The basic idea underlying this index is that a sector which increases, over time, the number of employees with respect to the produced output has decreasing job opportunities (vacancies) for fired workers. Thus, changes in this variable include changes in the labor demand (for example due to changes of the capital-labor ratio in production), which are not captured by variations in traditional unemployment indicators.

At a country-level, I control for inflation (*Country-level consumption prices inflation*, obtained from OECD (2016)) and the main institutional dimensions possibly influencing industrial actions according to previous literature (Gunderson *et al.*, 1989; Gunderson and Melino, 1990; Cramton *et al.*, 1999). In particular, with *Country-level employee representation rights* I control for the legislation of employee representation; this variable, ranging from 0 (minimum worker interest

protection) to 1 (maximum protection), is obtained by averaging seven sub-indicators covering the right to form trade unions, the right to collective bargaining, the employer’s duty to bargain with unions, the extension of collective agreements to third parties at the national or sectoral level, the regulation of closed shops entrance, the workers’ right to nominate board level directors, and the legal power of co-decision making given to works council. With *Country-level industrial action rights*, I control for the protection of the right to industrial action in the country’s constitution or equivalent, with higher values, between 0 and 1, indicating stronger protection of worker rights. With *Country-level replacement workers legislation*, finally, I control for the prohibition on replacement workers; this variable equals 1 if dismissal for taking part in an industrial action is unlawful and 0 if the law allows employers to permanently replace striking employees (further gradations between 0 and 1 reflect changes in the strength of the law). All the three institutional indicators are obtained from the Labour Regulation Index Dataset (Armour *et al.*, 2016).<sup>6</sup> It is important to emphasize that the *Dismissal constraints* index and the *Country-level replacement workers legislation* variable account for two distinct legal mechanisms. On the one side, *Country-level replacement workers legislation* specifically accounts for the legislation that prohibits replacement workers (often termed “anti-scab” law), and measures legal provisions which are commonly enacted with the purpose of reducing the picket line violence and the polarizing of positions that occurs when worker replacement is used. On the other, *Dismissal constraints* refers to the overall discharge legislation and measures constraints to dismissal not directly related to the participation to a specific industrial action. An employee dismissal originated from a conflict between the worker and the employer may take place some time after the dispute; thus, where dismissal constraints are very weak, the discharge threat may influence worker dispute activity even in the presence of replacement bans.

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<sup>6</sup>In the empirical analysis, *Country-level industrial action rights* and *Country-level replacement workers legislation* cannot be included in the same model regression specification, as they are shown to be strongly correlated.

Basic descriptive statistics are presented in Table 1.

*[insert Table 1 about here]*

## 6 Basic results

In the econometric analysis, I employ a model structure design where cross-national, cross-sector and establishment-level heterogeneity is exploited. My basic model is specified as follows:

$$Y_i = \text{constant} + \beta \textit{Dismissal constraints}_{c,t} + \mathbf{b} \mathbf{X}_{i,s,c,t} + \text{sector FE}_s + \text{year FE}_t + \varepsilon_i \quad (11)$$

where  $i$  denotes the establishment,  $s$  the sector,  $c$  the country and  $t$  the year, and where  $Y_i$  is the dependent variable,  $\mathbf{X}$  the vector of controls and  $\mathbf{b}$  its corresponding vector of parameters. The term  $Y_i$  refers to different dependent variables in different model specification. In the model specification for industrial action incidence,  $Y_i$  is a dummy variable equal to 1 if an industrial action occurred at the establishment-level in the period covered by a ECS wave and equal to 0 otherwise; in this case, Equation (11) is estimated by means of a probit. In the model specification for industrial action intensity,  $Y_i$  is coded as an ordered variable equal to 0 when no industrial action was undertaken and equal to values greater than 0 if an action occurred (1 = “work-to-rule”, 2 = “short strike”, 3 = “long strike”); in this latter case, Equation (11) is estimated as an ordered probit.

*[insert Table 2 about here]*

Basic estimation results are presented in Table 2. The *Dismissal constraints* variable is associated with a positive and statistically significant (at a 1% level) marginal effect in all the model

specifications considered. In particular, in the industrial action incidence probit model, when all the controls are included (models [3] and [4]), a change from 0 to 1 in the *Dismissal constraints* variable is associated with an increase in the likelihood of observing an industrial action ranging between 10.5 and 14.8 percentage points. In the industrial action intensity ordered probit model, the effect of a 0-1 change in *Dismissal constraints* corresponds to a 1.6 percentage points increase in the likelihood of observing a “work-to-rule” (model [5a]), to a 2.7 percentage points increase in the likelihood of observing a “short strike” (model [5b]), and to a 5.0 percentage points increase in the likelihood of having a “long strike” (model [5c]). These results support the argument that stricter dismissal regulations make companies experience more frequent and intense industrial actions. To help with interpreting the results, it is useful to remember that *Dismissal constraints* equals 0 when there are no procedural requirements for dismissal and employment is at-will and equals 1 when a dismissal is necessarily unjust if the employer fails to follow procedural requirements prior to dismissal and dismissal is only permissible for serious misconduct or fault of the employee.

Turning to the other regressors, I observe that all the establishment-level controls are associated with statistically significant marginal effects. A basic prediction of many bargaining models is that dispute incidence is increasing in the level of information asymmetries (Hayes, 1984; Card, 1990; Gunderson *et al.*, 1986). Related to this, I find that, when employee representative bodies are timely informed on the economic, financial and employment situation of the establishment (as it is captured by *Establishment’s information sharing*), both dispute incidence and intensity are relatively lower. Consistently with previous findings, moreover, I find that unionization rates and company size stimulate industrial actions at the establishment-level (see, e.g., Jansen (2014) and Cramton *et al.* (1999), respectively) as well as the subsidiary status of the establishment with respect to headquarters and independent sites.

Coherently with common theoretical predictions and previous evidence (Kennan, 1985; Tracy,

1986; McConnell, 1990; Cramton and Tracy, 1992, 1994a), sectoral employment fluctuations appear to be an important determinant of labor conflicts. I find that a reduction in the outside job opportunities (as measured by *Sector-level job saturation index*) reduces dispute activity. Specifically, a one standard deviation change in this employment fluctuation measure is associated with a 1.6 (model [3]) and a 1.7 (model [4]) percentage points decrease in industrial action incidence and with a 0.7, 0.4 and 0.8 percentage points decrease in the likelihood of observing “work-to-rule”, “short strike” and “long strike”, respectively.

At a country-level, beside *Dismissal constraints*, the estimated effects of the other labor policy variables is shown statistically significant and in line with the findings of Gunderson *et al.* (1989), Gunderson and Melino (1990), and Cramton *et al.* (1999). I find that, while laws favoring employee representation, conciliation and co-decision making (measured by *Country-level employee representation rights*) moderate labor conflicts, laws protecting worker industrial action rights (*Country-level industrial action rights*) and banning the use of replacement workers (*Country-level replacement workers legislation*) encourage labor disputes. In a similar vein, very recent research has showed that the quality of industrial relations and of employee representation institutions reduces the incidence of strike activity at an establishment-level (Addison and Teixeira, 2017).

## 7 Robustness

### 7.1 Endogeneity

A potential problem with my empirical estimates of dismissal regulation effects is the possibility that policy heterogeneity both among countries at a point in time and within countries over time is endogenous to dispute activity. Coordinated industrial actions may be aimed at pushing legal policy-makers towards worker friendly reforms (such as those tightening dismissal regulation), and



this may introduce reverse causality in my basic regression.

To address this concern, I run additional batteries of regressions exploiting alternative econometric strategies, which allow me to check whether endogeneity significantly influences my basic estimated parameters.

### 7.1.1 Instrumental variable

As a first standard procedure to deal with endogeneity, I employ an instrumental variable (IV) strategy. Following comparative legal research (Roe, 2003), I instrument dismissal constraints by means of an index of corporate governance regulation, which is shown to be correlated with dismissal regulation but not with labor disputes. Specifically, I use the *Corporate governance index* obtained from the Doing Business Database (World Bank, 2017). This index measures the strength of minority investor protections as determined by sorting the country's distance to frontier scores for protecting minority investors. These scores are the average of the distance to frontier scores for the extent of conflict of interest regulation index (covering disclosure rules, the extent of director liability, and the ease of shareholder suits) and the extent of shareholder governance index (covering shareholders' rights in corporate decisions, the safeguards protecting shareholders from board entrenchment, and transparency rules on ownership, compensation, and financial issues). The variable *Corporate governance index* ranges from 0 to 10 and is defined at a country-year level. This index is shown to be a good candidate for instrumenting dismissal regulation, as, in a weighted cross-country univariate panel regression analysis, *Corporate governance index* is associated with a R-squared equal to 0.985 in a model explaining *Dismissal constraints* and with a R-squared equal to only 0.114 in a model of industrial action incidence.

I run a 2SLS, by regressing *Dismissal constraints* on *Corporate governance index* and then using instrumented *Dismissal constraints* values in both the industrial action incidence and intensity

models. Results are reported in Table 3.

*[insert Table 3 about here]*

My main results continue to hold. Estimated marginal effects associated with the instrumented *Dismissal constraints* turn out positive, statistically significant at a 1% level and slightly lower in magnitude with respect to the basic regression analysis. In particular, a 0-1 change in the instrumented *Dismissal constraints* is shown to increase industrial action incidence by 8.2 percentage points, while the marginal effects disentangled across “work-to-rule”, “short strike” and “long strike” are equal to 1.3, 2.2 and 4.0 percentage points, respectively. Although the impact of discharge regulations on the incidence and the intensity of labor disputes seems to be reduced when an IV strategy is implemented, both the statistical and the economic magnitude of the estimated effects remain significant.

### 7.1.2 Company-specific industrial actions

As an alternative strategy to address endogeneity, I run an additional battery of regressions specified as in Equation (11), in which the dependent variable refers to establishment-specific industrial actions and excludes actions triggered by issues relevant at an entire country or sector level. In particular, establishment-specific industrial actions include only actions motivated by disputes specific to the company or the organization and that do not involve economy-wide issues.<sup>7</sup> By restricting my regression analysis on establishment-specific industrial actions, I circumvent possible reverse causality whilst keeping the model specification similar to my basic analysis.

*[insert Table 4 about here]*

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<sup>7</sup>Descriptive statistics on establishment-specific industrial actions are reported in the Appendix.

Estimation results are presented in Table 4. In this robustness check, I also exploit information on establishment occupation provided in the 2013 ECS wave and run three model versions: an industrial action incidence probit model (specification [1]) on data from both the 2009 and 2013 ECS waves, an industrial action intensity ordered probit model (specifications from [2a] to [2c]) on data from both the 2009 and 2013 ECS waves, and an industrial action intensity ordered probit model (specifications from [3a] to [3d]) on data from the 2013 ECS wave with information on occupation. Being *Country-level industrial action rights* and *Country-level replacement workers legislation* strongly correlated, I use only the *Country-level industrial action rights* variable in my preferred model specification, as the *Country-level replacement workers legislation* indicator shows a relatively lower variability across countries and over time.

I find that a change from employment at-will to a regime with very strict dismissal constraints is associated with an increase in the likelihood of observing a company-specific industrial action of roughly 6.7 percentage points and with an increase in the likelihood of observing a company-specific “work-to-rule”, “short strike” and “long strike” of 1.4, 2.0 and 2.5 percentage points, respectively. These estimated effects are very similar in magnitude to those obtained in the IV estimation. Again, reverse causality, possibly due to policy-motivated industrial actions, if present, does not drive my estimates. Moreover, as specifications from [3a] to [3d] (in Table 4) are run only on data from the 2013 ECS wave, this robustness check also shows that my findings are not affected by time patterns in the variables of interest.

### 7.1.3 Difference-in-differences

Finally, to further check the presence of a causal link between dismissal regulation and industrial actions in EU firms, in this sub-section I develop a difference-in-differences analysis. In particular, I exploit quasi-experimental variations in dismissal regulation, driven by employment protection reforms implemented in a small group of EU countries in the period between the 2009 and the

2013 wave of the ECS and having an expected differential impact on discharge constraints in eligible establishments, as reported in the LabRef Database (European Commission, 2017).

First, I consider policy measures with a size-contingent nature (i.e. those reforms applying above - or below - a certain employment threshold) and, specifically, setting minimum requirements for collective redundancies.<sup>8</sup> In this case, I use only observations of companies based in Slovak Republic and Spain. In Slovak Republic, Law 257/2011 has changed the definition of collective dismissals given in the National Labour Code, allowing to dismiss up to 20 employees without collective redundancies procedure being applied. Given that, under the previous regulation, the threshold qualifying a collective dismissal was 10 employees for companies with more than 20 and less than 100 employees (small firms), 10% of the total amount of employees for companies with more than 100 and less than 300 employees (medium-size firms), and 30 employees for companies with more than 300 employees (large firms), the new provision has increased the firing flexibility (without dismissals being qualified as collective redundancies) for small establishments, has left collective firing restrictions on average unchanged for medium-size firms, and has increased collective discharge constraints for large firms. In Spain, Law 801/2011 has modified the administrative procedure for filing collective redundancies, widening the scope for collective redundancies in general and imposing the design of a social plan including training, social or reallocation measures to firms with more than 50 workers. While this measure was aimed to ease the transition of dismissed workers, it has introduced additional burden to firms above the 50-employee size threshold undertaking collective dismissal and has reduced the constraints for collective firing for small firms *relative* to larger ones.

Second, I consider policy measures with a sector-contingent nature. In this case, I exploit sectoral variations introduced in Greece with Law 4046/2012. This reform abolished all rules

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<sup>8</sup>Rules on collective redundancies make collective dismissals relatively more burdensome for the firm with respect to individual dismissals, as they imply stricter procedural and notification requirements and additional criteria for selecting employees to be dismissed. Such rules apply when a minimum number of workers is dismissed in a given lapse of time and in a given location; generally, in EU countries, this minimum number is linked to firm size.

providing special protection against dismissal. Under the previous regulation, the lawfulness of the dismissal of an employee on a open ended contract did not depend on the existence of a cause. There were, however, some sector-internal regulations, imposing specific procedures for terminating a labor contract and determining a more effective protection against unjust dismissal particularly for bank companies (Papadimitriou, 2013). Law 4046/2012, therefore, has reduced dismissal constraints for firms in the banking sector *relative* to all other firms.

Formally, I estimate the following difference-in-differences model by pooling the 2009 and 2013 ECS waves:

$$\begin{aligned}
 Y_i = & \text{constant} + \phi_1 \textit{Treatment group}_{i,s,c} + \phi_2 \textit{Treatment group}_{i,s,c} \times \textit{Reform}_t + \\
 & + \mathbf{f} \mathbf{X}_{i,s,c,t} + \text{sector FE}_s + \text{year FE}_t + \varepsilon_i
 \end{aligned} \tag{12}$$

where  $Y_i$  is a dummy variable recording the occurrence of a company-specific industrial action,  $\mathbf{X}_{i,s,c,t}$  is the same vector of controls included in the basic Equation (11), *Reform* is the treatment variable referring to a reduction of dismissal constraints, which equals 1 for 2013 observations and 0 otherwise, and where *Treatment group* is a dummy variable equal to 1 for the companies targeted by the reform and 0 for those in the control group. As a result, the interaction term *Treatment group*  $\times$  *Reform* identifies the establishments experiencing, after the reform, weaker discharge constraints relative to their non-targeted counterparts.<sup>9</sup>

I run two versions of Equation (12). In a first version, I consider only firms treated with a size-contingent policy measure, with data on Slovak Republic and Spain. In this case, given data availability constraints on establishments' size in the ECS sample, I define establishments below the 50-employee threshold as the treatment group and establishments in the closest size class (i.e. 50-249 employees) as the control group. In a second version, I also use data on Greece and I

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<sup>9</sup>Notice that, the non-interacted *Reform* variable is not explicitly included in the model because it is fully absorbed by year FE. The relatively low number of observations for the three countries considered in this analysis does not allow me to run the industrial action intensity regression.

extend my analysis to sector-contingent measures, by adding Greek companies operating in the financial services sector to the treatment group. In this case, the control group is further restricted to non-manufacturing sectors. Thus, my results will be confirmed if, in both model versions, the sign of the parameter of interest  $\phi_2$  is negative.<sup>10</sup>

*[insert Table 5 about here]*

Results from difference-in-differences estimates are reported in Table 5. The estimated marginal effects indicate a statistically significant reduction in the likelihood of observing a company-specific industrial action in treatment establishments in relation to control firms of roughly 3.8 percentage points in model [1a] and 4.7 percentage points in model [1b]. It is worth noting that the magnitude of the marginal effects is relatively lower than that of the parameters obtained in the IV and in the company-specific disputes estimations; arguably, this is due to the less significant economic impact of the law reforms exploited in the difference-in-differences analysis.<sup>11</sup>

Table 5 also reports the results of a placebo test through which I further investigate the validity of the identification strategy implemented in the difference-in-differences estimation. Following standard procedure in quasi-experimental analysis, I repeated regression (12) by using company-level data from an alternative sample of countries in which labor reforms did not have expected differential impact on discharge constraints across establishments. Specifically, I consider three of the largest EU economies (Italy, Germany and UK). I restrict my placebo test to German and UK companies, by using the size-contingent definition of the treatment group, in model [2a] of Table 5, while I include also Italian companies, with the sector-contingent definition of the treatment

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<sup>10</sup>Policy measures weakening dismissal constraints on a size-contingent basis have been implemented in the 2009-2013 period also in Italy and Greece. In Italy, Law 97/2012 has reduced cases of mandatory reinstatement for firms with more than 15 employees. In Greece, Law 3863/2010 has increased the threshold qualifying a collective dismissal for firms employing more than 20 employees. In both cases, however, to clearly distinguish control and target groups is impossible with ECS data, which do not cover firms with less than 10 employees.

<sup>11</sup>Also the sign and the statistical significance of the control variables' effects (not reported in Table 5, but available upon request) remain virtually unchanged with respect to the basic and the other robustness regressions.

group, in model [2b]. The reliability of the identification strategy would be compromised if the treatment effect was negative and significant for this sample of companies. Reassuringly, this is not the case.<sup>12</sup>

## 7.2 Unobserved heterogeneity

### 7.2.1 Country and sectoral heterogeneity

An additional concern may stem from country and sectoral heterogeneity in several, possibly relevant, dimensions. In my basic estimates, I control for both an array of country-level variables and for sectoral fixed effects. However, these controls may not account for all the relevant heterogeneity at a country and sectoral level.

On the one hand, countries may be characterized by different institutional frameworks, possibly correlated with the dismissal regulation, which are not entirely captured by the country-level regressors included in my basic estimates. For example, the Nordic countries tend to implement active labor market policies, intended to reduce workplace conflict, coupled with relatively weak product market regulation and high levels of competition, while Southern European economies show rigid employment protection legislations and tend to prevent conflicts between labor and capital through “concertation”, i.e. the involvement of unions and employers’ associations in bargaining tables chaired by the government. These institutional models are defined over a very large number of dimensions, which cannot be clearly disentangled and observed from a quantitative point of view.

On the other hand, relevant unobservable heterogeneity may be present also at an industry-level. Cross-sector heterogeneity may encompass human capital levels and specialization, extension of collective agreements and collective negotiation structures, trade unions’ organization and

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<sup>12</sup>In unreported regressions, I have verified that the treatment effect is statistically insignificant also in a placebo test conducted on a sample of three countries picked at random from those not included in the basic difference-in-differences analysis.

their fragmentation and mobilization capacity, the pattern of labor contracts and of the forms of employment, and demographic characteristics of workers. Also these dimensions are difficult to measure and to include in a regression model. Moreover, they may interact with the discharge regulation, so affecting the impact of dismissal restrictions on the incentive and capability of workers to undertake industrial actions (for instance, dismissal constraints effects may vary across industries depending on the degree of bargaining decentralization). If ECS establishment-level data are partly sector-selected, these sources of sectoral heterogeneity may confound my results. In addition, if a country's pattern in the interaction between dismissal constraints and sectoral effects tends to dominate, the generalizability of my findings would be compromised.

In this robustness check, I estimate Equation (11), including a vector of country-cluster fixed effects (in particular, I distinguish five institutional models covering Scandinavian, Anglosaxon, Central, Eastern and Mediterranean Europe systems) and a vector of interaction terms between the *Dismissal constraints* variable and sectoral dummies on the right hand side of the equation.<sup>13</sup> Here, the dependent variable  $Y_i$  is coded so as to include only establishment-specific industrial actions.

As far as country-sector heterogeneity is concerned, the legislation on redundancy compensation is an additional institutional determinant to be accounted for. Legally mandated redundancy compensation, payable to a worker after the dismissal, is generally linked to the employee seniority and measured in weeks or months of pay. Since average worker seniority and wages are likely to be different across sectors, the economic effects of severance pay laws may represent a further source of sectoral heterogeneity. I thus include a control for this institutional dimension, by using a *Country-level severance pay legislation* indicator, measuring the amount of redundancy compensation payable to a worker made redundant after 3 years of employment, measured in weeks of pay and normalized between 0 and 1 (this variable is obtained from the Labour Regulation Index

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<sup>13</sup>Non-interacted sectoral terms are also included, as sector FE.



Dataset (Armour *et al.*, 2016)).<sup>14</sup> Although severance pay legislations are defined at a national level (and so is my indicator), *Country-level severance pay legislation* may partly capture also cross-country sectoral heterogeneity to the extent that countries specialize in different industries and a country's establishments tend to cluster at an industry-level.

The following equation is then estimated:

$$\begin{aligned}
 Y_i = & \text{constant} + \gamma \textit{Dismissal constraints}_{c,t} + \mathbf{g1} \textit{Dismissal constraints}_{c,t} \times \text{sector FE}_s + \\
 & + \mathbf{g2} \mathbf{X}_{i,s,c,t} + \text{sector FE}_s + \text{country-cluster FE}_c + \text{year FE}_t + \varepsilon_i
 \end{aligned} \tag{13}$$

where  $Y_i$  is either a dummy variable recording the occurrence of a company-specific industrial action (industrial action incidence model) or an ordered variable of dispute types (industrial action intensity model), and where all the remaining terms have the same meaning as in Equation (11), with  $\mathbf{X}$  now including also the *Country-level severance pay legislation* indicator.

Results are collected in Table 6. First, I find that the country-cluster fixed effects are statistically significant (Central Europe countries being the benchmark) and that the sectoral interaction terms (between *Dismissal constraints* and the sectoral dummies) are never significant (only the interaction with the *Commerce & hospitality* dummy is weakly significant in the industrial action intensity model). This confirms that, while different institutional systems are associated with both different extensive and intensive levels of labor disputes, unobservable sectoral heterogeneity, possibly interacting with the dismissal regulation, does not significantly influence industrial actions at an establishment-level. Second, the *Country-level severance pay legislation* indicator turns out associated with a weakly significant marginal effect and, therefore, it is showed not to be a crucial determinant of dispute activity. Third, finally, once country-cluster fixed effects, sectoral interactions and *Country-level severance pay legislation* are introduced in the model, the

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<sup>14</sup>Descriptive statistics on this additional variable are reported in the Appendix.

marginal effect of *Dismissal constraints* continues to be positive and statistically significant.

*[insert Table 6 about here]*

### 7.2.2 Establishment heterogeneity

Skeptics may argue that the incidence of industrial actions at the company-level might be driven by a very large set of establishment-specific factors (omitted in my basic estimates) possibly correlated with dismissal constraints, such as the presence of collective wage agreements, the use of fixed-term contracts and other company-level variables. However, many of these possibly relevant variables are available only in the 2009 wave of the ECS and were excluded in my basic estimates. Here, I therefore restrict my analysis to 2009 and run a battery of additional robustness regressions in which I consider a large set of additional control variables at the establishment-level, at the price of omitting time fixed effects. I re-code information provided in the 2009 ECS wave and construct additional controls covering the following establishment-level characteristics: the proportion of employees covered by a collective wage agreement, be it on the level of the establishment or on any higher level (*Collective agreement coverage*); the proportion of employees covered by a collective wage agreement negotiated at a higher level (e.g. agreements on a national, regional or sectoral basis), with the impossibility to derogate from this higher level collective agreement in order to pay wages below the collectively agreed level (*HL collective agreement coverage*); the proportion of employees holding a fixed-term contract (*Fixed-term contracts share*); whether there is any profit sharing scheme offered in the establishment, with profit sharing schemes meaning specific elements of pay the amount of which depends on the company's success (*Profit sharing*, dummy variable); whether there is any share ownership scheme offered in the establishment (*Share ownership*, dummy variable); the proportion of employees working in high-skilled jobs, i.e. jobs which usually require an academic degree or a comparable qualification (*High-skill jobs share*);

and whether the establishment encounters any difficulties in finding staff (*Difficulties in finding staff*, dummy variable).<sup>15</sup>

Formally, I estimate the following probit equation:

$$Y_i = \text{constant} + \delta \textit{Dismissal constraints}_c + \mathbf{d1} \mathbf{I}_{i,c} + \mathbf{d2} \mathbf{X}_{i,s,c} + \text{sector FE}_s + \varepsilon_i \quad (14)$$

where  $Y_i$  is a dummy variable equal to 1 if a company-specific industrial action occurred at the establishment-level in the yearly-basis period covered by the 2009 ECS wave and equal to 0 otherwise,  $\mathbf{I}$  is a vector containing the additional establishment-level controls and all the remaining terms have the same meaning as in Equation (11).<sup>16</sup>

Results are presented in Table 7.<sup>17</sup> I find that the marginal effect of *Dismissal constraints* is always positive and statistically significant (at a 1% level) even after controlling for a large set of additional establishment-level factors. Interestingly, I also find that the likelihood of an industrial action increases with the proportion of employees covered by a collective wage agreement (*Collective agreement coverage*), while it is not affected by the presence of binding agreements negotiated at a higher level (*HL collective agreement coverage*). This is consistent with the idea that unions tend to engage in dispute activity more likely when there is the possibility for the employer to derogate from existing agreements. Moreover, model [8] of Table 7 shows that establishments with a relatively higher proportion of skilled workers and with less difficulties in finding new staff are associated with a lower probability of experiencing a labor dispute. The remaining additional controls are not associated with statistically significant parameters. In particular, the proportion of employees holding a fixed-term contract at the establishment-level (*Fixed-term contracts share*)

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<sup>15</sup>Descriptive statistics on these additional variables are reported in the Appendix.

<sup>16</sup>In this robustness check, I am able to run only the industrial action incidence model, as the relatively low number of observations available from the 2009 ECS are not sufficient for the industrial action intensity model.

<sup>17</sup>For reasons of space, in Table 7, I report only the estimated effects of the variables of interest in this analysis and omit the full set of marginal effects associated with all the control variables, which are available upon request.

turns out statistically insignificant, in line with Jansen *et al.* (forthcoming).

*[insert Table 7 about here]*

## 8 Conclusions

In this paper, I analyzed the relationship between discharge regulation and industrial actions. By using establishment-level data on more than 30000 companies covered by the ECS matched with the Labour Regulation Index Dataset, I measured the marginal effect of dismissal constraints on both the incidence and intensity of dispute activities, including work-to-rule, strikes and occupations. Through the use of a large vector of establishment-, sector- and country-level covariates, I was able to control for virtually all the main determinants of industrial conflict highlighted by previous studies and to circumvent possible endogeneity due to reverse causality, by means of an IV strategy and by restricting my sample to company-specific industrial actions. I also further verified the presence of a causal link between dismissal regulation and industrial actions in EU firms with a difference-in-differences analysis, in which I used information on employment protection reforms implemented in a group of EU countries in the 2009-2013 period and having an expected differential impact on discharge constraints in eligible establishments. I showed that a change from employment at-will to a regime with very strict dismissal constraints (i.e. dismissal is necessarily unjust if the employer fails to follow procedural requirements and dismissal is only permissible for serious misconduct of the employee) is associated with an increase in the likelihood of observing an industrial action at the establishment-level ranging between 10.5 and 14.8 percentage points, and that this effect reduces to around 6.7 percentage points when only company-specific industrial actions are considered. Given that these effects refer to a full change from no regulation to maximum regulation, they should be interpreted as an upper bound, while, in practice, a more

typical magnitude of regulation changes in EU countries would be lower. To the best of my knowledge, this is the first study aimed at measuring the impact of dismissal regulations on industrial actions. My empirical findings, in particular, add to the literature on labor policies and strikes, which covers several legal variables (such as mandatory strike votes, compulsory conciliation and prohibition on replacement workers) and that, however, overlooks the role played by the general dismissal regulation (Gunderson *et al.*, 1989; Gunderson and Melino, 1990; Budd, 1996; Cramton *et al.*, 1999). Furthermore, my study extends the available empirical evidence on the economic effects of employment protection legislations, which encompasses innovation, productivity, job reallocation and unemployment but does not cover industrial dispute activity and labor conflict (e.g., Autor *et al.*, 2007; Garibaldi and Violante, 2007; MacLeod and Nakavachara, 2007; Messina and Vallanti, 2007; Bird and Knopf, 2009; Griffith and Macartney, 2014; Cingano *et al.*, 2015).

My main finding is that stricter dismissal regulations make EU companies experience more frequent and intense industrial actions. This result is consistent with two different (but, possibly, complementary) views of the bargaining process between workers and employers at a firm-level.

Where binding labor contracts are unenforceable and sunk investments are made by one party, the other party may play opportunistic actions aimed at extracting some undue rent from the relationship. On the one hand, after the employer has undertaken an irreversible investment in fixed capital or in the training of the worker, the union may engage in an industrial action to reap a larger share of the surplus at the expenses of the employer. In this case, stricter dismissal constraints reduce the ability of employers to punish worker opportunism and therefore may encourage union claims and activism. On the other hand, if also the workers have undertaken sunk private investments in the relationship, the employer may demand ex-post wage reductions, by threatening dismissal. Only in the presence of protective employment regulation, workers may have the incentive to react to employer opportunism through industrial actions.

From both points of view, dismissal constraints boost dispute activity. However, while, in

the worker opportunism case, industrial actions stem from union “pro-activism”, in the employer opportunism case, industrial actions represent a form of union “re-activism”. With my baseline analysis, I demonstrated that weaker discharge regulations moderate labor conflicts, by disciplining workers. However, as I cannot observe directly the motivations behind labor disputes and how they impact on rent sharing, my results do not allow to infer whether only one or both of these views hold. Conclusive answers will require further empirical investigation with data on industrial actions’ outcomes and on the impact of labor disputes on the production surplus distribution. Industrial actions are an essential part of negotiation processes between workers and employers, and the analysis of their impact on the outcomes (interpreted broadly to include investments, restructuring, outsourcing, work safety and other issues, beside wages) of such processes should receive greater attention both by future research and by policy-makers interested to the welfare effects of labor public policies. With this article, I made a step along this line.

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# Appendix

## Additional variables' description

*[insert Table 8 about here]*

Table 1: Basic variables: descriptive statistics.

	MEAN	STANDARD DEVIATION	SOURCE OF VARIATION <sup>†</sup>	YEARS OF AVAILABILITY
<b>Industrial actions<sup>‡</sup></b>				
Any action occurred (1 = yes, 0 = no)	0.058	0.234	establishment	2009-2013
Type of action (if an action occurred):				
Work-to-rule (1 = yes, 0 = no)	0.185	0.354	establishment	2009-2013
Short strike (1 = yes, 0 = no)	0.249	0.443	establishment	2009-2013
Long strike (1 = yes, 0 = no)	0.458	0.493	establishment	2009-2013
Occupation (1 = yes, 0 = no)	0.106	0.262	establishment	2013
<b>Explanatory variables</b>				
<i>Dismissal constraints</i>	0.662	0.241	country-year	2009-2013
<i>Establishment's information sharing</i>	0.779	0.414	establishment	2009-2013
<i>Establishment's unionization rate</i>	0.488	0.348	establishment	2009-2013
<i>Establishment's size: 10-49</i>	0.483	0.499	establishment	2009-2013
<i>Establishment's size: 50-249</i>	0.315	0.464	establishment	2009-2013
<i>Establishment's size: 250+</i>	0.201	0.400	establishment	2009-2013
<i>Establishment's type: headquarter (or independent)</i>	0.693	0.461	establishment	2009-2013
<i>Establishment's type: subsidiary</i>	0.306	0.461	establishment	2009-2013
<i>Sector-level job saturation index</i>	-0.015	0.892	country-sector-year	2009-2013
<i>Country-level consumption prices inflation</i>	1.302	1.921	country-year	2009-2013
<i>Country-level employee representation rights</i>	0.598	0.138	country-year	2009-2013
<i>Country-level industrial action rights</i>	0.759	0.379	country-year	2009-2013
<i>Country-level replacement workers legislation</i>	0.897	0.295	country-year	2009-2013

<sup>†</sup> Establishment-level data are pooled, i.e. establishments are observed only once in either the 2009 or the 2013 ECS wave. <sup>‡</sup> Industrial actions may refer to any reason (i.e., the issue which triggered the industrial action may be relevant at an entire country or sector level or restricted to the company/organisation). Work-to-rule refers to the situation where employees do no more than the minimum required by the rules of their contract, and follow regulations to the letter (it also includes refusal to do overtime). Short strike refers to work stoppage or strike for less than a day. Long strike refers to strike of a day or more. Information on occupation is collected only in the 2013 ECS wave.

Table 2: Basic results: determinants of industrial actions.

VARIABLE	INCIDENCE OF INDUSTRIAL ACTIONS				INTENSITY OF INDUSTRIAL ACTIONS		
	[1]	[2]	[3]	[4]	[5a]	[5b]	[5c]
	Any action	Any action	Any action	Any action	Work-to-rule	Short strike	Long strike
	(ANY REASON)	(ANY REASON)	(ANY REASON)	(ANY REASON)	(ANY REASON)	(ANY REASON)	(ANY REASON)
<i>Dismissal constraints</i>	0.056*** (0.011)	0.141*** (0.017)	0.105*** (0.019)	0.148*** (0.018)	0.016*** (0.003)	0.027*** (0.005)	0.050*** (0.009)
<i>Establishment's information sharing</i>		-0.095*** (0.011)	-0.086*** (0.011)	-0.089*** (0.011)	-0.010*** (0.001)	-0.018*** (0.002)	-0.037*** (0.006)
<i>Establishment's unionization rate</i>		0.139*** (0.012)	0.112*** (0.013)	0.110*** (0.013)	0.015*** (0.002)	0.026*** (0.003)	0.049*** (0.006)
<i>Establishment's size: 50-249 vs. 10-49</i>		0.130*** (0.013)	0.138*** (0.013)	0.135*** (0.013)	0.020*** (0.002)	0.035*** (0.003)	0.075*** (0.008)
<i>Establishment's size: 250+ vs. 10-49</i>		0.039*** (0.010)	0.042*** (0.011)	0.041*** (0.011)	0.007*** (0.001)	0.013*** (0.003)	0.024*** (0.006)
<i>Establishment's type: headquarter vs. subsidiary</i>		-0.031*** (0.011)	-0.030*** (0.010)	-0.029*** (0.010)	-0.004*** (0.001)	-0.008*** (0.002)	-0.016*** (0.005)
<i>Sector-level job saturation index</i>			-0.016*** (0.006)	-0.017*** (0.001)	-0.007*** (0.005)	-0.004*** (0.001)	-0.008*** (0.003)
<i>Country-level consumption prices inflation</i>			0.009*** (0.003)	0.000 (0.003)	0.000 (0.000)	0.001 (0.000)	0.001 (0.001)
<i>Country-level employee representation rights</i>			-0.491*** (0.038)	-0.385*** (0.035)	-0.078*** (0.008)	-0.132*** (0.012)	-0.242*** (0.019)
<i>Country-level industrial action rights</i>			0.159*** (0.014)	0.159*** (0.014)	0.023*** (0.002)	0.040*** (0.004)	0.073*** (0.007)
<i>Country-level replacement workers legislation</i>				0.116*** (0.015)			
<i>Constant (coeff.)</i>	-1.431*** (0.043)	-2.101*** (0.105)	-1.351*** (0.134)	-1.619*** (0.134)	—	—	—
Estimation	probit	probit	probit	probit	ordered	ordered	probit
Year FE	YES	YES	YES	YES	YES	YES	YES
Sector FE	YES	YES	YES	YES	YES	YES	YES
Pseudo R2	0.003	0.080	0.113	0.103			0.085
Prob > $\chi^2$	0.000	0.000	0.000	0.000			0.000
Number of obs.	13265	7652	7501	7501			7387

Statistical significance: \* = 10%, \*\* = 5%, \*\*\* = 1%. The entries are marginal effects, unless otherwise specified. Standard errors are in parenthesis. Industrial actions may refer to any reason (i.e., the issue which triggered the industrial action may be relevant at an entire country or sector level or restricted to the company/organisation). Work-to-rule refers to the situation where employees do no more than the minimum required by the rules of their contract, and follow regulations to the letter (it also includes refusal to do overtime). Short strike refers to work stoppage or strike for less than a day. Long strike refers to strike of a day or more.

Table 3: Robustness: endogeneity (instrumental variable).

VARIABLE	INCIDENCE OF	INTENSITY OF INDUSTRIAL ACTIONS		
	INDUSTRIAL ACTIONS	(ANY REASON)		
	(ANY REASON)	[2a]	[2b]	[2c]
	[1]			
	Any action	Work-to-rule	Short strike	Long strike
<i>Dismissal constraints</i> (instrumented)	0.082*** (0.019)	0.013*** (0.003)	0.022** (0.005)	0.040*** (0.009)
<i>Establishment's information sharing</i>	-0.088*** (0.011)	-0.010*** (0.001)	-0.019*** (0.002)	-0.038*** (0.006)
<i>Establishment's unionization rate</i>	0.108*** (0.013)	0.015*** (0.001)	0.026*** (0.002)	0.048*** (0.006)
<i>Establishment's size: 50-249 vs. 10-49</i>	0.138*** (0.013)	0.020*** (0.002)	0.035*** (0.003)	0.074*** (0.008)
<i>Establishment's size: 250+ vs. 10-49</i>	0.042*** (0.011)	0.007*** (0.001)	0.013*** (0.003)	0.026*** (0.005)
<i>Establishment's type: headquarter vs. subsidiary</i>	-0.031*** (0.010)	-0.005*** (0.001)	-0.008*** (0.002)	-0.016*** (0.005)
<i>Sector-level job saturation index</i>	-0.015** (0.006)	-0.002*** (0.001)	-0.004*** (0.001)	-0.008*** (0.003)
<i>Country-level consumption prices inflation</i>	0.010*** (0.003)	0.000 (0.000)	0.001 (0.001)	0.002 (0.001)
<i>Country-level employee representation rights</i>	-0.497*** (0.038)	-0.078*** (0.008)	-0.133*** (0.012)	-0.246*** (0.019)
<i>Country-level industrial action rights</i>	0.165*** (0.014)	0.024*** (0.002)	0.041*** (0.004)	0.076*** (0.007)
<i>Constant</i> (coeff.)	-1.276*** (0.132)	—	—	—
Estimation	probit (2SLS)	ordered probit (2SLS)		
Year FE	YES	YES		
Sector FE	YES	YES		
Pseudo R2	0.111	0.084		
Prob > $\chi^2$	0.000	0.000		
Number of obs.	7501	7387		

Statistical significance: \* =10%, \*\* =5%, \*\*\* =1%. *Dismissal constraints* is instrumented with *Corporate governance index*, obtained from the Doing Business Database (World Bank, 2017). The entries are marginal effects, unless otherwise specified. Standard errors are in parenthesis. Industrial actions may refer to any reason (i.e., the issue which triggered the industrial action may be relevant at an entire country or sector level or restricted to the company/organisation). Work-to-rule refers to the situation where employees do no more than the minimum required by the rules of their contract, and follow regulations to the letter (it also includes refusal to do overtime). Short strike refers to work stoppage or strike for less than a day. Long strike refers to strike of a day or more.



Table 4: Robustness: endogeneity (company-specific industrial actions).

VARIABLE	INCIDENCE OF INDUSTRIAL ACTIONS (COMPANY ISSUES)				INTENSITY OF INDUSTRIAL ACTIONS (COMPANY ISSUES)			
	[1]	[2a]	[2b]	[2c]	[3a]	[3b]	[3c]	[3d]
<i>Dismissal constraints</i>	Any action 0.067*** (0.011)	Work-to-rule 0.014*** (0.002)	Short strike 0.020*** (0.003)	Long strike 0.025*** (0.004)	Work-to-rule 0.010*** (0.003)	Short strike 0.013*** (0.003)	Long strike 0.020*** (0.005)	Occupation 0.007*** (0.002)
<i>Establishment's information sharing</i>	-0.061*** (0.008)	-0.015*** (0.001)	-0.086*** (0.002)	-0.021*** (0.003)	-0.013*** (0.002)	-0.019*** (0.006)	-0.031*** (0.004)	-0.012*** (0.002)
<i>Establishment's unionization rate</i>	0.054*** (0.008)	0.010*** (0.001)	0.015*** (0.002)	0.020*** (0.003)	0.013*** (0.002)	0.018*** (0.003)	0.027*** (0.004)	0.009*** (0.001)
<i>Establishment's size: 50-249 vs. 10-49</i>	0.072*** (0.010)	0.013*** (0.002)	0.019*** (0.003)	0.028*** (0.004)	0.017*** (0.002)	0.024*** (0.003)	0.040*** (0.005)	0.016*** (0.003)
<i>Establishment's size: 250+ vs. 10-49</i>	0.033*** (0.007)	0.006*** (0.001)	0.010*** (0.002)	0.013*** (0.003)	0.008*** (0.001)	0.011*** (0.002)	0.018*** (0.003)	0.006*** (0.001)
<i>Establishment's type: headquarter vs. subsidiary</i>	-0.004*** (0.006)	-0.031*** (0.001)	-0.006*** (0.002)	-0.008*** (0.002)	-0.004*** (0.001)	-0.006*** (0.002)	-0.010*** (0.003)	-0.003*** (0.002)
<i>Sector-level job saturation index</i>	-0.004 (0.003)	-0.000 (0.000)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.000)	-0.001 (0.001)	-0.002 (0.001)	-0.000 (0.000)
<i>Country-level consumption prices inflation</i>	-0.005** (0.002)	-0.001** (0.000)	-0.002*** (0.000)	-0.002*** (0.001)	-0.000 (0.000)	-0.000 (0.000)	-0.001 (0.001)	-0.000 (0.000)
<i>Country-level employee representation rights</i>	-0.154*** (0.024)	-0.027*** (0.005)	-0.039*** (0.007)	-0.049*** (0.009)	-0.040*** (0.006)	-0.054*** (0.008)	-0.081*** (0.012)	-0.028*** (0.005)
<i>Country-level industrial action rights</i>	0.054*** (0.009)	0.008*** (0.002)	0.012*** (0.002)	0.016*** (0.003)	0.016*** (0.002)	0.021*** (0.003)	0.032*** (0.004)	0.011 (0.001)
<i>Constant (coeff.)</i>	-2.032*** (0.174)	—	—	—	—	—	—	—
Estimation	probit	ordered probit	ordered probit	ordered probit	ordered probit	ordered probit	ordered probit	ordered probit
Year FE	YES	YES	YES	YES	YES	YES	YES	NO†
Sector FE	YES	YES	YES	YES	YES	YES	YES	YES
Pseudo R2	0.120	0.098	0.098	0.098	0.097	0.097	0.097	0.097
Prob > $\chi^2$	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Number of obs.	7501	7387	7387	7387	7387	7387	7387	5525

Statistical significance: \* =10%, \*\* =5%, \*\*\* =1%. The entries are marginal effects, unless otherwise specified. Standard errors are in parenthesis. Only industrial actions on company related issues are considered. This restriction refers to the issue which triggered the industrial action, not the action itself (e.g. if an issue that affects the entire country or sector results in industrial action confined to the company/organisation, the industrial action is not considered on company related issues). Work-to-rule refers to the situation where employees do no more than the minimum required by the rules of their contract, and follow regulations to the letter (it also includes refusal to do overtime). Short strike refers to work stoppage or strike for less than a day. Long strike refers to strike of a day or more. Occupation includes also blockade. † Information on worker occupation are available only in the 2013 wave of the ECS.

Table 5: Robustness: endogeneity (difference-in-differences).

VARIABLE	INCIDENCE OF INDUSTRIAL ACTIONS (COMPANY ISSUES)			
	[1a] Any action	[1b] Any action	[2a] Any action (Placebo test)	[2b] Any action (Placebo test)
	Type of treatment: size-contingent reform <sup>a</sup>	Type of treatment: size-contingent or sector-contingent reform <sup>ab</sup>	Type of treatment: size-contingent reform <sup>c</sup>	Type of treatment: size-contingent or sector-contingent reform <sup>cd</sup>
<i>Treatment group</i>	0.020 (0.021)	0.045 (0.030)	0.001 (0.012)	0.002 (0.015)
<i>Treatment group</i> × <i>Reform</i>	-0.038** (0.018)	-0.047** (0.023)	-0.007 (0.007)	-0.009 (0.015)
Estimation	probit	probit	probit	probit
Establishment controls	YES	YES	YES	YES
Sector-country-time controls	YES	YES	YES	YES
Country-time controls	YES	YES	YES	YES
Year FE	YES	YES	YES	YES
Sector FE	YES	NO	YES	NO
Pseudo R2	0.223	0.214	0.272	0.195
Prob > $\chi^2$	0.000	0.000	0.000	0.000
Number of obs.	640	503	399	592

Statistical significance: \* =10%, \*\* =5%, \*\*\* =1%. The entries are marginal effects. Standard errors are in parenthesis. Only industrial actions on company related issues are considered. This restriction refers to the issue which triggered the industrial action, not the action itself (e.g. if an issue that affects the entire country or sector results in industrial action confined to the company/organisation, the industrial action is not considered on company related issues). <sup>a</sup> Slovak Republic (treatment group: *Establishment's size: 10-49*; control group: *Establishment's size: 50-249*; reform: Law 257/2011); Spain (treatment group: *Establishment's size: 10-49*; control group: *Establishment's size: 50-249*; reform: Law 801/2011). <sup>b</sup> Greece (treatment group: *Establishment's sector: financial services*; control group: *Establishment's sector: all other non-manufacturing sectors*; reform: Law 4046/2012). <sup>c</sup> Germany (treatment group: *Establishment's size: 10-49*; control group: *Establishment's size: 50-249*; UK (treatment group: *Establishment's size: 10-49*; control group: *Establishment's size: 50-249*. <sup>d</sup> Italy (treatment group: *Establishment's sector: financial services*; control group: *Establishment's sector: all other non-manufacturing sectors*. In model [1b] and model [2b], sector FE are excluded, as the treatment variable already includes, by construction, time-invariant information on an establishment's sector.

Table 6: Robustness: country and sectoral heterogeneity.

VARIABLE	INCIDENCE OF INDUSTRIAL ACTIONS (COMPANY ISSUES)	INTENSITY OF INDUSTRIAL ACTIONS (COMPANY ISSUES)		
	[1] Any action	[2a] Work-to-rule	[2b] Short strike	[2c] Long strike
<i>Dismissal constraints</i>	0.083*** (0.032)	0.018** (0.008)	0.024** (0.010)	0.032** (0.013)
<i>Dismissal constraints</i> × <i>Transport &amp; communications</i>	benchmark	benchmark	benchmark	benchmark
<i>Dismissal constraints</i> × <i>Industry</i>	-0.019 (0.035)	-0.000 (0.007)	-0.000 (0.010)	-0.000 (0.012)
<i>Dismissal constraints</i> × <i>Commerce &amp; hospitality</i>	-0.046 (0.044)	-0.018* (0.010)	-0.024* (0.014)	-0.032* (0.018)
<i>Dismissal constraints</i> × <i>Construction</i>	-0.084 (0.058)	-0.017 (0.011)	-0.024 (0.016)	-0.031 (0.020)
<i>Dismissal constraints</i> × <i>Financial services</i>	0.041 (0.054)	0.005 (0.010)	0.007 (0.015)	0.010 (0.019)
<i>Dismissal constraints</i> × <i>Other services</i>	0.033 (0.038)	0.013* (0.008)	0.019* (0.011)	0.024* (0.014)
<i>Establishment's information sharing</i>	-0.060*** (0.008)	-0.009*** (0.001)	-0.014*** (0.002)	-0.020*** (0.003)
<i>Establishment's unionization rate</i>	0.053*** (0.008)	0.010*** (0.001)	0.015*** (0.002)	0.019*** (0.003)
<i>Establishment's size: 50-249 vs. 10-49</i>	0.072*** (0.009)	0.013*** (0.002)	0.019*** (0.003)	0.028*** (0.004)
<i>Establishment's size: 250+ vs. 10-49</i>	0.033*** (0.007)	0.006*** (0.001)	0.010*** (0.002)	0.013*** (0.003)
<i>Establishment's type: headquarter vs. subsidiary</i>	-0.019*** (0.006)	-0.004*** (0.001)	-0.006*** (0.002)	-0.008*** (0.002)
<i>Sector-level job saturation index</i>	-0.001 (0.003)	0.000 (0.000)	0.000 (0.001)	0.000 (0.001)
<i>Country-level consumption prices inflation</i>	-0.004** (0.002)	-0.000 (0.000)	-0.000 (0.001)	-0.001 (0.001)
<i>Country-level employee representation rights</i>	-0.159*** (0.023)	-0.027*** (0.005)	-0.039*** (0.007)	-0.049*** (0.009)
<i>Country-level industrial action rights</i>	0.053*** (0.009)	0.008*** (0.002)	0.012*** (0.002)	0.015*** (0.003)
<i>Country-level severance pay legislation</i>	-0.016* (0.010)	-0.003 (0.002)	-0.005 (0.003)	-0.006 (0.005)
<i>Country-cluster: Central Europe</i>	benchmark	benchmark	benchmark	benchmark
<i>Country-cluster: Eastern Europe</i>	-0.042*** (0.005)	-0.012*** (0.002)	-0.015*** (0.002)	-0.019*** (0.002)
<i>Country-cluster: Mediterranean Europe</i>	0.030*** (0.011)	0.008*** (0.002)	0.011*** (0.003)	-0.016*** (0.005)
<i>Country-cluster: Scandinavian Europe</i>	-0.043*** (0.005)	-0.012*** (0.001)	-0.015*** (0.002)	-0.019*** (0.002)
<i>Country-cluster: Anglosaxon Europe</i>	-0.020** (0.010)	-0.006** (0.003)	-0.008** (0.003)	-0.010** (0.004)
<i>Constant (coeff.)</i>	-1.802*** (0.253)	—	—	—
Estimation	probit	ordered probit		
Year FE	YES	YES		
Sector FE	YES	YES		
Pseudo R2	0.166	0.142		
Prob > $\chi^2$	0.000	0.000		
Number of obs.	7501	7387		

Statistical significance: \* =10%, \*\* =5%, \*\*\* =1%. The entries are marginal effects, unless otherwise specified. Standard errors are in parenthesis. Only industrial actions on company related issues are considered. This restriction refers to the issue which triggered the industrial action, not the action itself (e.g. if an issue that affects the entire country or sector results in industrial action confined to the company/organisation, the industrial action is not considered on company related issues). Work-to-rule refers to the situation where employees do no more than the minimum required by the rules of their contract, and follow regulations to the letter (it also includes refusal to do overtime). Short strike refers to work stoppage or strike for less than a day. Long strike refers to strike of a day or more.

Table 7: Robustness: establishment heterogeneity.

VARIABLE	INCIDENCE OF INDUSTRIAL ACTIONS (COMPANY ISSUES)							
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]
	Any action	Any action	Any action	Any action	Any action	Any action	Any action	Any action
<i>Dismissal constraints</i>	0.075*** (0.019)	0.079*** (0.019)	0.082*** (0.021)	0.080*** (0.019)	0.079*** (0.020)	0.078*** (0.019)	0.077*** (0.019)	0.082*** (0.020)
<i>Collective agreement coverage</i>	0.039** (0.019)							0.038* (0.021)
<i>HL collective agreement coverage</i>		-0.005 (0.008)						-0.008 (0.009)
<i>Fixed-term contracts share</i>			0.001 (0.035)					0.001 (0.032)
<i>Profit sharing</i>				-0.008 (0.008)				-0.010 (0.008)
<i>Share ownership</i>					-0.007 (0.011)			0.017 (0.019)
<i>High-skill jobs share</i>						-0.019 (0.016)		-0.042** (0.018)
<i>Difficulties in finding staff</i>							0.007 (0.008)	0.016* (0.008)
<i>Constant (coeff.)</i>	-2.109*** (0.174)	-1.702*** (0.429)	-1.958*** (0.512)	-1.674*** (0.421)	-1.664*** (0.425)	-1.693*** (0.431)	-1.726*** (0.422)	-2.377*** (0.626)
Estimation	probit	probit	probit	probit	probit	probit	probit	probit
Establishment controls	YES	YES	YES	YES	YES	YES	YES	YES
Sector-country-time controls	YES	YES	YES	YES	YES	YES	YES	YES
Country-time controls	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	NO†	NO†	NO†	NO†	NO†	NO†	NO†	NO†
Sector FE	YES	YES	YES	YES	YES	YES	YES	YES
Pseudo R2	0.068	0.062	0.064	0.061	0.058	0.063	0.061	0.093
Prob > $\chi^2$	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.001
Number of obs.	1947	1947	1460	1962	1945	1958	1976	1402

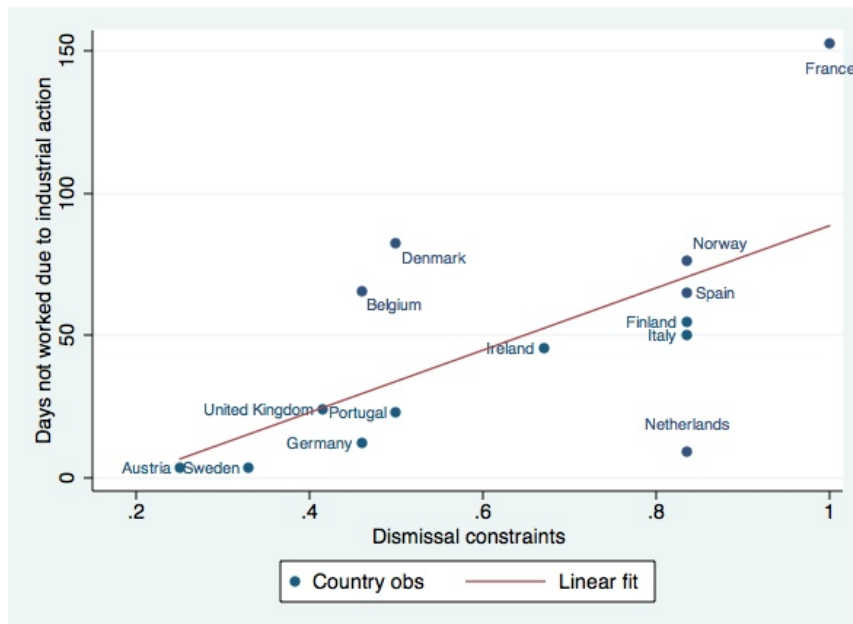
Statistical significance: \* =10%, \*\* =5%, \*\*\* =1%. The entries are marginal effects, unless otherwise specified. Standard errors are in parenthesis. Only industrial actions on company related issues are considered. This restriction refers to the issue which triggered the industrial action, not the action itself (e.g. if an issue that affects the entire country or sector results in industrial action confined to the company/organisation, the industrial status and information sharing. Sector-country-time-level controls include measures of unionization, company size, establishment controls include measures of inflation, legislation of employee representation, and protection of industrial action rights in the country's constitution. † Information for the additional establishment-level controls are available only in the 2009 wave of the ECTS.

Table 8: Additional variables: descriptive statistics.

	MEAN	STANDARD DEVIATION	SOURCE OF VARIATIO	YEARS OF AVAILABILITY
<b>Establishment-specific industrial actions<sup>†</sup></b>				
Any action occurred (1 = yes, 0 = no)	0.025	0.157	establishment	2009-2013
Type of action (if an action occurred):				
Work-to-rule (1 = yes, 0 = no)	0.236	0.391	establishment	2009-2013
Short strike (1 = yes, 0 = no)	0.305	0.448	establishment	2009-2013
Long strike (1 = yes, 0 = no)	0.458	0.476	establishment	2009-2013
<b>Explanatory variables used in the robustness checks</b>				
<i>Country-level severance pay legislation</i>	0.478	0.377	country-year	2009-2013
<i>Collective agreement coverage</i>	0.632	0.463	establishment	2009
<i>HL collective agreement coverage</i>	0.360	0.471	establishment	2009
<i>Fixed-term contracts share</i>	0.147	0.225	establishment	2009
<i>Profit sharing</i>	0.143	0.350	establishment	2009
<i>Share ownership</i>	0.058	0.234	establishment	2009
<i>High-skill jobs share</i>	0.244	0.286	establishment	2009
<i>Difficulties in finding staff</i>	0.419	0.493	establishment	2009

<sup>†</sup> Only industrial actions on company related issues are considered. This restriction refers to the issue which triggered the industrial action, not the action itself (e.g. if an issue that affects the entire country or sector results in industrial action confined to the company/organisation, the industrial action is not considered on company related issues). Work-to-rule refers to the situation where employees do no more than the minimum required by the rules of their contract, and follow regulations to the letter (it also includes refusal to do overtime). Short strike refers to work stoppage or strike for less than a day. Long strike refers to strike of a day or more. Information on the additional establishment-level characteristics are available only in the 2009 wave of the ECS.

Figure 1: Dismissal constraints and industrial action in EU (cross-country).



The graph shows the relationship between 'days-not-worked' in a year due to industrial action per 1000 employees (ETUI, 2016) and the strictness of employment protection legislation against dismissals as measured by an index of substantial and procedural constraints to the firing process (Armour *et al.*, 2016). Country values of both variables are averaged over the 2009-2013 period. Correlation coefficient: 0.63 [p-value: 0.01].