Power Distribution and Efficiency: Theory and Evidence from Unionized Firms*

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Job Market Paper

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Abstract

Institutions shape the distribution of power within societies and organizations, affecting resource distribution among their members. This paper explores whether reallocating power to disadvantaged groups can enhance equality and efficiency. By introducing the "burden of power" mechanism, I show that powerful groups can benefit by transferring power, thereby mitigating coercive actions on the part of the powerless that would otherwise reduce total surplus. I investigate this dynamic in the context of labor unions by examining how an increase in unions' bargaining power influences firms' profits. Utilizing data from a Chilean labor code reform, I run an event study based on a quasi-random treatment assignment. It reveals that while profits were unaffected, remuneration of nonmanagerial workers increased, the number of hours worked did not fall, and unionization rates declined. The heterogeneity in the effects by prepolicy bargaining power indicates that firms' profits are concave in unions' bargaining power while remunerations and unionization rates are convex in the same variable. I present a Nash bargaining model rationalizing these findings, formalizing the "burden of power" and characterizing Pareto-efficient bargaining power distributions. A model calibration for an average firm indicates that the union's surplus share increases from 0.39 (prereform) to 0.48 (postreform) without harming profits.

Keywords: Power distribution, Pareto efficiency, profit maximization, collective bargaining, Nash bargaining, unionization, coercion
JEL codes: C78, D02, D23, D61, J5

* First version: October 2023. I thank James Robinson, Joseph Root, and Evan Rose for their invaluable mentorship, support, and advice. I further thank Scott Behmer, Franco Calle, Wioletta Dziuda, Michael Greenstone, Shanon Hsuan-Ming Hsu, Chanwool Kim, Magne Mogstad, Casey Mulligan, Roger Myerson, Derek Neal, José Miguel Pascual, Ricardo Quineche, Doron Ravid, Haruka Uchida, Luigi Zingales, and seminar participants at the Department of Economics and at the Harris School of Public Policy of the University of Chicago for valuable comments and suggestions. I also thank Nicolás Cabezas and Isidora Lara for their excellent research assistance. I gratefully acknowledge financial support from the Pearson Institute for the Study and Resolution of Global Conflicts at the University of Chicago and from the Department of Economics of the University of Chicago. Finally, I thank the sponsorship of the National Commission of Evaluation and Productivity (CNEP) of the Chilean Ministry of Finance and the National Institute of Statistics (INE) of the Chilean Ministry of Economics and Development for data access.
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1 Introduction

The allocation of resources in societies, markets, and firms is one of the main topics of economics. In these organizations, power—defined as the ability to allocate resources as one prefers—is shaped by their rules, contracts, and institutions (Aghion et al., 2004; Acemoglu and Robinson, 2008, 2013). If we care about equality, should we modify our institutions to reallocate power to powerless groups? What are the associated efficiency costs or gains? I find that under unfavorable power distributions, disadvantaged groups may seek power by resorting to destructive actions, which I refer to as "coercion", that reduce the total surplus of the organization. Such coercive activities can manifest in various ways: citizens may organize riots to challenge an overmighty elite, consumers might threaten to boycott polluting firms, or workers may unionize to exert pressure on employers. Reallocating power can be Pareto improving: powerful groups can benefit from transferring some of their power as it mitigates these destructive actions. I call this mechanism the "burden of power." I empirically test this phenomenon in the context of labor unions and firms, asking: How does an increase in unions' bargaining power impact firms' profits?

Studying the impact of power shifts on welfare measures is inherently challenging because of endogeneity and reverse causality. For example, elites often shape the rules that define power, making causal inference particularly difficult.[1] To address these complexities, my research focuses on political economy within firms. While this context also presents its own set of identification challenges,[2] it offers some advantages for overcoming them. Specifically, the firm context provides clearer welfare metrics (e.g., profits and salaries) than those available in other settings and is subject to institutional changes that can induce exogenous shifts in the power distribution. Concretely, we can use policy reforms as quasi-natural experiments to isolate the effects of changes in unions' bargaining power on firms' profits, providing a more robust understanding of the underlying dynamics.

This paper delivers two main contributions. First, I examine a nationwide reform[3] of the Chilean labor code in 2017 that increased unions' bargaining power during collective bargaining processes.[4] This setting offers a unique causal inference opportunity: the timing of expiration of existing contracts, which obligates firms to enter into new bargaining processes, serves as a source of quasi-random variation in whether a firm's union had increased bargaining power. This allows me to isolate the effects of unions' strength by comparing firms that had to bargain under the new rules with those that bargained under the old ones. I investigate impacts on a range of outcomes. Specifically, I examine firms' wage expenses for both managerial and nonmanagerial workers. I also look at profits to explore whether employers' welfare

[1] The literature on power and economic outcomes has been able to use only anecdotal evidence, individual historic events, comparisons between specific countries or regions, and correlations from samples of dozens of countries at best as empirical results (North, 1991; Alesina and Rodrik, 1994; Alesina and Perotti, 1996; Aghion et al., 2004; Acemoglu et al., 2005; Acemoglu, 2008; Acemoglu and Robinson, 2008, 2013, 2017, 2020; Passarelli and Tabellini, 2017).

[2] Identifying the causal effects of union presence on firms' profits, let alone changes in unions' bargaining power, has long been difficult (Freeman and Medoff, 1984; Abowd, 1989; Booth, 1995; Lee and Mas, 2012; Frandsen, 2021).

[3] The key reforms are as follows: (i) strikes legalized during bargaining; (ii) unions gained access to firms' financial and payroll data; (iii) negotiation floor set to (at least) maintain past benefits; (iv) topics for union negotiation expanded; and (v) mandatory bargaining with multifirm unions implemented.

[4] In collective bargaining, each labor union and employer bargain over a collective contract defining wages and labor conditions for the workers for the next couple of years.

is reduced when they hold less power. Additionally, I investigate hours worked to check for mechanical explanations for profit stability. I study unionization rates to test whether increased bargaining power crowds out unions' exerted coercion. Finally, I consider operating expenses to understand how coercive actions manifest in profits.

Second, the paper formalizes a mechanism that rationalizes the empirical results. Utilizing a Nash bargaining framework between an employer and a labor union, the model shows how the burden of power operates. Bargaining theory traditionally explores how cooperating players divide resulting gains. The paper contrasts two channels that determine how gains from cooperation are divided—that is, two sources of power—bargaining power, derived from the rules of the game,[5] and power from outside options, through which a player with favorable payoffs in the case of a breakdown of cooperation can threaten to walk out if her preferred allocation is not implemented. The paper introduces the possibility that one of the players, the union, is able to exert coercion (e.g., increasing unionization rates), which modifies both players' outside options (given by the payoffs in a strike) and reduces cooperation surplus.[6] The model yields testable predictions about the effects of changes in union bargaining power on equilibrium outcomes like firms' profits, wages, and unionization rates. Moreover, the model allows me to (i) characterize efficient distributions of power (those inducing lower levels of coercion), (ii) identify the set of distributions of bargaining power implementing allocations on the Pareto frontier, and (iii) attain threshold levels of the bargaining power of a union at which the firm's profits begin to decline. Finally, connecting the theory with the empirical analysis, a model calibration indicates a rise in the average union's surplus share from 0.39 (pre-reform) to 0.48 (post-reform).

Chile, a middle-income OECD member country, serves as a compelling case study for this research, not only for its unique institutional setting that offers a clean quasi-natural experiment but also for its distinct labor market dynamics. Historically, Chilean unions have been relatively weak due to labor laws established during the military dictatorship (1973-1990), providing a broad scope for increases in union bargaining power. This allows for a nuanced exploration of how shifts in union power affect firms, especially at the lower end of the power distribution within the organizations. These findings can offer contrasting perspectives to what might be observed in Western economies like the US, where the balance of power between labor and management is less skewed towards employers. Notably, Chile has experienced a slight increase in unionization rates—from 13.2% in 2000 to 16.7% in 2021—bucking the global trend of declining unionization seen in countries like the US, Germany, Denmark, Brazil, and Japan, among others.[7]

I link two nationally representative surveys with administrative records.[8] The latter contains infor-

[5] For example, in an ultimatum game, the player assigned as the proposer gains all the bargaining power. This allocation would be the same in a Nash bargaining setting where the proposer has full bargaining power.

[6] For example, increases in operating expenses; exerting coercion might be associated with politicking and a belligerent attitude from workers (Milgrom and Roberts, 1998), leading to less efficient use of the company's resources.

[7] For a similar period, these countries' rates went from 12.9% to 10.3%, 24.5% to 16.2%, 74.5% to 67%, 20.1% to 13%, and 21.5% to 16.8%, respectively. International Labor Organization data: https://www.ilo.org/shinyapps/bulkexplorer49/. Data for Chile uses administrative records: https://www.dt.gob.cl/portal/1629/w3-article-122769.html.

[8] Authorization for data access was granted by the CNEP (*Comisión Nacional de Evaluación y Productividad*, or National Commission of Evaluation and Productivity), an agency under the Chilean Ministry of Finance, and the INE (*Instituto Nacional de Estadísticas*, or National Statistics Institute), with the aim of providing the first causal evidence on the effects of the Chilean labor code reform.

mation on the year in which collective bargaining happened at each firm. The first survey, the *Encuesta Longitudinal de Empresas*, (ELE, or Longitudinal Survey of Firms), is a large panel with six waves produced by the *Instituto Nacional de Estadísticas* (INE, or National Statistics Institute) that spans from 2007 to 2019. It provides detailed information about firms' balance sheets, income statements, remunerations, labor costs, number of hours worked by different workers categories, unionization rates, investment, and many other firm characteristics. The second survey, the *Encuesta Laboral* (ENCLA, or Labor Survey), is produced jointly by the INE and the *Dirección del Trabajo* (Directorate of Labor). ENCLA focuses on labor relations, offering data on unions, collective contracts, and crucially, whether collective bargaining occurred before or after the legislative reform.[9] Hence, this novel merged dataset allows the study of this quasi-natural experiment with panel data on key outcomes for unions and firms for the first time. Because I know the exact year of bargaining, I am able to perform an event study.

The research design leverages the unique institutional framework of collective bargaining (CB) in Chile, which distinguishes between regulated and unregulated bargaining processes. The 2017 labor code reform significantly altered the procedures for regulated bargaining but did not change any procedures regarding unregulated bargaining. This study focuses on firms that underwent regulated CB after the reform's effective date, using firms with unregulated bargaining as control units to both expand the sample size and provide a counterfactual for firms engaging in regulated CB.[10] Collective bargaining (both regulated and unregulated) occurs at the expiration of existing contracts, with no room for date adjustments, ensuring no selection into treatment conditional on having an active collective contract at the time of the reform.[11]

I employ an event study design, where an "event" is defined as a regulated CB process occurring post-reform. The sample includes both not-yet-treated firms (i.e., firms that are eventually treated in the analyzed period) and never-treated firms. The latter contains both firms with unregulated CB and firms with regulated CB that have not bargained post-reform at the time of the survey. This design addresses endogeneity concerns in two ways. First, the inability of firms to choose the timing of their next CB alleviates issues about self-selection. Second, idiosyncratic factors in the timing of collective contracts' expiration dates (e.g., firm creation dates and worker unionization timing) offer quasi-random variation in the treatment assignment, conditional on having a collective contract at the reform, mitigating other identification threats like selection or omitted variable bias.

Increasing unions' bargaining power allows workers to extract more surplus, leading to a statistically significant rise in remuneration for nonmanagerial workers, with estimates showing increases of 8.2%, 10.4%, and 31.5%, respectively, for the three post-event years. There is no evidence of a reduction in the number of hours worked (which serves as a precise measure of the amount of labor of the firm). Despite this, firm owners do not bear the cost; profits remain largely unchanged.[12] This stability in profits is

[9] The dataset was also combined with administrative records of workers' social security contributions, to validate its quality and accuracy. See Table B.1

[10] I provide evidence that workers engaging in unregulated CB, instead of regulated CB, do so because they prefer the flexibility provided by this type of bargaining and not because of prereform power imbalances with the employer.

[11] The concern about manipulation of contract length is accounted for since both the old and new laws mandate that collective contracts last for a minimum of two years.

[12] The coefficients of the leads of the event study are close to zero (in annual millions of dollars, 95% confidence interval are $[-7.7, 12.7]$,

attributed to a significant reduction in some of the firms' operating expenses. Surprisingly, despite the substantive increase in unions' bargaining power, the reform did not lead to an increase in unionization rates, which actually showed a non-significant decrease of around five percentage points. Conflict (e.g., work slowdowns, lawsuits, sabotage of firm operations) happening outside the CB period also decreases by 17.8% in treated firms compared to controls.

Were firms inefficient prereform? The Chilean government, not employers, defines the laws and rules bestowing bargaining power during CB. Firms therefore did not have the capacity to modify the parameters changed by the reform.[13] The decrease in operating costs does not seem ascribable to an investment contraction of employers either; fixed assets did not change. Instead, a plausible mechanism is an increase in workers' efficiency in the use of the firm's inputs. An increased bargaining power reduces workers' incentives to exert coercive actions like concerted slowdowns, "work-to-rule" campaigns (i.e., employees doing the bare minimum), sabotage (i.e., disruption of machinery/workflows), and lawsuits. Unionization rates typically indicate the capacity of workers to organize and execute coordinated actions like these, affecting how likely and effective they are. Firms affected by these coercive actions exhibit, on average (no implied causality), unionization rates that are seven percentage points higher and operating expenses that are 76% greater than those that were not affected. Thus, reductions both in unionization rates and operating expenses suggest a reduction in these coercive actions as well. Overall, the government reform alleviated a commitment problem faced by the employers in which they were not able to credibly yield their larger bargaining power during the CB.[14]

A heterogeneity analysis reveals that, in firms with unions having low ex ante bargaining power, unionization rates drop (significantly) more, operating expenses decrease more, remunerations increase less, and profits grow more than in firms with unions with higher ex ante bargaining power. These findings suggest that unionization, operating expenses, and remunerations are convex in unions' bargaining power while profits are concave in the same variable.

I interpret my empirical results using a bargaining model, which allows me to formalize the notion of the burden of power (Proposition 4): whenever the union's coercion is sufficiently crowded out by an increase in their bargaining power, the firm's profits are maximized at a positive level of the union's bargaining power. In other words, whenever an increase in the union's bargaining power reduces the union's incentives to exert coercion, then it is in the best interest of the employer to reduce her own bargaining power in favor of the one of the union; the firm's profits are maximized whenever the employer does not hold all the bargaining power. The result is counterintuitive under the typical Nash bargaining situation in which agents do not exert coercion. This offers an explanation as to why the policy did not increase unionization rates and why profits did not decrease.

In turn, Proposition 2 provides the conditions for finding heterogeneous effects in the firm's profits.

$[-8.6, 17.7]$, $[-12.3, 19.3]$ for the three post-event years).

[13] Lobbying in favor of the reform would have been a suboptimal strategy since pro-union political parties would have brought unions' bargaining power beyond firms' optimum.

[14] Legal constraints on the length of collective contracts and workers switching jobs between contracts limit reputational considerations alleviating the commitment problem.

Whenever the union's bargaining power is above some critical level, we get the a priori expected result that its increase reduces the employer's profits and increases the union's utility. Whenever the union's bargaining power is below that critical level, the model predicts that its increase leads to both an increase in the union's utility and in the firm's profits. The theoretical section also wonders what would happen if a social planner were to take a policy approach to choose an *optimal* distribution of bargaining power (e.g., through the implicit choice of institutions inducing it).[15] Proposition 5 then allows us to characterize power distributions implementing Pareto efficient allocations.

The paper links the theoretical framework with the empirical analysis through a model calibration that analyzes the pre- and post-reform bargaining problems for an average treated firm. Using observed and inferred equilibrium outcomes, this exercise estimates a rise in the unions' surplus share of 8.8 percentage points due to the reform, and a large enough increase in the total surplus so that the employers' welfare, given by firms' profits, was not harmed.[16]

Related literature and contributions This paper contributes to three interrelated bodies of literature: the impact of power distribution on economic outcomes, the effects of unions on labor market outcomes, and bargaining theory. The literature on power distribution and economic outcomes has been largely theoretical, focusing on how institutional configurations shape power dynamics and, consequently, economic prosperity (Becker, 1983, 1985; Wittman, 1989, 1995; North, 1991; Laffont, 2000; Aghion et al., 2004; Acemoglu, 2003, 2008; Acemoglu et al., 2005; Acemoglu and Robinson, 2008). This paper contributes to this branch of the literature by introducing the burden of power phenomenon. Its implication on distributing power towards the weaker group is aligned with the discussions regarding inclusive institutions found in Acemoglu and Robinson (2013), the *narrow corridor*'s power balance between state and society found in Acemoglu and Robinson (2017, 2020), and the notion found in Bhagwati (1982); Hirshleifer (1991); Alesina and Rodrik (1994); Alesina and Perotti (1996) that material inequalities (of endowments) lead to "unproductive profit-seeking activities." [17] However, how do we know when to stop transferring power to the powerless? The main theoretical contribution of this paper answers this question, characterizing the set of Pareto efficient distributions of power within an organization. Lastly, my model provides a theoretical foundation for how bargaining power crowds out unions' coercion, speaking to the literature on democratic concessions as a solution to social discontent, coercion, and de facto power (Granovetter, 1978; Acemoglu and Robinson, 2000a,b, 2006; Hart and Moore, 2008; Acemoglu and Wolitzky, 2011; Passarelli and Tabellini, 2017).

Using a unique quasi-natural experiment in the context of Chilean firms, the main empirical contribution of this study is to provide the first causal evidence on how shifts in power distribution affect economic outcomes and efficiency. This builds on prior work which has relied on correlations from samples of dozens of countries, case-study comparisons between particular regions, individual historical events, or even anecdotal evidence.[18]

[15] As in the case of the Chilean government.

[16] The firm's profits represent the utility of the employer and not the total surplus of the bargaining.

[17] In Hirshleifer (1991), the "paradox of power" agent's welfare is non-decreasing in their power, which substantively contrasts with my theory of the burden of power in which larger bargaining power of an agent might lead to less welfare.

[18] North (1991); Alesina and Rodrik (1994); Alesina and Perotti (1996); Aghion et al. (2004); Acemoglu et al. (2005); Acemoglu (2008);

This paper complements a new wave of interest in labor unions (Lee and Mas, 2012; Dahl et al., 2013; Farber et al., 2021; Frandsen, 2021; Bhuller et al., 2022),[19] and also builds on and contributes to the large body of literature developed during the 1980s and 1990s. My work enhances the empirical research in this area (Freeman and Medoff, 1981, 1984; Brown and Ashenfelter, 1986; MaCurdy and Pencavel, 1986; Christofides and Oswald, 1992; Abowd and Lemieux, 1993; Booth, 1995; Farber, 2005) in three ways. First, this paper focuses on the causal effects of an increase in union bargaining power on firm outcomes, as opposed to simply studying the impact of unions' presence. Second, it provides a research design that addresses endogeneity and omitted variable concerns of unionization (Lewis, 1986; Lee and Mas, 2012). Third, it finds evidence supporting the strongly efficient contracts hypothesis (Abowd, 1989; Borjas, 2010).[20] My research also enriches the theoretical body of work on unions (McDonald and Solow, 1981; Eberts and Stone, 1986; Farber, 1986; Svejnar, 1986; Horn and Wolinsky, 1988; Moene, 1988; Johnson, 1990; Oswald, 1993). It rationalizes the mixed results[21] of unions on firms' profits by identifying threshold levels on the bargaining power distribution at which the firm's profits begin to decrease on the union's bargaining power. Moreover, the paper introduces the union's decision problem over the optimum choice of coercion (understood as unionization rates by Freeman and Medoff (1981); Farber (2005); Lee and Mas (2012)), providing a rationale to Freeman and Medoff's (1984) "optimal level of unionization."

Finally, this paper extends the theoretical framework of bargaining theory, particularly Nash bargaining models (Nash, 1950), by introducing real-world frictions in the form of coercion that can modify the disagreement point between bargaining parties.[22] Traditional bargaining theory has been largely axiomatic (Raiffa, 1952; Kalai and Smorodinsky, 1975; Roth, 1979; Moulin, 1991; Myerson, 1991)[23], focusing on normative criteria of fairness, and has been criticized for being too reduced-form and abstract. This paper responds to these critiques by introducing a bargaining friction that emerges from a player's strategic actions to change both parties' outside options. This addition not only enriches the existing theoretical framework but also provides a more realistic and applicable model for various organizational settings. It also offers a methodological advancement by showing how to disentangle the effects of changes in the disagreement point and bargaining power (Livne, 1986; Svejnar, 1986), thereby providing a more nuanced understanding of power dynamics within bargaining situations.

Structure of the paper The remainder of this article is organized as follows. Section 2 details the setting of the reform and offers background information about unionization and collective bargaining regulation in Chile. Section 3 presents the data and discusses summary statistics. Section 4, presents the empirical framework; it discusses both the estimation and identification strategies. Section 5 exhibits the empirical results, followed by robustness checks, and a presentation of heterogeneous effects by union's strength.

Acemoglu and Robinson (2008, 2013, 2017, 2020); Passarelli and Tabellini (2017).

[19] Connected to a growing belief of the unions value among American workers: 53% increase in union representation petitions in 2022 (Labor Relations Board) `www.nlrb.gov`. In 2021, union support was at its highest in the US (68% in favor) since 1965 `https://news.gallup.com/poll/398303/approval-labor-unions-highest-point-1965.aspx`. Recent high-profile union victories (Starbucks and Amazon).

[20] The case when the unionized firm hires a competitive level of labor, having a vertical contract curve over which the employer and union only bargain over wages. I find no evidence of decreased labor nor about bargaining over employment levels.

[21] Freeman and Medoff (1984); Abowd (1989); Booth (1995); Lee and Mas (2012); Frandsen (2021).

[22] See Livne (1986); Thomson (1987, 1994); Owen (2013) for a review of the study of disagreement points changes.

[23] Being Rubinstein (1982) a notable exception.

Section 6 presents the theoretical framework used to study the research question and it derives this paper's core testable predictions, introducing a mechanism that rationalizes the empirical results. Section 7 provides a calibration exercise. Section 8 concludes.

2 Background and Setting

2.1 Labor Unions in Chile

Since its return to democracy in 1990, Chile has almost duplicated the number of people affiliated with labor unions, going from 606,812 in 1990 to 1,201,440 in 2021.[24] Regardless, since the 1970s unions in Chile have usually been rather weak. This is largely a consequence of the labor laws established during the military dictatorship in Chile (1973-1990), which placed a strong emphasis on individualizing employment relationships and leaving the Chilean labor market as one of the most flexible and deregulated in the world (Barrett, 2001; Landerretche et al., 2013; Bellido de Luna, 2022).

In this context, the majority of unions in Chile are company-specific; that is, all of their members belong to the same firm. In 2019, this type of union represented 82.4% of the total, the remaining share includes unions of temporary or transient workers (those whose employment contracts are not of a permanent nature) and intercompany unions (those representing workers from several different companies). The latter type is different from trade unions (those representing workers in a specific trade or profession) and sectoral unions (those representing workers across an entire sector of the economy, regardless of their specific trades or professions). In addition, before 2017, employers were not obligated to bargain with intercompany unions. Therefore, in the Chilean context, it is usually the case that unions' strength is bound to the actions of the workers within each firm.

This offers a clean setting to study power distribution within an organization because the lack of bargaining power of a group of workers in a specific firm cannot be compensated by a strong sectoral or trade union that provides power from members outside the organization. Consequently, whenever workers want to accumulate more power, they are forced to exert *coercion* (e.g. unionize) to change both the workers' and employer's outside options. Thus being able to change the allocation of resources in their favor. In other words, this unique setting incentivizes the unions to use the mechanism studied in this paper, allowing me to fully exploit this context to observe the analyzed behavior.

2.2 Collective Bargaining and Regulation

There are two types of CB processes in Chile. The unregulated CB has no guidelines or procedures determining how it should be performed, and can happen at any time that both parties (the workers and the employer) agree to do it.[25] Importantly, workers do not need to form a union to have an unregulated CB;

[24] https://www.dt.gob.cl/portal/1629/w3-article-122779.html.
[25] Each side cannot unilaterally impose the date of the unregulated CB.

groups of workers are allowed to participate in an unregulated CB. The result of an unregulated CB is called a collective agreement, which is binding and lasts for at least two years and at most three (at most four before the reform).

On the other hand, regulated CB processes have very detailed procedures in each of its stages. In addition, and in contrast to the unregulated CB, only unions are allowed to have a regulated CB. This type of CB happens upon the expiration date of the firm's current collective contract. Both the union and the employer can veto any anticipations or deferrals of that date, preventing any unilateral decision of when this event occurs. The outcome of a regulated CB is a collective contract, which lasts for at least two years and at most three (at most four before the reform).

Along all this process, the Directorate of Labor oversees and regulates every dispute, conflict, or disagreement between workers and employers. Furthermore, it enforces collective contracts and agreements, authorizes strikes, sanctions anti-unionization practices by the employers, and illegal practices by the unions, among other regulatory actions. The presence of the Directorate of Labor is important in our context since it is able to enforce the laws, rules, and concrete procedures established by the labor code, guaranteeing that the changes to this code are effective in modifying both parties' (employers' and unions') bargaining power.

2.3 The Reform to the Labor Code

In 1991, after Chile's return to democracy, a new law came into effect establishing rules and procedures for labor unions and CB. This legislation remained in effect (with only minor modifications) until April 1st, 2017, when the labor code was reformed, modifying some rules and procedures of the CB to increase unions' bargaining power against employers. According to the authorities of the time, the change was made to increase the balance and equity in labor relations through strengthening labor unions.[26]

The main changes by the reform are all oriented to increase unions' bargaining power during the CB against employers. First, strikes became a right (only during a CB). As a consequence, employers are explicitly prohibited from replacing workers on strike with workers external to the company. This made strikes a more effective bargaining tool for workers. Second, unions have now the right to receive detailed information about the firm's payroll, investment plans, and accounting information. Third, the introduction of a negotiation floor establishes that benefits obtained in a previous CB cannot be diminished in the following one (in each new round of negotiations, the existing benefits are considered the "floor" or minimum, and discussions are based on how to improve or add to these existing benefits). Fourth, unions got the right to negotiate over more topics. Unlike before, when unions were only allowed to discuss wages and remunerations, now they are also able to bargain over labor conditions. Fifth, before the reform, firms were not obligated to collectively bargain with intercompany unions; in contrast, now firms are forced to accept the CB against this type of union. Sixth, there are new restrictions to extend the benefits of the CB to non-unionized workers. The benefits can only be given to other workers if they pay the union membership

[26] https://www.dt.gob.cl/portal/1627/w3-article-110072.html.

fee in its entirety, and unions have veto power regarding this decision.

All of these changes aim to strengthen unions' position during a CB. Interestingly, these modifications became effective upon the beginning of the CB of the firm. In addition, given that these changes are imposed by the government and enforced by the Directorate of Labor, this reform constitutes an exogenous change in workers' bargaining power. This offers a unique opportunity to study the effects of a change in power within an organization that is not the direct result of its (endogenous) institutions.

3 Data and Descriptive Statistics

The paper exploits a unique dataset from Chile, linking two surveys of national representation with administrative records of the year in which each firm's CB happened.[27] Both surveys were merged by INE (*Instituto Nacional de Estadísticas*, or National Statistics Institute) exclusively for the purpose of this research,[28] using a privately known unique national identification number.[29] Both surveys contain information at the firm level.

The first one, ELE[30] (*Encuesta Longitudinal de Empresas*, or Longitudinal Survey of Firms), is produced by the INE and is a large panel with six waves, the first from 2007 and the last covering 2019. After the first wave (ELE-1), some of the questions of the survey (e.g. balance sheets, unionization rates) cover two years (in contrast, other questions, like number of workers and wages by type of workers' qualifications, include information only for the last covered year). Concretely, ELE-2 (the second wave) includes information for 2008 and 2009; ELE-3 (the third wave) for 2012 and 2013; ELE-4 for 2014 and 2015; ELE-5 for 2016 and 2017; and ELE-6 for 2018 and 2019. The fieldwork for each of the surveys happens one year after the last covered period. This survey offers detailed information about firms' balance sheets, income statements, remunerations, and labor costs, number of workers by different categories, unionization rates, investment, and many other firm characteristics. However, some variables are non-comparable in older years, so I focus most of my analysis from 2012 onwards.

ELE is representative of all the (formal) firms operating in Chile with at least $ 20,000 USD of yearly sales.[31] The sampling design of the ELE is probabilistic and stratified, where the strata are defined by economic activity and company size (based on annual sales). In turn, the sampling frame comes from administrative tax records from the Internal Revenue Service (SII, in Spanish) from Chile. Over 6,000

[27] The dataset is also combined with administrative records from the SUSESO (*Superintendencia de Seguridad Social*, or Social Security Superintendency) which allows to show the good quality and accuracy of the survey. See Table B.1

[28] I was authorized to request these data with the sponsorship from CNEP (*Comisión Nacional de Evaluación y Productividad*, or National Commission of Evaluation and Productivity), an agency from the Chilean Ministry of Finance. The data collection was permitted and supported with the purpose of providing, for the first time, causal evidence of the effects of this large reform on the Chilean labor code.

[29] The INE knows the national identification number associated with each ID in both surveys. However, the identification number cannot be shared with the public.

[30] Methodological information about ELE, in Spanish, is found at https://www.ine.gob.cl/estadisticas/economia/ciencia-y-tecnologia/encuesta-longitudinal-de-empresas.

[31] For the sixth wave of ELE, the firms in the objective population are all of those who at least earned 500 UF (UF is a measure of money used in Chile adjusted by inflation) of yearly sales in 2018. At December of 2018, 1 UF corresponded to $ 27,565.70 Chilean pesos, and 1 USD corresponded to $693.5 pesos on December 31st, 2018.

firms are included in each wave; from those over 4,000 are also present in contiguous waves and over 2,000 are present in all of them.

The second survey, called ENCLA[32] (*Encuesta Laboral*, or Labor Survey), is produced by the Directorate of Labor (an institution belonging to the Ministry of Labor) and its fieldwork is entrusted to the INE as well. ENCLA is a cross-sectional survey and it is one of the main surveys on forms of employment, working conditions, and labor relations conducted in Chile, periodically and systematically, since 1998. It has nine versions in total, but for this paper, I use the last one, from 2019. The fieldwork of ENCLA 2019 occurred between May and September 2019. This survey comprises four questionnaires: one applied to employers, one for unions (for firms that have one), one for workers (for firms without unions), and one about firms' general information.[33] ENCLA 2019 provides detailed information about collective bargaining processes, collective contracts, conflict between workers and employers, general firm characteristics, and crucially, data on whether their last collective bargaining (at the moment of the survey fieldwork) took place before or after the reform. I complement this information with the administrative records provided by INE about the year in which that CB happened.

ENCLA is representative of all the (formal) firms operating in Chile with at least five employees. Like ELE, ENCLA's sampling design is also probabilistic and stratified, with very similar strata; these are defined by economic activity, company size, and geographical region. The sampling frame for this survey also comes from the administrative records from the SII. This survey has a sample size of 3,670 firms, and 1,172 out of them have an active union. Considering that in the year of the survey, there were 4,991 firms with an active union, the survey sampled 23.5% of the total amount of unionized firms.[34]

The combined dataset merges the ELE-5 and ELE-6 with the ENCLA 2019. In total, 528 out of the 3,670 observations from ENCLA are successfully merged with at least one of these two waves. 416 are present in waves six and five, 357 in waves six, five, and four, and 245 are present since wave three. Because of their sampling design, both surveys tend to oversample larger companies, thus most of the merged observations correspond to this type of firm (which is also convenient since unions are overrepresented in these companies). Besides firm size, Table B.1 and Table B.2 show that the merged observations are balanced in other variables.

In terms of attrition, there are several potential reasons why firms are no longer present in the panel such as changes in contact information, lack of cooperation from the firms, incomplete questionnaires, and surveys declared as not enforceable. The latter category includes all firms reached by the INE but answers to the questionnaire cannot be retrieved due to bankruptcy, termination of operations, or company in standstill (due to either *force majeure* or economic reasons), among others. For ELE-5 and ELE-6, there were 26 and 25 firms, respectively, in this category that were left out of the panel sample because of economic reasons. Since these firms are out of the sample, by construction, we cannot know whether any

[32]Methodological information about ENCLA, in Spanish, is found at https://www.ine.gob.cl/estadisticas/sociales/mercado-laboral/condiciones-de-empleo-y-relaciones-laborales.

[33]The questionnaires can only be merged through an ID, which is only provided upon request to the Directorate of Labor.

[34]These firms ended up oversampled because, in Chile, unions are overrepresented in bigger firms. Thus, considering the sampling design, larger firms are oversampled in the survey.

of them were treated or not, nor if they ended up out of the sample because of the treatment itself. Still, considering that 5,456 out of the 6,480 and 4,178 out of the 4,478 observations from ELE-5 and ELE-6, respectively, show up in other waves as well, then only a 0.5% and 0.6% of the panel units were left out of sample from ELE-5 and ELE-6, respectively, due to economic reasons. These figures are small even if we assume that the only reason why these firms were no longer operating was due to the effects of the reform (which would be extremely unlikely considering that according to ENCLA 2019, only 6.28% of the firms in Chile had a union in that period). From this information at least, we should not be concerned about a survivorship bias in the analysis from the next sections.

Table B.3 shows a list of all the variables used in the paper with their respective description. In turn, Table 1 displays the descriptive statistics of all the firm outcomes and some other firm characteristics used for the balance tests.

I construct two control groups and, in the next section, I explain the details of how they are defined. For the moment, looking at Table B.4, we see that except for the total number of monthly hours worked, there is a good balance between firms in the treatment group and those in control group 2. In contrast, there are significant differences in many of the firm outcomes between the treated units and those in control group 1. Still, even with these differences in levels between control group 1 and treated firms, what we care about is the parallel trends in the absence of the treatment between these two groups.[35]

The differences between control group 1 and the treated firms are due to the presence of very large firms in control group 1.[36] These outliers drive the averages up. These differences are reduced in the comparison with control group 2. While the latter includes all the firms in control group 1, it adds firms that neither have collectively bargained or a union (and the reason for that is not because of the employer's threats or retaliations), which are typically smaller firms, thus reducing the averages of the outcome variables.

Notice that both control groups are comprised of never-treated units. In fact, since treated firms receive the treatment at different moments in time, some of them act as controls (as not-yet-treated units) from an event study perspective. For the balance tables, I included only the never-treated observations in the control groups. However, we should expect the treated firms to be very similar among them. The next section presents the empirical strategy in detail.

4 Empirical Framework

4.1 Estimation Strategy

Since firms have been treated at different points in time since 2017, I exploit the panel structure of my data by running a firm-year-level (dynamic) event study. Treated firms are those that held a regulated collective bargaining [CB] after April 1st, 2017, and had an active collective contract (signed before the reform) when

[35] This is confirmed in the results section by looking at the lack of statistical significance of most of the lag coefficients in the event study.
[36] Which includes firms with unregulated CB, which is more likely in larger firms.

they did so. Therefore, an event is defined by a regulated CB happening after the date of the reform (April 1st, 2017) for firms with an active collective contract.

Control group 1, includes two subgroups. The first one (1.a) includes all the firms that, at the moment of the survey fieldwork, had their last regulated CB before April 1st, 2017, and had an active collective contract when they did so. The second subgroup (1.b) includes all firms whose last CB was unregulated and had an active collective contract when they did so. In turn, control group 2 includes all the observations from control group 1 (i.e., subgroups 1.a and 1.b) plus all the firms whose reasons for not having a union or why they have not collectively bargained were not because of the employer threats or retaliations. For now, I will only explain what is the kind of firms composing each control group, and I will leave the discussion about identification to the next subsection.

Since control group 2 includes a larger sample size, it can provide more precise estimates, reducing their variance. This gain in precision (reduced variance) from the larger sample might come at the cost of increased bias if the control group 2 has underlying differences from the treatment group not captured by observed trends.

Notice that this event study considers both never-treated and not-yet-treated observations as controls. While all the observations in control groups 1 and 2 are never treated considering the data availability for this event study, those controls in subgroup 1.a are not different than the not-yet-treated observations that ended up eventually treated within my sample. This happens only because at the moment the survey was applied these observations still not have a CB after the reform was enacted.

Concretely, I run a two-way fixed effect regression estimating the following equation.

$$Y_{ft} = \alpha_f + \lambda_t + \sum_{k=-5}^{-2} \beta_k D_{ft}^k + \sum_{k=0}^{2} \beta_k D_{ft}^k + \varepsilon_{ft} \tag{1}$$

Here, f denotes a firm and t denotes a year. Thus, Y_{ft} is an outcome for firm f at year t. All the outcome variables in the next section, except for unionization rates, which represent percentages, are in natural logarithms. D_{ft}^k indicates if firm f collectively bargained k periods earlier or ahead with respect to 2017. Specifically $D_{ft}^k = 1\{k = t - E_f\}$, where k measures the relative time and E_f indicates the year in which an event happens for firm f. Consequently, each β_k is the effect of the reform on Y_{ft} in the relative period k (when the variable is logarithm, it represents the percentage change). α_f and λ_t are firm and time-fixed effects, respectively. The former control for time-invariant characteristics of each firm, while the latter control for broader trends or shocks that affect all firms in a given period. Finally, ε_{ft} is the error term for firm f at period t. Standard errors are clustered at the firm level and robust to heteroskedasticity.

Finally, since the omitted dummy corresponds to $k = -1$,[37] all other coefficients on the event time dummies are interpreted relative to this baseline. In essence, this means that the coefficients on the other dummies represent the deviation in the outcome, relative to what was observed in the period right before the event. Hence, failing to reject the null hypothesis of each of the relative-time dummies means that their

[37] Following the common practice, I leave out $k = -1$, and $k = -\infty$ to avoid the age-period-cohort problem.

effect is not statistically different from that baseline of $k = -1$.

4.2 Identification strategy

4.2.1 Quasi-Random Assignment and Control Groups

As has been hinted already, one of the main advantages of the empirical analysis is the quasi-random assignment of the treatment for all the observations that at some point are not yet treated and those included in subgroup 1.a of control group 1, as defined above. I am able to make this claim because of three features of the setting. First, the six main changes of the reform discussed in Section 2 are all effective during the process of regulated CB that happened since April 2017. To identify which firms had collectively bargained before or after the reform, I use the answers from the ENCLA questionnaire[38] that directly asks about this. In addition, I complement this information with non-public records provided by INE indicating the exact year in which the CB happened. Overall, these elements guarantee that the treatment is received at different periods after the enactment of the law.

Second, both the new and previous law[39] establish that for firms with an active collective contract, their CB has to happen upon the expiration of the current collective contract. Moreover, both workers and employers can veto any anticipation or deferrals of the corresponding date. Firms without an active collective contract can initiate a CB at any moment (with minor exceptions). Since the latter group of firms might present a threat to identification due to potential selection into the treatment, these firms are excluded from the sample. To distinguish between these two kinds of firms (with and without an active collective contract), I use a question from ENCLA asking if the firm has been collectively bargaining since 2015. 94.6% of the sample have done so. Importantly, according to the old and new labor codes, entering into a CB is a sufficient (and necessary) condition for having a collective contract.[40] Thus ensuring that their last CB occurred upon the expiration of their current contract.

Third, the previous labor code stated that collective contracts[41] must have a length between two and four years. Hence, this extra condition reassures that firms that have been collectively bargained since 2015 have not been selected into the treatment by signing a short placeholder contract close to the date of the reform just to stall for the enactment of the new law. Therefore, the second and third conditions combined guarantee that a firm (employers and unions) cannot decide when to receive the treatment. Furthermore, the date they received it only depended on the date the contract that was about to expire was originally signed. Thus, since firms are created at different points in time, workers within the firm unionize at different

[38] In Spanish: https://www.ine.gob.cl/estadisticas/sociales/mercado-laboral/.

[39] The new one is law # 20,940: https://bcn.cl/3ema6. The old one is law # 19,069: https://bcn.cl/2kb8b.

[40] While the outcome of a regulated CB is a collective contract, the outcome of an unregulated CB is called a collective agreement. I am referring to both of them as contracts to ease the language and because the law states that a CB has to happen upon the expiration of the current collective contract or collective agreement, and no worker can be affected by both a contract and an agreement simultaneously. Additionally, there should not be concerns about firms with agreements changing to contracts or vice versa; the decision of choosing one over the other depends on the union exclusively with no incentives to move from contracts to agreements, and the share of collective contracts has remained stable since 2014 (73.8% according to ENCLA 2014 vs. 74.7% in 2019; way below the margin of error of both surveys).

[41] And collective agreements (defined in the previous footnote).

points in time, and collective contracts have different lengths for many idiosyncratic reasons, then treatment allocation is as good as random for the group of firms that had an active collective contract at the moment of collectively bargain post-reform.

Given all this, why not just compare the averages between treated and controls, and why add the control observations from subgroup 1.b and control group 2? First, for outcome variables that are present in ENCLA 2019 (e.g. measures of conflict), I will indeed take simple differences to measure the causal effects of the reform because the sample size of ENCLA 2019 allows it. Second, for the main outcomes (e.g. profits, remunerations), all of them coming from the merged data from ELE, I run an event study including those additional control observations because the sample size is smaller for the resulting merged dataset. Concretely, while there is a reduced number of observations in subgroup 1.a, the number of treated units is larger due to the fieldwork that happened in 2019, at which point most of the firms had already bargained after the reform. Thus, I could still compare sample averages for one particular year for the main outcomes using only not-yet-treated observations, but using an event study is more advantageous in that sense because it aggregates all these different non-parametric estimates. Nevertheless, as a robustness check (see Figure 12 and Figure 13, I show the time trend for the main outcomes for the treated and the available controls in subgroup 1.a, thus becomes clear that before 2017 the averages were the same and since 2017 they began to diverge.

Arguments for including additional control observations are provided in the next subsection.

4.2.2 Identifying Assumptions

The main identifying assumption of an event study is usually to consider parallel trends in outcomes in the absence of the policy between treated and controls. As discussed above, the quasi-random variation in the expiration date of collective contracts among controls in subgroup 1.a and treated observations (which most of them also act as controls when regarded as not-yet-treated observations) suggests that these firms are ex ante indistinguishable, thus providing strong evidence in favor of the parallel trends assumption.

For the added control observations, it is still plausible to claim that they fulfill this assumption. Using data from ENCLA 2019, firms whose unions engaged in unregulated CB (those in 1.b) did so, mostly because they considered that it was administratively simpler or they believed that it was more convenient for the workers; only 0.6% of the unions who entered into unregulated bargaining did it because there was disagreement with the management about engaging in a regulated CB.[42] Hence, there is no strong evidence to conclude that there is an ex ante imbalance in power between the union and the employer for the firms that chose an unregulated CB over a regulated CB. Thus, it seems plausible to believe that parallel trends hold in this case. Firms choosing this modality might just be because they prefer the flexibility of this type of bargaining.

To be able to receive the treatment, workers need to have a union (otherwise, they cannot engage in a

[42] The union questionnaire of ENCLA 2019 explicitly asks for the reasons the union chose to bargain for a collective agreement (unregulated CB) instead of a collective contract (regulated CB).

regulated CB) and choose to bargain collectively. Therefore, if the reasons why the workers do not have a union or have not collectively bargained are not due to the employer's threats or retaliations (which would imply an ex ante unbalance in power between the workers and management), then these companies are also included as controls. Consequently, I expect that the parallel trends assumption holds for these firms as well. However, since these companies might be qualitatively more different than those who engaged in unregulated bargaining, I include them in a separate control group. Still, as I later show, the magnitude of the effects is similar regardless of which control group I use; they mainly differ in the size of the standard errors due to the number of observations.

Regarding the no-anticipation assumption, one could be concerned that workers, or employers, may modify their behavior in anticipation of the future CB date. If that were the case, the first symptom would be an increase in the instances of conflict between unions and management outside the CB process. However, we can see in Table 3 that for treated firms (i.e., those that would be more prone to conflicts due to these changes in behavior) instances of conflict actually narrowed down to the CB period only. A possibility is that employers reduced investments in anticipation of harder times for the firm. Nonetheless, the evidence provided in Table 7 suggests no reduction in the fixed assets of the firm.

4.2.3 Accounting for Endogeneity Threats

One of the features distinguishing my paper from others in the literature is its uniqueness in studying an exogenous allocation of bargaining power within an organization.[43] Therefore, it is essential to account for two usual endogeneity threats: reverse causality, group composition, and measurement error.

Regarding reverse causality, one could think that treatment status was caused by one of the outcome variables. However, as it was explained in detail in the previous subsection, selection into the treatment only depended on the expiration date of the current collective contract of the firm. One could further think that maybe this whole reform originated due to unions having low bargaining power in the first place (which is in fact what the authorities of the time claimed). Hence, for example, it would be tempting to think that because workers received low wages, then that is why firms received the treatment at all. While this is probably true, this does not imply that a particular firm self-selected into the treatment, because of the current contract expiration date constraint. Nevertheless, even in that case, the reform was inspired by workers' low bargaining power overall. So, the outcome variables are not causing the treatment allocation of a particular group of firms. However, what *can* be claimed is that the effects of an increase in unions' bargaining power can be different depending on how was the original distribution of bargaining power (a result rationalized by my model). Nevertheless, this would not be a concern since it would affect both treated and controls in a similar way, thus not affecting the selection into the treatment.

Another concern would be the presence of changes in the composition of the different groups, especially among firms in the different control groups or firms with unregulated CB changing to regulated CB. Table B.5 shows average values and shares for fixed firms attributes such as economic sector, size, and age

[43] Particularly, it is different from the usual papers studying the effects of union presence.

of the firm at the survey fieldwork in 2015 and 2019 for the treatment and different control groups. We see almost no difference in the value of the variables, suggesting no changes in composition.

In terms of measurement error, surveys are always vulnerable to some degree to this threat. However, both ENCLA and ELE follow state-of-the-art international standards[44] and both of them are administered by the National Institute of Statistics (INE) from the Chilean government. Concretely, with respect to potential mistakes in the answers about whether the CB process happened either before or after the reform, I minimize the risks from this potential problem by taking into account the answers from both the union's questionnaire and the employer's questionnaires (remember that ENCLA has four questionnaires in total, applied to different people). That is, I kept the observations in which both questionnaire responses coincided (which was the majority of the cases).

5 Results

This section begins by presenting the main results coming from the effects of the reform on three core outcomes: profits (non-significant change), remuneration expenses (significant increase), and unionization rates (non-significant reduction). Next, I present additional supporting results suggesting that the driving mechanism of the main results is the burden of power. I introduce evidence against alternative explanations.

Overall, I find that the increase in union's bargaining power allowed workers to force employers to increase remunerations. The increment in unions' strength reduced their incentives to exert coercion, thus reducing politicking and improving the work environment. This manifests in lower unionization rates and in more efficient use of the firm's inputs (reflected in a reduction of the firm's operating expenses and in fewer instances of conflict –e.g., labor complaints, work slowdowns, lawsuits–). These cost savings compensate for the increased remuneration expenses, leaving profits unchanged.

5.1 Main Results

As can be seen from the descriptive statistics (Table 1), there is a significant presence of large firms acting as outliers. For that reason, I present most of the results using the natural logarithm of the outcome variables. Thus, we can approximately interpret point estimates as percentage changes with respect to the omitted dummy of the first lag ($k = -1$), conditional on the pre-event coefficients not being statistically significant. However, two exceptions are made: profits and unionization rates. More than 10% of the sample has negative profits, inhibiting us from applying logs.[45] In turn, since unionization rates are a number between

[44] Methodological information about ENCLA, in Spanish, is found at https://www.ine.gob.cl/estadisticas/sociales/mercado-laboral/condiciones-de-empleo-y-relaciones-laborales. Methodological information about ELE, in Spanish, is found at https://www.ine.gob.cl/estadisticas/economia/ciencia-y-tecnologia/encuesta-longitudinal-de-empresas.

[45] We could try to normalize the observations, making all of them positive, but that would require adding a small constant. In this case, to make all observations positive, that constant should be adding the absolute value of the minimum of the distribution of profits. Nevertheless, the constant is high and distorts all the profits close to zero, eliminating most of the variance.

0 and 1, and because its distribution is not skewed, I use it directly as an outcome variable (it also eases the interpretation: the coefficients represent percentage points changed due to the reform).

I run four different types of event studies given the combination of two elements: control groups 1 and 2, and balanced and unbalanced panels. The only variable for which I only have two regressions is unionization rates because all the added observations of the control group [CG] 2 are firms without unions. While the maximum number of observations for CG 1 is 1,693, the maximum for CG 2 is 2,959. Hence, CG 2 helps us provide more precision. Similarly, the unbalanced panel allows me to analyze more firms over time, so in this subsection I present the results for the unbalanced panel, leaving the results of the balanced one as a robustness check. Overall, all the results are robust to the four combinations.

Figure 1 answers the research question of this paper, i.e., *the increase in union's bargaining power (due to this reform) has no effect on the profits of the studied firms*. In fact, if anything, there is a small (but not significant) increase. Figure 1 displays confidence intervals at 90% statistical significance, and we see no effect even under this more lenient interval. To complement this finding, Figure B.1 displays the results for the logged measure of total revenues (panel a) and total expenses (panel b). From the latter, we see that both variables move in a parallel way (and at a very similar magnitude), thus confirming the results of no change in profits.

These findings contrast with those of (Abowd, 1989; Lee and Mas, 2012; Frandsen, 2021) who found a negative effect of union presence on a firm's profits. The results seem to follow the ideas presented by Freeman and Medoff (1984); Booth (1995) who discuss the potential benefits of unions on firm profits. Comparison with these results has to be done with caution. While one could regard union presence with an increase in workers' bargaining power, in my case, I am studying the effects of an increase in the power of an existing union. Hence, even though some firms without unions were added to the control groups, the comparison is mainly between (and within) firms with unions.

Did the reform have no impact? Figure 2 refutes that idea, illustrating an increase in the total amount of expenses in nonmanagerial remunerations. For CG 1 (CG 2) The growth goes from 8% (7%) gain in the year of the CB to 32% (29%) in the third year (lead 2). While the coefficient for lead 0 is close to the 90% significance, the point estimate of lead 2 is significant at 95%.

The results on remunerations suggest a positive outcome for the union during the negotiations of the CB due to their increased bargaining power. Possibly, the multi-year collective contract (they last between two and three years) signed during the CB established a stepped increase in wages, providing some time adjustment for the firms. To put the 31% rise in remunerations in perspective, according to the Bureau of Labor Statistics from the U.S.,[46] on average union members in 2022 earned 18% more than non-union members. However, there are important differences across economic sectors and geographical regions. For example, in service occupations (which belong to the tertiary sector) unionized workers earn on average 48% more than non-unionized workers. As we can see from Table 1, 78% of my sample are firms from the tertiary sector. The significant boost in remunerations is understandable for two reasons: First, the large

[46] https://www.bls.gov/news.release/pdf/union2.pdf.

set of pro-union changes introduced by the reform. Second, the low baseline of unions' bargaining power given the pro-employer labor code established with the heritage of the Chilean military dictatorship.

Of course, one could wonder whether the increase in remunerations is attributable not to an increase in wages, but to an increase in the number of hours worked. While Figure 5 hints at an increase (though not statistically significant) in the total amount of nonmanagerial hours worked per month, Figure 11 confirms an increase in nonmanagerial wage per hour.

A priori, it seems plausible that in response to a substantive increase in the union's bargaining power, workers would now have more incentives to join the union. However, if unionization is a costly strategy to improve workers' bargaining position through the coordination of coercive activities (e.g. concerted slowdowns, "work-to-rule" campaigns, sabotage, and lawsuits, among other tactics),[47] then obtaining more power crowds out incentives toward costly coercive actions. In other words, if one considers that the union makes efforts to summon more members, then solving the collective action problem is costly. Consequently, given an increase in the union's bargaining power, they might have fewer incentives to increase their number of members.

Figure 3 imparts insights consistent with this situation. We see no significant increase in unionization rates due to the reform, if anything, we see a decrease. Lead 2 (Lead 1) indicates a reduction of 4.6 (3.9) percentage points.

5.2 Mechanisms and Supporting Results

This subsection looks at additional results from the effects of the reform to understand what is the underlying mechanism driving the main outcomes.

If profits (nor revenues according to Figure B.1) did not change and at the same time expenses in nonmanagerial remunerations increased, then some cost had to have gone down. An extensive literature states that unions tend to compress wages within firms (Freeman and Medoff, 1984; Card, 1996; Card et al., 2003; Farber et al., 2021), so if we see an increase in nonmanagerial wages, then maybe what explains that profits did not change is a decrease in managerial remunerations. Figure 4 rules out the latter conjecture. Expenses in salaries for managers and executives remained stable after the reform.

Another possibility considered in the literature (McDonald and Solow, 1981; Freeman and Medoff, 1984; Svejnar, 1986) is that during a CB there might be a trade-off between higher wages and less labor, that is as if the union acts as a monopoly of labor moving on the demand curve of the firm. In other words, the higher wages demanded by the union would imply a reduction in the amount of labor hired by the firm.

To study that avenue, I looked at the total number of nonmanagerial monthly hours worked in each firm. Which conveys information about the exact demand for labor of the company. If the "monopoly union" hypothesis were true, then we should expect to see a decline in the number of hours worked. On the

[47] "Work-to-rule" campaigns consist of employees following exactly the text of their contract or rule books, doing the bare minimum, and sabotage involves the disruption of machinery or workflows.

contrary, Figure 5 shows no reduction in the amount of labor used by the firm after the reform. If anything there seems to be an enhancement (not significant though).

My results also provide inputs on the discussion regarding two additional alternative hypotheses to the one considering unions as a monopoly. Namely, the efficient contract and the strongly efficient contract hypotheses (McDonald and Solow, 1981; Svejnar, 1986; Oswald, 1993; Borjas, 2010). The former states that unions and employers bargain over wages and labor (potentially choosing more wages and labor than the optimum level). In contrast, the latter posits that the negotiation happens over wages only keeping the optimum level of labor fixed.

While the evidence provided by Figure 5 allows us to rule out the case of a "monopoly union", we still are not able to discredit either of the other two hypotheses from the previous paragraph with this information alone. Consequently, I used information from ENCLA 2019 to know whether employers have consulted the union on hiring and firing decisions. If the treated firms had been more consulted than firms in CG 1,[48] then we should expect an increase in the likelihood of the efficient contract over the strongly efficient contract hypothesis after the reform. Table 2 shows a t-test for the difference in means of a dummy variable taking value 1 if the employer of the firm consulted the union on hiring and firing decisions. We see not only a reduction of almost 5% for the treated firms but also very low levels at all of consultation; only 6.7% of the treated firms consulted with the unions about employers that need to be hired or fired. This suggests, that the strongly efficient contract hypothesis is more plausible in this case.[49]

While Figure B.1 exhibits no changes in profits due to a similar evolution of revenues and expenses, we observe an insignificant drop in both variables. Hence, if total expenses went down while expenses in remunerations went up, it has to be that another item in the firms' income statement was reduced. Figure 6 reveals a decline in operating expenses,[50] This category aggregates a large group of items such as overhead, energy, depreciation, and administrative and financial expenses (more details in Table B.3). Since this variable is composed of many other expense items, the large standard errors, especially in lead 2, occur due to the different changes/adjustments made within each firm for the different combinations of the items in this aggregated variable. Still, we observe statistically significant (at 90%) coefficients for CG 1 in leads 1 and 2, with a large magnitude. Yet, the size of the effect seems to be overestimated given the apparent (though not significant) negative pre-trend of this variable.

What explains this outcome? There are two alternatives: either it is attributable to the employer's decisions or to workers' actions. Let me consider both. If these results are a consequence of the former, then it should be that management reduced the investment of the firm. A reduction in the amount of physical assets would directly explain the reduction in all of the items included in the operating expenses category (fewer companies' offices or cars require fewer office supplies, less insurance, less fuel, less maintenance, fewer items to depreciate, fewer needs and costs of financing, etc.). If there is no reduction in physical assets, then an alternative explanation would be that employers decided to become more efficient in the use

[48] Remember that CG 2 contains firms that have not collectively bargained.

[49] This would be one of the few papers finding evidence in favor of this hypothesis, being Abowd (1989) the one making a strong case to confirm it. I will use this hypothesis to later assume a fixed amount of labor in the bargaining model of the next section.

[50] Those related to a company's day-to-day business operations or manufacturing.

of these resources. However, this would imply that before the reform the employers were not optimizing. Agents' rationality would be violated.[51]

Figure 7 exhibits the null effects of the reform on firms' fixed assets, that is, land, buildings, vehicles, machinery. Therefore, the conjecture about management being the one modifying its behavior as a consequence of the reform seems less plausible.

Alternatively, the last remaining possibility is that the reform affected workers' behavior. The larger union's bargaining power (materialized into higher wages) might have reduced the needs and incentives to overcome the collective action costs to summon more people into the union. This could have improved the relationships with management or between white- and blue-collar workers. Following the ideas of Freeman and Medoff (1984); Milgrom and Roberts (1998), appeasement of the workers (or the lack of the need to start a conflict) and reductions in the belligerence of the work environment lead to a more collaborative environment. Better communications, higher levels of trust, and more accountable and responsible workers ultimately lead to a more efficient use of the company's resources. All this does not necessarily materialize with a reduction of strikes. Even in the absence of them, workers could be efficient and careful in the use of company resources in the day-to-day company's operations.

It is crucial to sustain the above conjecture to observe what happened with conflict within the firm. I look again at ENCLA's questionnaire and study whether conflicts (measured as complaints, concerted slowdowns, "work-to-rule" campaigns, sabotage, and lawsuits, among others) between the company and the workers were focused during the CB process only, or if they spread across time in more instances of conflict. That is, I look at a measure of conflict in the extensive margin. I find that on average, a vast majority of conflict between management and workers, 70.2%, happened outside the CB period. Furthermore, I observe that almost 83% of the conflict happened outside the CB in the never-treated firms. In contrast, that value is 65% for the treated firms. Table 3 presents the results of the t-test for the difference in means for the two groups. The data evidence a statistically significant (at 0.1%) difference of 17.8% fewer instances of conflict in the firms in which the bargaining power of the union was increased.

To further explore the proposed mechanism, that is, higher unions' bargaining power crowding out coercive actions and consequently lowering operating expenses, I run a regression of log operating expenses on an indicator for the presence of coercive actions and control variables.[52] Column 2 of Table B.6 shows the results, suggesting that firms affected by coercive actions have, on average, 76.2% higher operating expenses than those unaffected by them. In turn, to evidence that unionization rates serve as a catalyst for coercion, I run the same regression, using unionization rates as the outcome. Column 4 of Table B.6 displays that firms affected by coercive actions have, on average, 76.2% higher operating expenses than those without them.

Still, even if workers were responsible for these cost-savings due to an increase in their bargaining

[51] E.g. are employers more carefully turning off the lights of their offices when they exit now? As absurd as it may sound, this captures the logic of why this would be so counterintuitive.

[52] The indicator takes value one if the workers of a firm performed wither lawsuits, slowdowns, sabotage, complaints, "work-to-rule" campaigns, among other tactics during the year covered by the ENCLA survey.

power, why firms did not increase it earlier? The laws and rules bestowing bargaining power during a CB were and are set by the Chilean Government, not the employers, so they did not have the capacity to modify the parameters changed by the reform. What about lobbying in favor of a reform redistributing power to unions? Having lobbied in favor of the reform would have been a suboptimal strategy since pro-union political parties would have brought unions' bargaining power beyond firms' optimum. Overall, the reform alleviated a commitment problem faced by the employers in which they were not able to credibly yield to the union their larger bargaining power during the CB process.[53] Consequently, the pre-reform incentives for exerting coercion were due to an institutional constraint and not a suboptimal choice of the agents.

5.3 Robustness Checks

This section presents four robustness checks. The first one has the goal to show that all the main findings are robust to using only a sample of firms that are observed in all the considered years, i.e., I present the results both for CG 1 and CG 2 for a balanced panel. Second, I consider a different specification of the econometric model that controls for the effects of engaging in regulated collective bargaining, regardless if it is before or after the reform. Third, I present an alternative measure of remunerations in the form of wages per hour. Fourth, I present evidence of the quasi-random assignment of the treatment on firms with active collective contracts.

Balanced panel findings are displayed in Figure B.2 (profits), Figure B.3 (nonmanagerial remuneration expenses), and Figure B.4 (unionization rates). While most of the point estimates have similar magnitude and statistical significance as in the case of the unbalanced panel, one caveat is worth mentioning. Lags 2 and 3 for the event study of profits are close to being statistically significant, which might indicate an overestimation of the positive leads (1 and 2). This suggests that they might be more negative than displayed. Still, even accounting for that potential overestimation (lag coefficients are still not significant at 90%), the confidence intervals of the leads are sufficiently wide to disregard a statistically significant drop in profits.

Next, I distinguish whether the effects captured by the event study are due to having engaged in regulated collective bargaining or if they are due to the effects of the new rules regulating collective bargaining. For this new specification, I redefine an event, $\widetilde{E}_f$, as having collectively bargained (at all). I run this regression:

$$Y_{ft} = \widetilde{\alpha}_f + \widetilde{\lambda}_t + \sum_{k=-5}^{-2} \widetilde{\beta}_k \widetilde{D}^k_{ft} + \sum_{k=0}^{2} \widetilde{\beta}_k \widetilde{D}^k_{ft} + \sum_{k=-5}^{-2} \widetilde{\beta}_k \widetilde{D}^k_{ft} T_f + \sum_{k=0}^{2} \widetilde{\beta}_k \widetilde{D}^k_{ft} T_f + \widetilde{\varepsilon}_{ft} \tag{2}$$

Where T_f is an indicator for having collectively bargained after March 31, 2017, and $\widetilde{D}^k_{ft} = \mathbb{1}\left\{k = t - \widetilde{E}_f\right\}$. The parameters and error term are defined as in Equation 1.

[53] Legal constraints on the length of collective contracts and workers switching jobs between contracts limit reputational considerations alleviating the commitment problem.

We see that Figure 8, Figure 9, and Figure 10 confirm the main results on profits, remuneration expenses, and unionization rates. Furthermore, the negative pre-trend on profits suggests that the leads' point estimates might be underestimated, thus suggesting a positive effect on profits. In terms of nonmanagerial remuneration expenses, the magnitude of the point estimates in the third year of the reform are slightly larger than before, results for CG 2 are still significant at 95%. Results on unionization rates are even more interesting now. We see a statistically significant reduction of this variable during the second year of the reform. Point estimates are also smaller now; lead 1 and 2 suggest reductions of 13.7 and 9.9 percentage points in unionization rates. These results are feasible considering the large baseline in unionization rates of the firms in the sample (Table 1).

Figure 11 displays the results of the event study for the log of nonmanagerial wages per hour of work (for the unbalanced panel). The coefficient of lead 0 suggests an increase of 27.6% (25%) in the wage per hour for CG 1 (CG 2). In turn, the point estimate of lead 2 indicates a rise of 42.8% (39.3%) for CG 1 (CG2). The coefficient of lead 2 is statistically significant at 90% for CG 1 and at 95% for CG 2. So, regardless of the intriguing negative point estimate of lead 1, it seems that the increase in wages due to the reform was persistent in time. The magnitude of the effect is similar (above 30%) to the one of lead 2 for the total increase in nonmanagerial remuneration expenses (Figure 2).

Regarding the results of lead 1, I cannot disregard the possibility of some change in the composition of the workforce. One conjecture could be that employers fired or contracted fewer hours of work of union members, substituting it with new employees, driving the average wage per hour down if non-union members' wages were lower. Then, there are two options for the later *back to normality* in lead 2. Either the new employees joined the union or, thanks to the changes of the reform, the unions agreed to extend the benefits to non-unionized members (conditional on members paying the union membership fee).

One of the main features of this empirical analysis comes from the fact that firms with a current collective contract at the time of the reform were not able to select into the treatment, they had to wait until the contract expiration to begin a new collective bargaining and be affected by the reform. Because of the merging process between the two surveys, I only managed to have around twenty firms (the exact number fluctuates depending on the outcome variable) present in subgroup 1.a, which provides the cleanest comparison among all the never-treated (at the time of the fieldwork) firms. Still, because of the nature of the dynamic event study, all the treated firms (except those treated at $k = 0$) are used as controls at some point. Therefore, providing some evidence that there was indeed a quasi-random assignment of the treatment between the treated units and those in subgroup 1.a would also make it more plausible to sustain that randomness among the treated units.

To confirm the idea of a quasi-random assignment, we should expect that the evolution of the main outcomes in time should be not only parallel but coincide exactly the same for the years before the policy was enacted and be distinct since that year in case there is some effect of the policy on the outcome variable, and to remain the same in case the policy had no effect on the respective outcome variable. Figure 12 and Figure 13 show exactly this phenomenon for the nonmanagerial remuneration expenses (which coincide before the reform and diverge since 2017) and for total revenues and total expenses (which coincide before

and after indicating no effect of the reform on these variables), respectively.

5.4 Heterogeneous Effects

While the construction of the theoretical model of this paper has taken the empirical results presented so far as an input in order to provide a theory that rationalizes them, it has also hinted at the relevant heterogeneity that needed to be explored in order for everything to fit together. As presented in the next section, the model will allow us to understand that the null effect detected in profits actually hides heterogeneity depending on the ex ante distribution of bargaining power within the firm. This is an important conclusion that allows me to reconcile the different findings in the literature regarding the effects of unions on profits.[54]

In this subsection, I look at the heterogeneous effects of the reform, distinguishing between firms in which the ex ante distribution of bargaining power favored the union versus those in which it favored the employer. The key idea behind doing this is that this allows me to study the second derivative of the outcome variables with respect to changes in the union's bargaining power. That is, I am exploring the effects on profits, wages, and unionization given a change (by the reform) in union's bargaining power at different ex ante levels of this variable. Therefore, finding heterogeneous effects of this reform suggests a non-linear effect of bargaining power over the outcome variables.

To measure the ex ante strength of the union, I construct a dummy variable (called Weak Union), that takes the value 1 if the outcomes of the CB were not more favorable for the workers than for the firm and the union did not hire consulting services for the CB. The former is built based on the perceptions of employers and union leaders (question included in both questionnaires of ENCLA); they are asked whether they regard "*the outcomes of the CB more favorable to the employer or to the workers relative to their bargaining power*". Since a large share of respondents answered that the outcomes were equally favorable for both parties, I complemented these questions with another one asking about the actions taken by the union to prepare for the CB. In that sense, hiring consulting services represents a valuable asset that might lean the bargaining in favor of the union, i.e. increasing their bargaining power.[55]

In order to interpret this variable as a relative (with respect to other unions) measure of the ex ante power of the labor union, I make the following assumption:

Assumption: The reform equally shifted the distribution of bargaining power across all labor unions.

While the assumption might seem somewhat strong, it is in fact plausible from the perspective that the reform is a change in the law that specifies concrete protocols that have to be followed during a regulated CB process, affecting all firms in the same way. Therefore, if the change in bargaining power is the same for all unions, then differences in their bargaining power have to be attributable to their ex ante strength.

Considering that the sample size is reduced now, I only show the findings for CG 2 (except for unionization rates in which I have to use CG 1) for the unbalanced panel to try to maximize the number of firms

[54] Again, my paper is not about studying the effect of union presence, but rather an increase in their bargaining power, but we can regard the former as a pseudo-increase in the bargaining power of workers, too.

[55] Even if consulting services were more valuable for weak unions, they would not have the resources to finance them in the first place.

in each regression.

Panel (a) of Figure 14 displays the event study plot for firms with weaker unions, and panel (b) does it for stronger unions. While no coefficient is statistically significant, there are two noticeable differences between both. First, there seems to be a negative trend in the lags for weaker unions. Second, leads 0 and 1 in panel (a) are large in their magnitude. Hence, putting both things together, the negative pre-trend could suggest an underestimation of leads 0 and 1. Thus suggesting an even larger positive effect on profits. In contrast, results for stronger unions are consistently closer to zero.

Panel (a) from Figure 15 exhibits a statistically significant (at 90%) effect on wages in the year of the event for weaker unions. However, it looks like all of the effect in this case is due to pre-trends, considering that lags 5, 4, and 2 are similar or larger in magnitude and almost statistically significant at 90%. In contrast, the results for firms with stronger unions are much more similar to what I find in the general case.

The findings from Figure 16 reveal an interesting contrast. While from panel (b) I find no significant changes in unionization rates due to the reform, panel (a) shows a statistically significant (at 90%) drop in lead 2. While the point estimates of lags range from -1 to -5 percentage points, the point estimates of the leads range from -4 to -14 percentage points.

Finally, Figure B.5 offers the results for operating expenses. Interestingly, we see no significant effects for firms with stronger unions with relatively smaller point estimates. On the other hand, for leads 1 and 2, we see a substantial magnitude in the size of the coefficients. While the considerable size of the standard errors does not allow for rejection of the coefficients being different than zero, this is most likely happening due to a lack of statistical power. Notice that the regression of panel (a) uses 84 firms only, and this happens on top of the already large standard errors using the whole sample (due to the large variance produced for the adjustment within the different items in this aggregated category). Even though the lack of precision, still the magnitude of the effect is suggestive of a large negative impact on operating expenses.

Table 4 summarizes the main empirical findings of the paper. First of all, the heterogeneous effects provide evidence in favor of reducing union coercion as the driving mechanism of the results. Concretely, we see that the larger the drop in unionization rates, the larger the reduction in operating expenses. Hence, we can infer a positive relationship between union coercion, represented by the unionization rates, and operating expenses.

In turn, it seems that profits might be increasing in the union's bargaining power, but only up to a point. This would be consistent with profits being a concave function of union's bargaining power. Moreover, we can speculate that at larger levels of unions' bargaining power, a further increase in their strength could eventually reduce profits. Instead, from the exhibited evidence, it seems that remunerations could be convex in union's bargaining power, with larger changes at higher levels of this variable. Finally, the relationship between unionization rates and union's bargaining power seems to be negative, but with smaller reductions at larger levels of union's strength. This would be consistent with the union's coercion being a decreasing convex function on the union's bargaining power.

6 Theoretical Framework

This section aims to introduce a model that allows us to characterize optimal distributions of bargaining power and, at the same time, rationalize the paper's empirical findings.

The first subsection establishes the set-up of a two-agent bargaining problem between an Employer and a Union. The bargaining solution determines the payoffs of a decision problem faced by the Union, which needs to choose an amount of coercion that affects the disagreement point of the bargaining. The second subsection determines the optimal level of coercion. Here, Proposition 1 presents the idea that a larger bargaining power for the Union reduces their exerted coercion. The next subsection studies the comparative statics with respect to changes in the Union's bargaining power. Proposition 2 shows that if the latter increases, both Union's utility and wages increase, but the effects on the firm's profits are uncertain. Proposition 3 presents the conditions under which the Union's utility and the firm's profits are strictly convex and strictly concave, respectively, in the Union's bargaining power (being the latter necessary for the next two propositions). Next, Proposition 4 identifies the conditions under which the burden of power exists. The fourth subsection considers the optimal distribution of bargaining power to be implemented by a social planner and discusses the notion of optimality to consider. Proposition 5 characterizes the set of optimal distributions of bargaining power. The last subsection gives an example.

6.1 Model Set-Up

Consider a bargaining problem between two agents (the leading example of the paper considers an Employer, *she*, and a Labor Union, *they*)[56] in which both need to decide how to split the gains from a cooperative endeavor (firm's profits coming from production). In general, a bargaining problem between two agents is described by two elements: a closed and convex utility possibility set (from here forward UPS) $V \subset \mathbb{R}^2$ representing the feasible solutions to the problem in terms of utility payoffs, and a disagreement point $\underline{v} \in \operatorname{int} V$, the outcome that will occur if there is a breakdown of cooperation. Where $\{v \in V : v \geq \underline{v}\}$ is bounded.

I will introduce structure using this framework by first considering a case without coercion and assuming $\underline{v} = (0,0)$. The Employer owns a firm generating surplus $y > 0$. Workers, represented by a Union, provide labor, helping to generate y in exchange for a transfer (wages), w.[57] The Employer commits to distribute the gains from cooperation through w; determined by an efficient bargaining process.[58] The Employer's utility is given by the firm's profits, $\Pi(w) = y - w$, and the Union's utility is $U(w) = w$;[59] thus,

[56] This is my leading example, but the model can be applied to any bargaining setting in which one of the players can modify the disagreement point of the bargaining problem (e.g. an elite versus a group of citizens, a bargaining situation between two countries, two political parties negotiating in congress, a monopoly versus a monopsony, etc.).

[57] We can consider w as the firm's total expenses in workers' salaries and remunerations.

[58] A bargaining solution implementing a point on the Pareto frontier of the utility possibility set.

[59] Union's and Employer's preferences are modeled similarly in many models of wage bargaining (see Oswald (1986) for a survey), including (Moene, 1988). The only difference is that, instead of analyzing an average wage per worker multiplied by the total number of workers in the firm, as other papers do, I regard w as the total transfer made to all the workers in the firm. I make this simplifying modeling decision because I assume that the labor level is fixed at some optimal level and that the Employer and Union are not bargaining

$V = \{(U,\Pi) : U + \Pi \leq y\}$. In this case, an asymmetric Nash bargaining solution (Nash, 1950) implements the transfer $w^* = py$. Where $p \in [0,1]$ is the bargaining power of the Union, and $1-p$ is the one from the Employer. We see the, *a priori*, expected result (usual in bargaining theory) that agents' welfare is increasing in that player's bargaining power. We can interpret p as induced by the rules, laws, and institutions regulating the bargaining.

Consider now a case in which, before the bargaining begins, the Union chooses a certain level of coercion, $\kappa \geq 0$, to pressure the Employer and modify both players' outside options. Here, the disagreement point from the bargaining (the point determining both players' outside options) is given by the payoffs of a costly conflict (a strike). In that case, productive activities stop, and the agents get a share of a reduced surplus $\underline{y}$. Following the literature on unions (Freeman and Medoff, 1981; Farber, 2005; Lee and Mas, 2012), I regard κ as unionization rates (it can also be interpreted as efforts towards coordinating workers' collective action, e.g. planning strikes or concerted slowdowns). Consequently, while κ does not represent a full-fledged conflict (which only happens upon a breakdown of the cooperation), it can be interpreted as of belligerence of the Union towards the firm.

Coercion in the model has three features: (i) it modifies agents' outside options by affecting the share of $\underline{y}$ obtained by each player; (ii) exerting it is costly for the Union; and (iii) it affects workers' performance reducing Employer's profits. Feature (ii) is because coordinating collective action requires effort (it usually has a monetary cost too). In turn, feature (iii) captures the idea that the larger the level of coercion there is more politicking and a less productive environment, resulting in greater hostility from the workers towards the management. Causing either a lack of proactivity, inefficiencies in the use of inputs, or even destruction of the firm's assets. As discussed in the empirical section, concrete examples of coercive actions are concerted slowdowns, "work-to-rule" campaigns, sabotage, and lawsuits. In the calibration section, I use unionization rates as a proxy for coercion. Unionization rates typically indicate workers' capacity to organize and execute coordinated actions like those, affecting how likely and effective these are. Moreover, the larger the number of unionized workers, the larger the pressure exerted during a strike, and the larger the share of $\underline{y}$ obtained by the union.

Consequently, coercion, κ, determines the payoffs of the asymmetric Nash bargaining. However, since the Union's decision problem in choosing the optimal level of costly coercion occurs before the bargaining, the Nash bargaining solution takes κ as given. Preferences are now:

$$\Pi(w,\kappa) = y - w - \pi(\kappa) \tag{3}$$

$$U(w,\kappa) = w - c(\kappa) \tag{4}$$

$\pi(\kappa)$ and $c(\kappa)$ are both strictly increasing and differentiable functions representing coercion's features (iii) and (ii), respectively. Additionally, $\pi(0) = c(0) = 0$, $c(\kappa)$ is strictly convex, and $\pi(\kappa)$ is convex.[60] The assumptions on $c(\kappa)$ are similar to those imposed by Acemoglu and Wolitzky (2011) in the cost function

over it. This assumption is sustained by the empirical evidence favoring the strongly efficient contract hypothesis in the previous sections. Unions care about the amount paid to all the firm's workers.

[60] Alternatively, we can have $c(\kappa)$ being convex, and $\pi(\kappa)$ being strictly convex.

they use for the acquisition of *guns* and coercion that modifies the agent's outside option in a model of forced labor. I also assume $\pi(\kappa) \leq \bar{\pi} < y$, that is, there is a limit to the harm that coercive activities can inflict on production. Putting all this together, I can define the UPS of the bargaining problem with coercion as $V = \left\{(U,\Pi) : U + \Pi \leq y - c(\kappa) - \pi(\kappa)\right\}$.

The ensuing equation represents Employer's and Union's outside options, $\underline{\Pi}$ and $\underline{U}$.

$$\underline{\Pi}(\kappa) = \left[1 - q(\kappa)\right]\underline{y} \tag{5}$$

$$\underline{U}(\kappa) = q(\kappa)\underline{y} - c(\kappa) \tag{6}$$

Where $\underline{y} \in (0, y - \bar{\pi})$ and $q(\kappa) \in [0,1]$ is a strictly increasing, concave, and differentiable function.[61][62] Following the typical conception in the literature on conflict (Fearon, 1998; Bueno De Mesquita, 2016), we have two interpretations for the first term of equation (6). It can either say that whenever the Union's coercion (unionization rates) are large enough, then the Union takes control over the firm's reduced profits, $\underline{y}$, or that the Union keeps a share equal to $q(\kappa)$ of $\underline{y}$, leaving the share $1 - q(\kappa)$ to the Employer. Finally, notice that the Union has to pay the coercion's cost, $c(\kappa)$, regardless of whether they engage in conflict. Conversely, since there are no productive activities during a strike, $\pi(\kappa)$ does not appear in the Employer's outside option.

The next expression gives the transfer implemented by the Nash bargaining.

$$w(\kappa) = q(\kappa)\underline{y} + p[y - \underline{y} - \pi(\kappa)] \tag{7}$$

This is the solution to the following problem.

$$\max_{w} \left[\Pi(w,\kappa) - \underline{\Pi}(\kappa)\right]^{1-p} \left[U(w,\kappa) - \underline{U}(\kappa)\right]^{p} \tag{8}$$

Which is the typical asymmetric Nash bargaining model. Notice first that $y - \underline{y} - \pi(\kappa) > 0$,[63] thus (7) shows that the direct effect of workers' bargaining power, p, on wages is positive. As displayed in Figure 17, while the total surplus from the cooperation between the Employer and the Union is $\Pi + U = y - c(\kappa) - \pi(\kappa)$, the maximum surplus that any of the two agents can extract from the other without a breakdown of cooperation is

$$(\Pi - \underline{\Pi}) + (U - \underline{U}) = y - \underline{y} - \pi(\kappa) > 0 \tag{9}$$

I will refer to $y - \underline{y} - \pi(\kappa)$ as the net cooperation surplus. Figure 17 exhibits all the pieces of the bargaining with coercion.

In the next subsection, I show that contrary to the result in the case without coercion, holding more bargaining power can reduce an agent's welfare. The friction driving this result is that the coercive activities

[61] $\underline{y} < y - \bar{\pi}$ guarantees that $(\underline{U}, \underline{\Pi}) = \underline{v} \in \text{int}\, V, \forall \kappa$.
[62] Concavity can be relaxed under some conditions.
[63] This holds since $y > \bar{\pi}$ and $y - \bar{\pi} > \underline{y}$.

are non-contractible (e.g. due to institutional constraints). That is, agents do not bargain over the level of coercion along with the transfer. By choosing the optimum level of coercion before the bargaining, the Union does not internalize the externality inflicted on the Employer.

6.2 Optimal Coercion

Plugging (7) into (4) gives us the Union's utility as a function of coercion only. The Union's decision problem is given by the maximization of their utility with respect to κ. This provides us with the ensuing first-order condition, which then allows us to state Proposition 1.

$$\underline{y}\frac{dq}{d\kappa} - p\frac{d\pi}{d\kappa} = \frac{dc}{d\kappa} \tag{10}$$

This first-order condition implicitly determines the optimal level of coercion. From (10), we can first notice that, since $c(\cdot)$ is increasing (so that $\frac{dc}{d\kappa} > 0$), $\underline{y}\frac{dq}{d\kappa} > p\frac{d\pi}{d\kappa}$ is a necessary condition for $\kappa > 0$. This is just saying that the marginal increase in the transfer due to a unit increase in coercion (through their effect of increasing the share of the reduced pie, $\underline{y}$, the Union would get in a conflict) has to be larger than the marginal decrease in the transfer due to the increase in coercion (through their effect of reducing firm's profits, and therefore the total surplus from cooperation).

Proposition 1 (Crowding-out Effect)**.** *If the bargaining power, p, of the Union increases, then the Union's optimal level of coercion κ will decrease.*

The proof of Proposition 1[64] arrives to the result by differentiating the first-order condition (10) with respect to p. I call it the crowding-out effect, as it implies that an agent has less incentives to coerce her opponent whenever she gets more bargaining power. Thus, the model suggests that whenever solving the collective action problem is costly, i.e. summoning more members to the union is costly, then the Union would not have incentives to do so if they have enough bargaining power. This is a simple result, yet it enlightens an intuition that has been around for so many years Granovetter (1978); Alesina and Rodrik (1994); Acemoglu and Robinson (2008); Hart and Moore (2008); and Passarelli and Tabellini (2017).

6.3 Comparative Statics

In this section, I explore what happens to the firm's profits, wages, and Union's utility after changes in the bargaining power, p. The results of this part rationalize the empirical findings of the effects of the reform.

Proposition 2 (Heterogeneous effects on profits)**.** *If the bargaining power of the Union, p, increases, then the Union's utility strictly increases. If, in addition, $\kappa > 0$, then the effects on the firm's profits are uncertain. Moreover, if the crowding-out effects on wages are smaller than the net cooperation surplus, then wages strictly increase.*

[64] See Appendix A.1.

Proposition 2 introduces one of the, *a priori*, most counterintuitive results of the paper: a reduction in the Employer's bargaining power might benefit her. Let me go over each of the findings. The proof[65] of Proposition 2 tells us that if $\kappa > 0$, that is, if the condition $\underline{y}\frac{dq}{d\kappa} > p\frac{d\pi}{d\kappa}$ is satisfied, and if the positive direct effects of p in wages are larger than the negative indirect effects of p (through its effects on a reduction in the level of coercion), then the transfer is strictly increasing in p. Next, using the first-order condition for coercion (equation 10) and the participation constraints, Union's utility is also strictly increasing in p. Finally, given an increase in the Union's bargaining power, the effects on profits show us the interaction of two opposing forces. On the one hand, we have the negative effects of p through a direct increase in the transfer size (first term of equation 11). On the other hand, we have the indirect positive effects of p (second term of equation 11) through a reduction in the size of the transfer and through a reduction of coercion inefficiencies, $\pi(\kappa)$ (caused by the crowding-out effect, i.e., the reduction in coercive activities after the increase in p). Depending on which of the two effects dominates, we might either find the expected negative effect of Union's bargaining power on the firm's profits (Abowd, 1989; Lee and Mas, 2012; Frandsen, 2021), or the more surprising positive effect on profits (Freeman and Medoff, 1984; Booth, 1995).

$$\frac{d\Pi}{dp} = \underbrace{-\frac{\partial w}{\partial p}}_{<0} \underbrace{-\frac{d\kappa}{dp}\left(\frac{\partial w}{\partial \kappa} + \frac{d\pi}{d\kappa}\right)}_{>0} \tag{11}$$

Comparing the results from Proposition 1 and 2 with what I present in the empirical section, we should first notice that the comparative static is analyzed for changes in p, Union's bargaining power because it is the parameter affected by the change to the labor code. Second, the causal effect of an increase in the Union's bargaining power shows us (i) a positive effect on the firm's expenses on wages and remunerations (the transfer, w, in the model), (ii) zero effect of companies' profits (Employer's utility, Π, in the model), and (iii) no increase (a negative but not statistically significant effect) in unionization rates (Union's coercion, κ, in the model) despite the increase in unions' bargaining power.

Result (iii) is consistent with Proposition 1, which implies $\frac{d\kappa}{dp} < 0$. In turn, result (i) is consistent with the findings of Proposition 2, which states that $\frac{dw}{dp} > 0$. Result (ii) can also be rationalized by Proposition 2. For example, some industries or economic activities have different types of organizational structures (e.g. firms providing technological, medical, or educational services have a more horizontal organization than firms extracting natural resources in which it is more vertical) (Grossman and Hart, 1986; Rajan and Zingales, 1998, 2001), so we expect to see more empowerment and bargaining power in workers belonging to more horizontal organizations and less of it in vertical organizations. Similarly, firms with larger market power in the goods market might also have more power in the labor market, thus workers' bargaining power might be lower in these firms than in others with less market power. This heterogeneity in the distributions of bargaining power between employers and unions, ex ante the application of the reform, might be the cause that for some of these firms we have a case in which $\frac{d\Pi}{dp} > 0$ and for others $\frac{d\Pi}{dp} < 0$ such that on

[65] See Appendix A.2.

average the effect is zero.

To be able to make a more accurate prediction regarding which of these heterogeneous (on their distribution of bargaining power) firms should have an increase or a decrease in their profits due to the reform, we need to take a look at the curvature of the profits with respect to p. Proposition 3 informs us about that.

Proposition 3 (Curvature)**.** *If the optimal level of coercion is positive $\kappa > 0$, then Union's utility is strictly convex in p. If in addition coercion is convex in p and $2\frac{d\pi}{d\kappa} > \frac{d\kappa}{dp}\left(\underline{y}\,\frac{d^2q}{d\kappa^2} - p\,\frac{d^2\pi}{d\kappa^2}\right)$, then wages are strictly convex and firm's profits are strictly concave in p.*

The proof[66] to Proposition 3 is straightforward by differentiating U, w, and Π twice with respect to p, respecitvely. The last part of the proposition says that if the technical condition along with the convexity of coercion with respect to p hold, then this guarantees that $\frac{d^2\Pi}{dp^2} < 0$. Importantly, the strict concavity of the profits not only guarantees the existence of a global maximum for some $p \in \mathbb{R}$, it also guarantees that there is a global maximum for the restricted domain $p \in [0,1]$. However, the results from Proposition 2 and 3 alone are not sufficient to prove that, in our bargaining problem, it would be in the best interest of the Employer to (sometimes) hold less bargaining power. To do that, we need a condition under which the corner solution $p = 0$ is ruled out. Proposition 4 demonstrates the conditions for the burden of power.

Proposition 4 (The Burden of Power)**.** *Given strict concavity of $\Pi(p)$, if crowding-out effects on profits are larger than the net cooperation surplus when the Union has no bargaining power, then there exists a maximum for the Employer's welfare and it does not happen when she holds all the bargaining power.*

Proposition 4 is saying that if the positive effect of Union's bargaining power, p, in the profits (through a reduction in the level of coercion) is larger than the net cooperation surplus, at least in the case in which that surplus is the smallest,[67] then the Employer would be maximizing profits at some $p > 0$. The key step of the proof[68] to this proposition is evaluating $\frac{d\Pi}{dp}$ at $p = 0$; the condition of the proposition comes from $\Pi'\big(\kappa(0)\big) > 0$, implying that the function will have values higher than $\Pi\big(\kappa(0)\big)$ in the immediate vicinity to the right of 0. This guarantees that the Employer's welfare is not maximized at $p = 0$, and in particular whenever $p \in [0,1]$.

In other words, Proposition 4 implies that there exists some margin to increase the Union's bargaining power and weakly increase the firm's profits. Thus, this conclusion allows me to rationalize the empirical finding in which Union's bargaining power increases and companies' profits are not reduced.

6.4 Optimal Distribution of Power

The idea of this subsection is to characterize what would be an *optimal* distribution of bargaining power and the conditions under which it can be implemented. Hence, this requires changing the perspective in which

[66] See Appendix A.3.

[67] The net cooperation surplus of the bargaining is given by $y - \underline{y} - \pi(\kappa)$, so it is minimized when $\pi(\kappa)$ achieves its maximum value, i.e. at $p = 0$.

[68] See Appendix A.4.

one usually analyzes a bargaining problem. That is, from one in which individuals (or an implicit arbitrator (Myerson, 1991)) try to distribute the gains from cooperation reflecting *fairly* the bargaining strength of both players, to one in which there is an implicit planner having to choose an institutional framework to induce a desired distribution of power.

In order to offer a definition of optimality in this context, first, we need to realize that the policy problem at hand is different from the classic bargaining problem in which we would just need to choose a utility vector within a particular utility possibility set, V. In this setting, we are faced with a problem in which we need to choose among several different UPS (an infinite amount of them given that at each level of κ, we have a different UPS associated with it and κ is continuous). You can see this situation represented in Figure 19 from the numeric example at the end of this section. You can see that for each distribution of bargaining power, there is a different optimal level of coercion, displacing both the disagreement point and the cooperation surplus.

Luckily, since this bargaining problem allows transfers,[69] then for any two different UPS, V and V', we always have $V \subset V'$ or $V' \subset V$.[70] Even though in my bargaining problem I allow for displacements of the disagreement point, this claim still holds because the movement of the outside options only displaces the position of the bargaining problem on $\mathbb{R}^2$, but what matters is the size of the area of each of the UPS (i.e., the cooperation surplus). Moreover, in my model, the area of each of the UPS is decreasing in the level of coercion. Therefore, for any two equilibrium levels of coercion such that $\kappa > \kappa'$, we have that the corresponding UPS, V and V', respectively, satisfy $V \subset V'$. With this information, we are now ready to think about optimality.

If $V \subset V'$, then we would be tempted to apply the typical (strong) compensation criterion,[71] that is, we would claim that V' is preferred to V because wherever we are in V it is possible to move to V' and compensate agents in a way that ensures that all of them are made (weakly) better off by the change to V'. However, if compensations are not possible, matters are not clear. For example, while a planner could choose p and, therefore, implement a particular equilibrium given the Union's decision problem, there might be additional institutional constraints not allowing the possibility of compensations. Therefore, if no player can commit to compensating the other unless both players are made better off under V', then the compensation criterion is not a viable option.

The alternative for the social planner would be to choose a particular social welfare function and choose the distribution of power that maximizes it. If the optimality criterion were just based on efficiency, then we would like to implement an allocation in which the total cooperation surplus is maximized. Therefore, in such a case, the $p \in [0,1]$ implementing that allocation, in the simple context of this model, would be $p = 1$. This would coincide with the choice made using a purely utilitarian social welfare function. However, there are many reasons why we might be skeptical of this being a *desirable* allocation.[72] First, we would be seriously overlooking any implications related to distribution. In fact, whenever $p = 1$,

[69] Implying preferences being quasilinear.
[70] Boundaries of these sets are hyperplanes (in my two-dimensional case it is just a line) determined by the unit vector, so they are parallel.
[71] For a detailed and clear discussion of the concept see Mas-Colell et al. (1995).
[72] Of course, this discussion (as most of the axiomatic bargaining theory is) is normative.

all the cooperation surplus (net of outside options) goes to the Union.[73] Alternatively, we could choose among many other social welfare functions, each of them satisfying different axioms conveying a distinct normative worth.

If we want to remain agnostic regarding which axiom is worth more than another, we should aim to focus on the characterization of a distribution of power implementing a (Nash-) bargaining solution satisfying a somewhat weaker criterion. Concretely, I propose to look for the smallest bargaining power for the Union, $\widetilde{p} \in [0,1]$, implementing a utility vector satisfying the (weak) Pareto property. This property says that for any $(\widetilde{U}, \widetilde{\Pi}) \in \widetilde{V}$ and any pair $p, p' \in [0,1]$ we have that $\widetilde{U}(p) \geq \widetilde{U}(p')$ and $\widetilde{\Pi}(p) \geq \widetilde{\Pi}(p')$.

Three clarifications have to be made. First, I referred to the Pareto property as a "weaker criterion" with respect to any other particular social welfare function solution. What I meant is that other typical welfare functions such as the purely utilitarian, Rawlsian, or CES, all of them already satisfy the Pareto property. However, they also impose additional *desirable* properties to satisfy sometimes at the cost of not satisfying others. Hence, focusing on only satisfying the Pareto property has less bite in choosing only one *ideal* distribution of bargaining power, but it allows us to characterize all the distribution of bargaining power that would be minimally agreed upon by any person regardless of other normative properties they would be willing to consider.

Second, what would correspond to $\widetilde{V}$ in my context? In the setting introduced in this section, in which I present the notion of a planner choosing an optimal p, we have that, for each $p \in [0,1]$, there is a different bargaining problem being induced,[74] and within each induced bargaining problem, the implemented allocation (the transfer w) is chosen through a Nash bargaining solution. Therefore, $\widetilde{V}$ would be determined by the locus of utility pairs obtained by the Nash bargaining procedure as p ranges from 0 to 1. In the example of Figure 19, $\widetilde{V}$ would correspond to a curve connecting all the equilibrium points.

Three, why did I mention looking for the "smallest" bargaining power for the Union, as opposed to the largest? Because we already know that the largest bargaining power $p = 1$ implements the utilitarian optimum. Hence, it has to already satisfy the Pareto property since the utilitarian solution does so. Consequently, what becomes not obvious is what is the smallest bargaining power assigned to the Union guaranteeing the satisfaction of the Pareto property. Proposition 5 presents the conditions to identify that critical value of Union's bargaining power, call it $\widetilde{p}$, which characterizes the set of distributions of bargaining power satisfying the Pareto property.

Proposition 5 (Optimal Distributions of Power)**.** *Given an optimal choice of coercion, $\kappa > 0$, and strict concavity of $\Pi(p)$,*

i. if the crowding-out effects on profits are larger than the net cooperation surplus when the Union

[73] We could reinterpret this problem as the Employer is the one able to coerce the Union (e.g. firing workers joining a strike); in such case, the purely utilitarian optimum would be giving all the bargaining power to the Employer. Intuitively, it is paradoxical to say that the whole surplus going to the Union harms redistribution considering that giving a larger share to the workers tends to be associated with more redistribution. However, my argument is strictly based on the division of this particular surplus abstracting from everything else from the real world.

[74] Again, this is because each p induces a different choice of κ by the Union, determining a new disagreement point and a new cooperation surplus.

has full bargaining power, then $\widetilde{p} = 1$ *and the set of distributions of bargaining power satisfying the Pareto property is the singleton* $\widetilde{p}$.

ii. *if the crowding-out effects on profits are smaller or equal than the net cooperation surplus when the Employer has full bargaining power, then* $\widetilde{p} = 0$ *and the set of distributions of bargaining power satisfying the Pareto property is the whole support of p.*

iii. *if the crowding-out effects on profits are larger than the net cooperation surplus when the Employer has full bargaining power, and the crowding-out effects on profits are smaller or equal than the net cooperation surplus when the Union has full bargaining power, then* $\widetilde{p} \in (0,1)$ *and the set of distributions of bargaining power satisfying the Pareto property is given by* $[\widetilde{p}, 1]$.

The proof[75] of Proposition 5 exploits the fact that $\frac{dU}{dp} > 0 \; \forall p \in [0,1]$ and analyzes the three possible cases that may arise depending on the position of the global maximum of the profits with respect to p. Whenever the p maximizing profits is equal to 1, then the first-best Union's bargaining power is given by $p^{FB} = 1$. Of course, the planner's choice in this case becomes trivial. If the p maximizing profits is equal to 0, then we have the less informative case for the planner in which any choice of $p \in [0,1]$ implies an increase of one of the agent's welfare at the cost of the other agent's welfare. In this case, equity preferences become essential for the planner to determine her ideal point, but without adding more welfare properties beyond Pareto, then this case just says that $p^{FB} \in [0,1]$. However, the empirically more appealing case is probably when the p maximizing profits is an interior point within the interval $[0,1]$; in such case, the planner is able to disregard any $p \in [0, \widetilde{p})$, and just focus on choosing some $p^{FB} \in [\widetilde{p}, 1]$. We can see an example of this in Figure 18.

The last case is practically appealing. Since it is probably impossible for a planner to exactly quantify the distribution of bargaining power induced by a particular institutional framework (e.g. if the planner creates a rule forcing the Employer to share payroll information with the Union for the collective bargaining process, how could someone exactly quantify the change in bargaining power produces by that rule), then a reasonable rule of thumb for the planner is to know whether the current distribution of bargaining power within a particular bargaining problem is lying either in $[0, \widetilde{p})$ or in $[\widetilde{p}, 1]$, and with that information have a practical notion of the institutional changes she needs to implement.

But then how can a social planner identify $\widetilde{p}$ in practice? To answer that question I now present an Example.

[75] See Appendix A.5.

6.5 Example

Consider $c(\kappa) = \frac{\kappa^2}{2}$, $\pi(\kappa) = \theta\kappa$, and $q(\kappa) = \Pr\left(\kappa \geq \varepsilon\right)$, where $\varepsilon \sim U\left[0,2\right]$. Notice then that $q(\kappa) = \frac{\kappa}{2}$. In that case, the equilibrium is given by the following equations:

$$\kappa^* = \frac{\underline{y}}{2} - \theta p \tag{12}$$

$$w^* = \left(\theta p - \frac{\underline{y}}{2}\right)^2 + p(y - \underline{y}) \tag{13}$$

$$\Pi^* = y + \left(\theta p - \frac{\underline{y}}{2}\right)\left(\theta(1-p) + \frac{\underline{y}}{2}\right) - p(y - \underline{y}) \tag{14}$$

$$U^* = \frac{\left(\theta p - \frac{\underline{y}}{2}\right)^2}{2} + p(y - \underline{y}) \tag{15}$$

Hence, by Proposition 3, if $(1-2p)\theta^2 + (1+\theta)\underline{y} - y > 0$, then Π is strictly concave in p. Then, by Proposition 5 is immediate that the p that maximizes Employer's welfare, which is the same one determining the lower bound of the set of optimal distributions of bargaining power, $\widetilde{p}$, is given by $\widetilde{p} = \frac{1}{2} + \frac{\underline{y}}{2\theta} - \frac{y-\underline{y}}{2\theta^2}$. We can see how all this fits together in Figure 18. For the plot I assume $y = 3; \underline{y} = 2; \theta = 0.5$.

Figure 18 shows us that for this particular example, we have that $\widetilde{p} = 0.5$. That is, we are in case (iii) of Proposition 5 with an interior $\widetilde{p}$, which is guaranteed because the global maximum of the profits function lies within the interval $[0,1]$. From the planner's perspective, observe how it would be inefficient to choose institutions inducing a bargaining power for the Union that is less than 0.5. Any Pareto efficient institutional design has to induce a bargaining power for the Union between 0.5 and 1.

Due to the concavity of profits, observe that movements of p closer to $\widetilde{p}$ affect profits in a smaller way than changes of p away from $\widetilde{p}$. Furthermore, the less curved the profits function is, the less sensitive profits are. Hence, it might be the case that something similar to this is what we observe in the Chilean data. For instance, if the Union's bargaining power before the reform was at a point on the left, but close, to $\widetilde{p}$, then even a significant change in bargaining power would not significantly affect firms' profits.

Figure 19 put all the pieces of the model together. We see the crowding-out effect in action: as the Union's bargaining power, p, increases, there is a reduction in the Union's coercion, κ; as κ is reduced, the disagreement point moves towards the north-west of the graph and the UPS expands to the right. Interestingly, while the model by construction does not predict conflict (the Nash bargaining solution always implements points on the frontier of the UPS), we see that for higher levels of coercion, the feasible utility pairs that sustain cooperation (the points within the triangles demarcated by the blue-toned dashed lines) are reduced. That is, the area of the light-blue triangle is smaller than the dark-blue one; hinting that cooperation would be harder to sustain. This is consistent with my empirical evidence, in which firms with higher Union's bargaining power had both a reduction in unionization rates (coercion) and conflict levels.

7 Model Calibration: Pre- and Post-Reform Bargaining

This section aims to connect the theoretical framework to the empirical analysis of the previous sections. To minimize the number of assumptions made, I do not provide a full calibration of the model. Still, I quantify –for an average treated firm– the total cooperation surplus, the net (of outside options) cooperation surplus, and the surplus share obtained by the Union and the Employer, both in the pre- and post-reform bargaining problems.

For the analysis, I use variables from Table B.3 to calculate some observed equilibrium outcomes. For the equilibrium outcomes that are not directly observed in the data, I make assumptions that allow me to infer them from complementary empirical data. For the directly observed variables in the pre- and post-reform bargaining problems, I take sample averages for the treated observations in the balanced panel at (relative-to-event) period $k = -1$ (Lag 1), which is the base category in the event study. To get a clean estimate of the value of those variables at $k = 2$ (Lead 2), I multiply their value at $k = -1$ by one plus the event study point estimate at $k = 2$.[76] Using the direct sample average at $k = 2$ would not capture the full extent of the treatment effect. Accounting for the event study point estimate creates the correct counterfactual, net of time and firm trends, and control group comparison.

Calibration Assumptions:

- **Efficient bargaining.** Both before and after the reform, the Union and the Employer engage in efficient (Nash) bargaining.
- **Union's cost function.** $c(\kappa_k) = \kappa_k^{\alpha}$, for $k \in \{-1, 2\}$ and $\alpha > 1$.
- **Conflict-reduced surplus.** Since most of the firms in the sample have not had strikes, this requires estimating a counterfactual.

$$\underline{y} = \overline{\Pi} \times \left(1 - \frac{\text{Median strike duration}}{\text{Yearly working days}}\right) \times \left(1 - \text{Median market share loss}\right)$$

In words, the contested reduced surplus during a strike, $\underline{y}$, equals the average yearly profit obtained by the firm in $k = -1$ and $k = 2$ times an estimated direct effect of a strike times a proxy of the indirect effect of the strike.[77] The direct effect of a strike is measured as one minus the ratio of days not worked due to the strike in a year. The numerator is the average over the different years of the panel of the median stoppage period of Chilean firms on strike (resulting in 10.33 days). The denominator is 365 minus the total number of weekend days and holidays in Chile (resulting in 249). The indirect effect of a strike captures the idea that during a strike customers might change to competitors which could lead to a permanent loss of market share. The estimated median market share loss (14%) is calculated as the median reduction in market shares in firms with strikes comparing the year of the strike and its market share two years before.

[76] Since profits is not a logged variable, I add the point estimate at $k = 2$ to the sample average at $k = -1$.
[77] Since $\underline{y}$ is a parameter that does not change in time, the use of $\bar{\Pi}$ is just a simplified way to get a fixed value for $\underline{y}$.

- **Measure of coercion.** An additional unit of coercion is represented by an additional unionized worker factored by its marginal value.

$$\kappa_k = \text{Unionization Rate}_k \times \overline{\#\text{ Workers}} \times \text{Union Dues}$$

To make coercion change only through the reform effect on unionization rates and not through its effect on the number of workers[78], I take the average number of workers for treated firms between Lag 1 and Lead 2. This gives an estimated number of unionized workers in the average treated firm. To quantify the marginal value of an additional unionized worker, I consider a yearly estimated measure of union dues per worker. The intuition is that, for an efficient union, a member's dues should be equivalent to the union's marginal cost of collective action, charging its last member an amount equal to her marginal value to the union.[79]

Table 5 presents the observed and inferred values for variables, parameters, and other equilibrium expressions both pre- and post-reform. These values allow me to characterize the set V and the equilibrium points. To identify $\underline{v}$ and fully describe the bargaining problems, I would need to make extra assumptions on the functional form of $q(\kappa)$ and any parameters included in it, any of such would impose a significant level of arbitrary structure. Despite that, I am able to identify $\underline{\Pi}+\underline{U}$, providing us with a set of possible disagreement points as $q(\kappa)$ ranges from 0 to 1. The dashed line connecting points B and C in Figure 20 represents this situation when both $\underline{\Pi} \geq 0$ and $\underline{U} \geq 0$.

Table 6 displays the main results of the calibration exercise. The first two rows quantify the total and net (of outside options) cooperation surplus while the last two rows indicate the surplus share obtained by an average treated firm in Chile before and after the reform.[80] According to this estimation, the reform increased unions' surplus share by 8.8%. But what interpretation can we give to the surplus share?

Notice that each agent's surplus share is different than each agent's bargaining power. Figure 20 displays a situation in which if $q(\kappa)$ is small, then point A would be consistent with a large bargaining power of the union, and vice versa. This figure then highlights how a favorable outside option can compensate for lower levels of bargaining power. In the Chilean pre-reform context of collective bargaining, the lack of unions' *de jure* power forced them to exert higher levels of coercion on employers allowing them to *de facto* improve their share of the total surplus. It is the interaction of p and $q(\kappa)$ what determines *the ability to allocate the resources as the agents prefer*, in which the total resources are the total cooperation surplus. Consequently, one way to interpret the surplus share is as a measure of the agents' materialized power that accounts for both their bargaining power and their influence through the disagreement point.

[78] There is no statistically significant change in this variable due to the reform.

[79] While in Chile each union establishes its own dues, it is common to see a monthly fee per worker of $10,000 ($ 15.89 dollars) Chilean pesos which corresponded to 3.5% of the minimum wage in Chile in 2019. Some telecommunication firms' unions charge monthly between 1 and 4 percent of the minimum wage, some mining firms' unions charge 5%, and the union of Santiago's subway charges 1% of workers' wages. This results in an estimated yearly fee of $120,000 pesos per worker ($ 190.62 dollars in 2019).

[80] Results need to be interpreted with caution since bigger firms are overrepresented in the sample.

8 Discussion

The central tenet of this paper revolves around the intricate dynamics of power distribution within organizations, specifically focusing on labor unions and firms. The paper introduces the novel concept of the "burden of power," a mechanism that not only enriches our understanding of power dynamics but also offers a counterintuitive perspective: that powerful groups may actually benefit from relinquishing some of their power. This paper's empirical and theoretical contributions provide a multifaceted lens through which we can reevaluate longstanding assumptions about power, equality, and economic efficiency.

One of the most significant empirical contributions of this paper is the utilization of a unique quasi-natural experiment based on a Chilean labor code reform. This approach addresses the methodological challenges that have long plagued research in this area, particularly issues related to endogeneity and reverse causality. The reform serves as an exogenous shift in the distribution of bargaining power between labor unions and firms, allowing robust causal inference. The findings reveal that an increase in unions' bargaining power led to a rise in remuneration for nonmanagerial workers without affecting firms' profits. Interestingly, the reform did not lead to an increase in unionization rates; in fact, the rates experienced a non-significant decrease. These empirical results serve as a cornerstone for the theoretical framework introduced in the paper, offering a real-world validation of the burden of power concept.

The paper's theoretical framework, grounded in Nash bargaining models, introduces the burden of power as a mechanism that can rationalize the empirical findings. Traditional bargaining theory has often been criticized for its abstract nature and lack of real-world applicability. This paper addresses these critiques by introducing a bargaining friction in the form of coercion, which can modify the disagreement point between bargaining parties. The model yields testable predictions about the effects of changes in union bargaining power on equilibrium outcomes like firms' profits, wages, and unionization rates. Moreover, the model characterizes efficient distributions of power and identifies threshold levels of the union's bargaining power at which the firm's profits begin to decline. A model calibration indicates a rise in the average union's surplus share from 0.39 (prereform) to 0.48 (postreform).

The findings have significant implications for policymakers and organizational leaders. The paper suggests that reallocating bargaining power can be Pareto-improving, meaning that both powerful and less powerful groups can benefit. This has far-reaching implications for labor policies, particularly in countries where labor unions have historically been weak. The paper also provides a rationale for why some reforms aimed at increasing union power do not lead to expected outcomes like increased unionization rates.

Most importantly, some of the lessons of this paper apply not only to capital and labor industrial relations between an employer and a union. The model is general enough to apply to other settings and potentially adversarial relations: an elite and citizens, bilateral relations between countries, consumer-producer relationships, cooperative endeavors between political parties or between the executive and legislative powers, cases of systemic discrimination between privileged groups and minorities, parents and their children, among others.

While this paper makes significant strides in understanding the dynamics of power distribution, several

avenues for future research remain. For instance, can we generalize the empirical findings to explore other organizational settings or countries with different labor market dynamics? Additionally, the concept of the burden of power could be explored in a dynamic Nash bargaining setting, as in Acemoglu (2003), and it can also be studied in other theoretical frameworks beyond bargaining theory.

In conclusion, by studying the political economy within firms, this paper offers a causal analysis to empirically validate the phenomenon of the burden of power. The paper challenges conventional wisdom and opens new pathways for both theoretical exploration and practical application.

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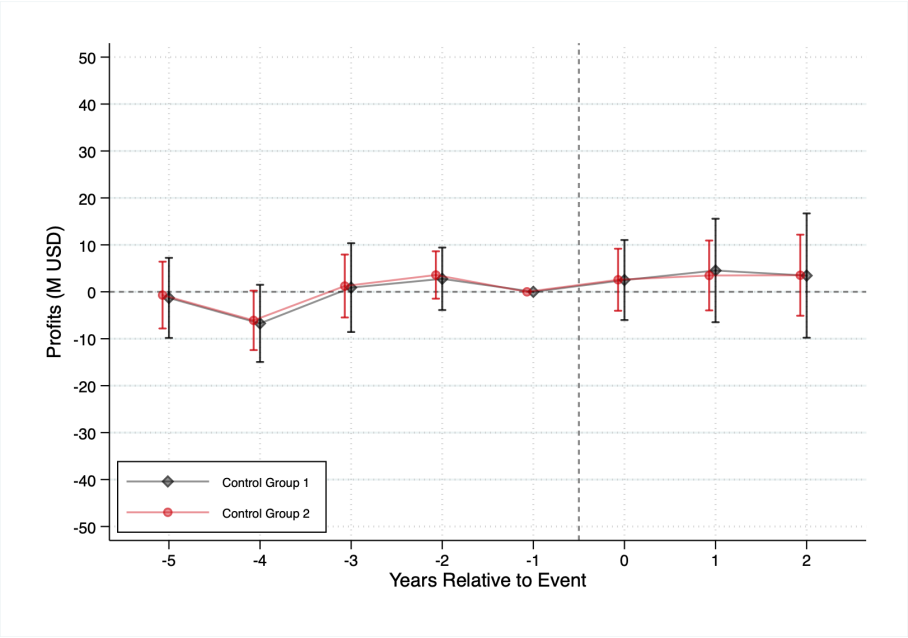
Table 1: Descriptive Statistics [*Back to text*]

Descriptive Statistics

	Mean	Std. Dev.	Bottom 10%	Median	Top 10%	Min	Max	# of Firms
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Firm Characteristics:								
Age of the firm (years)	21.36	17.81	7	20	35	1	189	457
Primary Sector [*1 if Yes*] (Raw Material Extraction)	0.09	0.28	0	0	0	0	1	457
Secondary Sector [*1 if Yes*] (Manufacturing & Construction)	0.13	0.34	0	0	1	0	1	457
Tertiary Sector [*1 if Yes*] (Service Provision)	0.78	0.42	0	1	1	0	1	457
Share of Women	0.37	0.24	0.07	0.34	0.70	0	1	457
Weak Union [*1 if Yes*]	0.33	0.47	0	0	1	0	1	256
Firm Outcomes:								
Profits (Millions USD)	16.91	70.88	-0.60	0.77	33.41	-100.07	842.18	455
Total Revenues (Millions USD)	353.69	2,252.05	1.80	22.71	522.82	0.17	44,552.00	455
Total Expenses (Millions USD)	336.77	2,213.70	1.56	22.36	473.54	0.11	44,033.25	455
Non-managerial Wage Expenses (Thous. USD)	16,578	45,974	313	4,691	36,548	0	478,875	390
Managerial Wage Expenses (Thous. USD)	1,957	5,552	15	414	4,300	0	59,372	390
Non-Managerial Work Hours/Month	142,035	316,388	4,515	56,358	278,640	0	3,207,149	392
Managerial Work Hours/Month	2,061	4,917	0	968	4,322	0	72,143	392
Non-managerial Wage/hr (USD)	8.12	7.37	2.98	6.02	15.91	1.15	105.92	391
Managerial Wage/hr (USD)	43.32	36.10	11.99	33.51	86.21	4.10	286.86	345
Operating Expenses (Thous. USD)	81,257	1,006,271	92	2,073	48,698	0	21,198,104	455
Fixed Assets (Thous. USD)	129,649	582,340	67	3,828	174,445	0	8,405,199	455
Unionization Rate	0.39	0.29	0	0.40	0.80	0	1	224

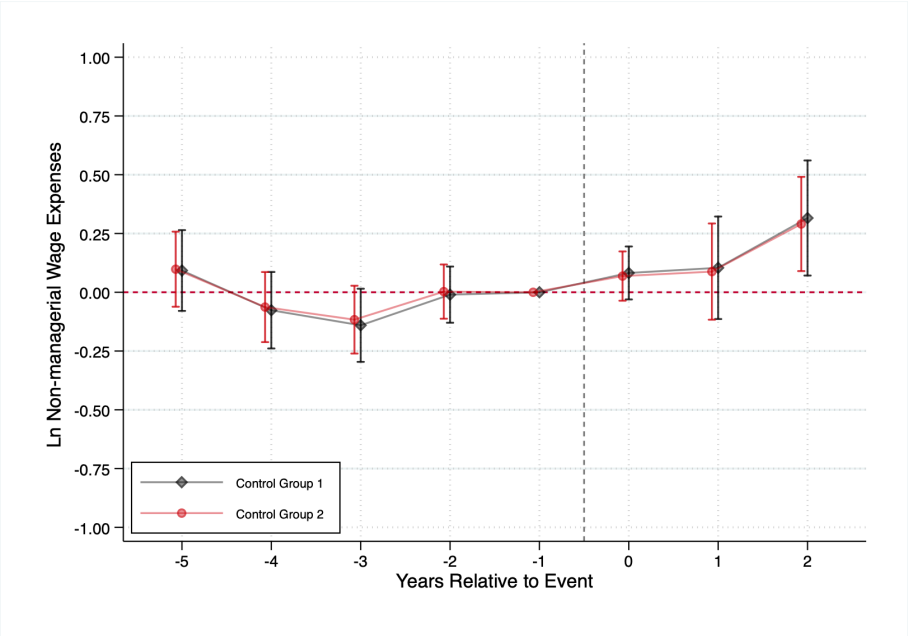
Notes: This table presents descriptive statistics for all the firms in the merged dataset that were either treated or included in control group 2 (some of these firms are not used for the balanced panels in the robustness checks section, but they are included in the unbalanced panels). Economic sectors, the share of women, and union's strength come from ENCLA; the other variables come from ELE. Variables are observed for the year 2016, except hours worked per month and wage per hour, which were observed in 2015. Regressions for "Weak Union" and "Unionization Rate" only include control group 1 (added firms from control 2 do not have unions); I measure descriptive statistics for these two variables only for treated and control-group-1 units.

Figure 1: Effects on profits [*Back to text*]



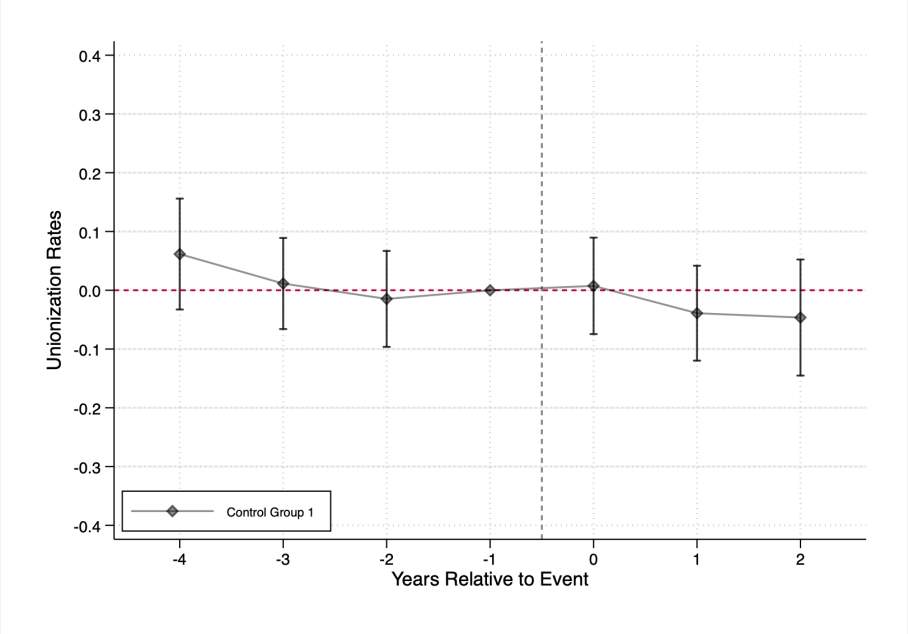
Notes: This figure presents event study evidence on the null effects of the reform on firms' profits. Logarithms are not used for this regression due to the large presence of large negative values in this variable (normalizing all observations to positive values requires adding a large number, significantly distorting the scale). The plot reports the point estimates and 90% confidence intervals (vertical lines) obtained from the dynamic two-way fixed-effects event study. Control group 1 results are presented in black (# of firms: 256, # of obs. 1,693), and control group 2 results are presented in red (# of firms: 457, # of obs. 2,959).

Figure 2: Effects on nonmanagerial remuneration expenses [*Back to text*]



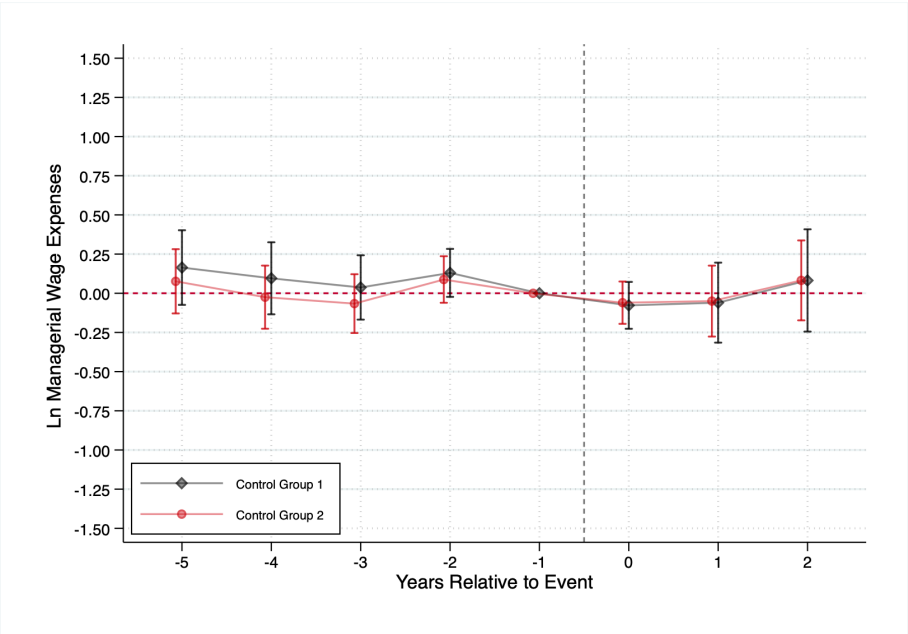
Notes: This figure presents event study evidence on the positive effects of the reform on firms' remuneration expenses for nonmanagerial workers. The plot reports the point estimates and 90% confidence intervals (vertical lines) obtained from the dynamic two-way fixed-effects event study. Control group 1 results are presented in black (Lead 0: 0.082, Lead 1: 0.104, Lead 2: 0.315; # of firms: 244, # of obs. 1,407), and control group 2 results are presented in red (Lead 0: 0.068, Lead 1: 0.087, Lead 2: 0.290 # of firms: 442, # of obs. 2,457). Results for lead 2 are also significant at 95%.

Figure 3: Effects on unionization rates (Control Group 1) [*Back to text*]



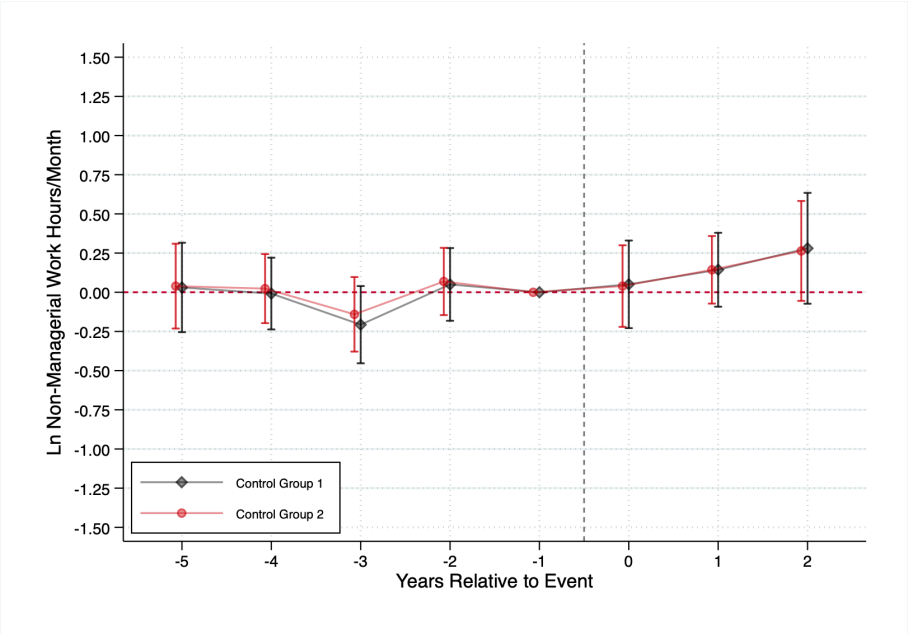
Notes: This figure presents event study evidence on the null (negative) effects of the reform on firms' unionization rates. Logarithms are not used for this regression to ease the interpretation of the coefficients since the outcome is a number between 0 and 1. Unionization rates are not observed in ELE-3, which is why I only include up to lag 4. However, it is measured in ELE-1 and ELE-2; those observations are aggregated into the omitted lag ≤ 5. The plot reports the point estimates and 90% confidence intervals (vertical lines) obtained from the dynamic two-way fixed-effects event study. Lead 1: -0.039, Lead 2: -0.046 # of firms: 244, # of obs. 813.

Figure 4: Effects on managerial remuneration expenses [*Back to text*]



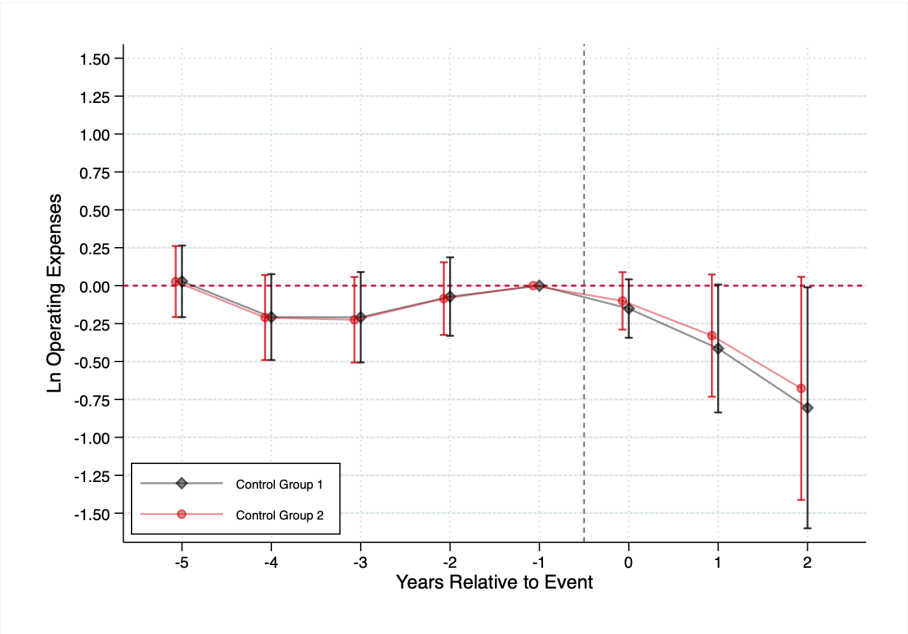
Notes: This figure presents event study evidence on the null effects of the reform on firms' remuneration expenses for managerial workers. The plot reports the point estimates and 90% confidence intervals (vertical lines) obtained from the dynamic two-way fixed-effects event study. Control group 1 results are presented in black (# of firms: 237, # of obs. 1,299), and control group 2 results are presented in red (# of firms: 419, # of obs. 2,213).

Figure 5: Effects on nonmanagerial monthly hours worked [*Back to text*]



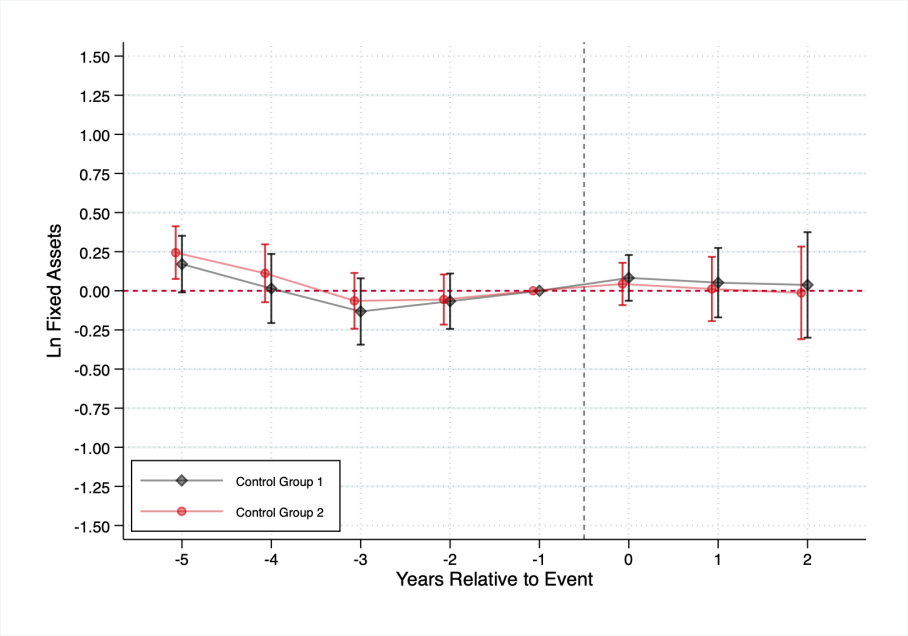
Notes: This figure presents event study evidence on the null (positive) effects of the reform on the total monthly hours worked of nonmanagerial workers. Worked hours are only observed for 2013, 2015, 2017, and 2019; reducing the observations to 830 (1,458) for CG 1 (CG 2). Inference for all the lags and leads is possible thanks to knowing the exact year of the event (e.g. inference for lead 1 is made with observations from 2019 for treated firms in 2018). The plot reports the point estimates and 90% confidence intervals (vertical lines) obtained from the dynamic two-way fixed-effects event study. Control group 1 results are presented in black (# of firms: 244, # of obs. 830), and control group 2 results are presented in red (# of firms: 442, # of obs. 1,458).

Figure 6: Effects on operating expenses [*Back to text*]



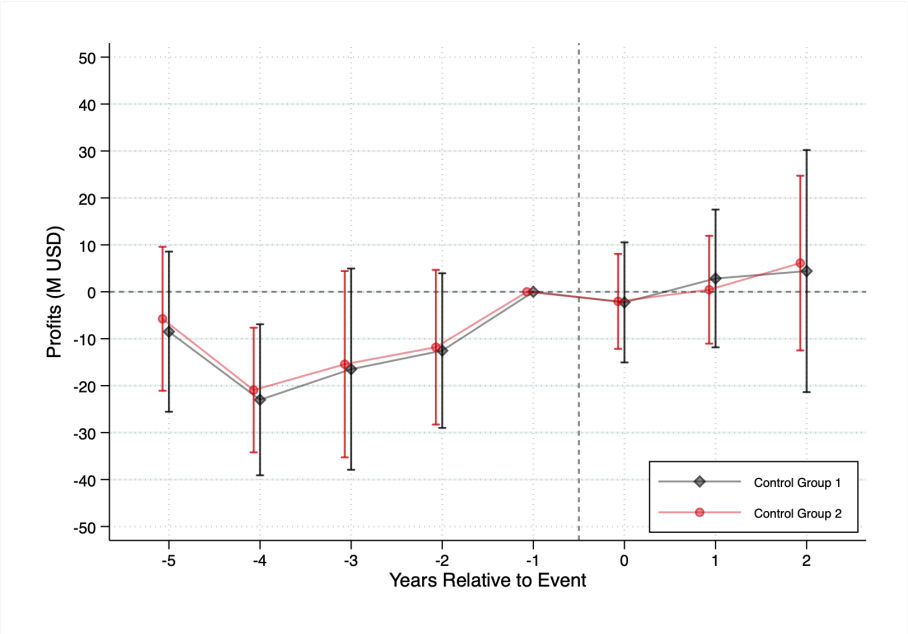
Notes: This figure presents event study evidence on the negative effects of the reform on firms' operating expenses. The plot reports the point estimates and 90% confidence intervals (vertical lines) obtained from the dynamic two-way fixed-effects event study. Control group 1 results are presented in black (# of firms: 256, # of obs. 1,693), and control group 2 results are presented in red (# of firms: 457, # of obs. 2,959).

Figure 7: Effects on fixed assets [*Back to text*]



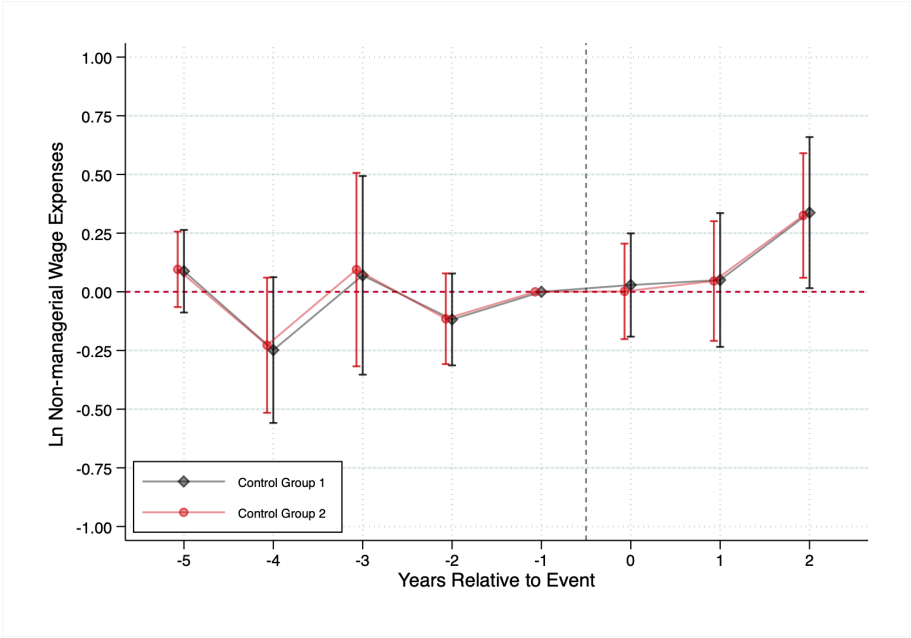
Notes: This figure presents event study evidence on the null effects of the reform on firms' fixed assets (land, buildings, machinery). The plot reports the point estimates and 90% confidence intervals (vertical lines) obtained from the dynamic two-way fixed-effects event study. Control group 1 results are presented in black (# of firms: 248, # of obs. 1,656), and control group 2 results are presented in red (# of firms: 444, # of obs. 2,852).

Figure 8: Effects on Profits [*Back to text*]



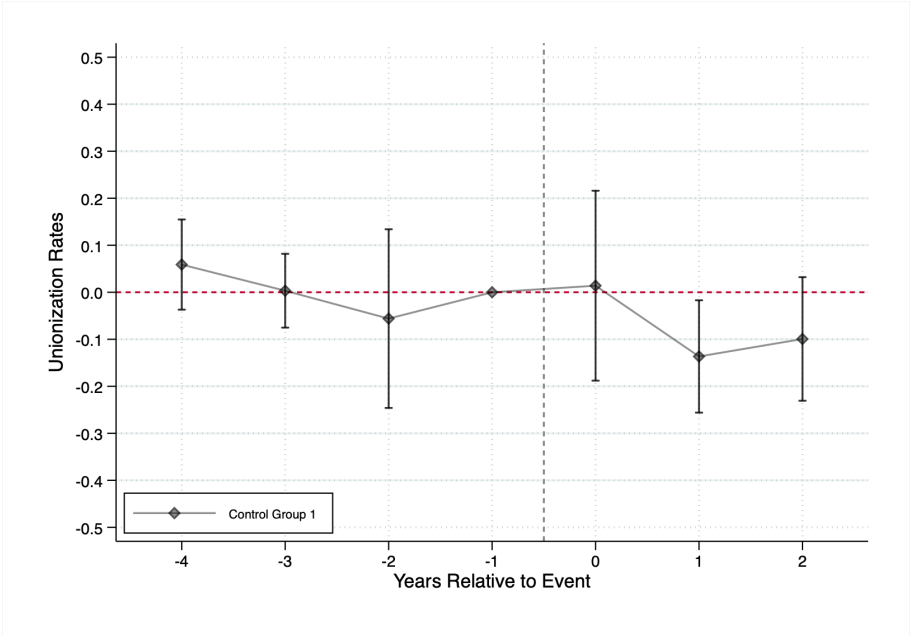
Notes: This figure presents event study evidence on the null effects of the reform on firms' profits (the negative pre-trend suggests an underestimation of the effect). Logarithms are not used for this regression due to the large presence of large negative values in this variable (normalizing all observations to positive values requires adding a large number, significantly distorting the scale). The plot reports the point estimates and 90% confidence intervals (vertical lines) obtained from the dynamic two-way fixed-effects event study. Control group 1 results are presented in black (# of firms: 256, # of obs. 1,693), and control group 2 results are presented in red (# of firms: 457, # of obs. 2,959).

Figure 9: Effects on nonmanagerial remuneration expenses [*Back to text*]



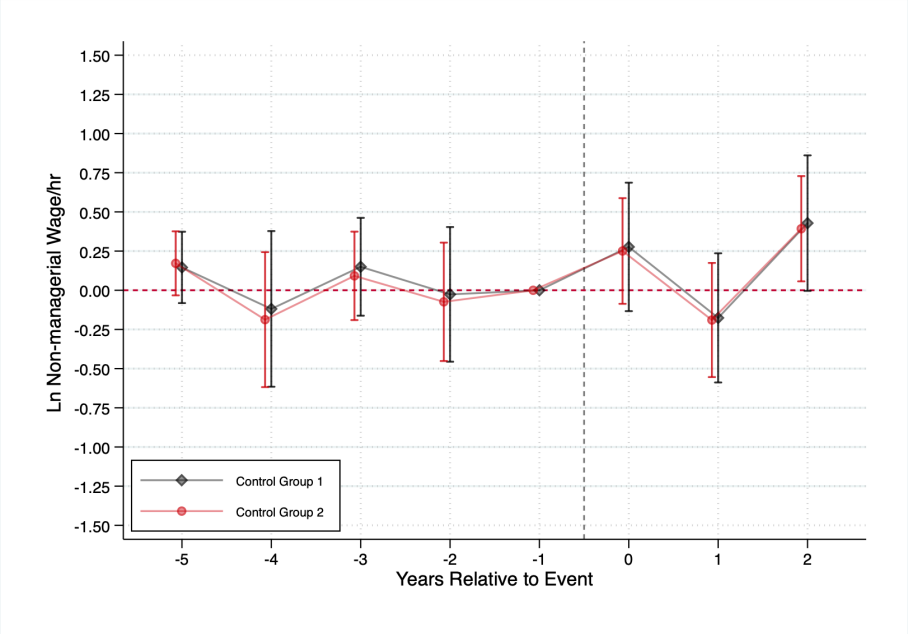
Notes: This figure presents event study evidence on the positive effects of the reform on firms' remuneration expenses for nonmanagerial workers. The plot reports the point estimates and 90% confidence intervals (vertical lines) obtained from the dynamic two-way fixed-effects event study. Control group 1 results are presented in black (Lead 0: 0.029, Lead 1: 0.050, Lead 2: 0.337; # of firms: 244, # of obs. 1,407), and control group 2 results are presented in red (Lead 0: 0.002, Lead 1: 0.046, Lead 2: 0.325 # of firms: 442, # of obs. 2,457). Results for lead 2 using CG 2 are also significant at 95%.

Figure 10: Effects on Unionization Rates [*Back to text*]



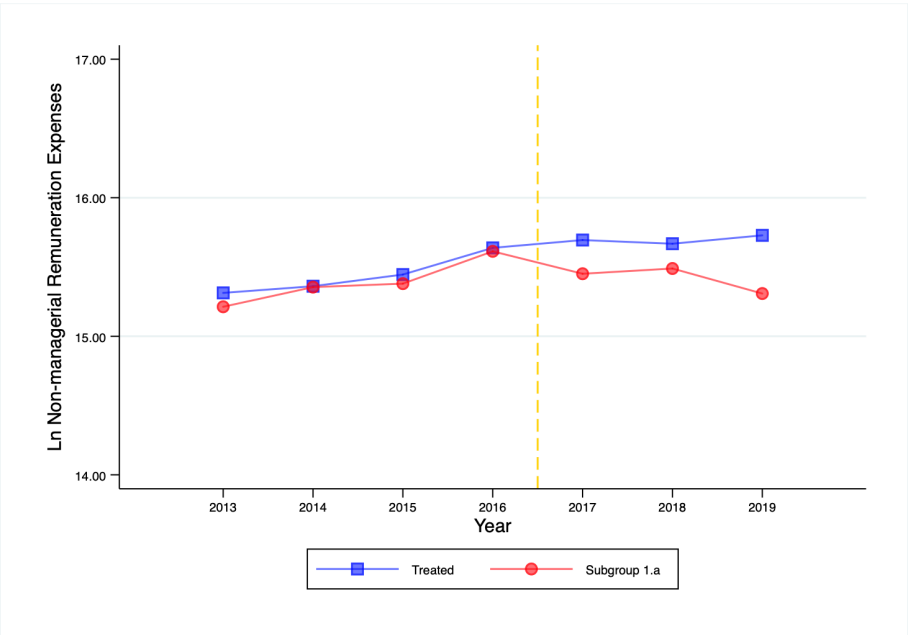
Notes: This figure presents event study evidence on the null (negative) effects of the reform on firms' unionization rates. Logarithms are not used for this regression to ease the interpretation of the coefficients since the outcome is a number between 0 and 1. Unionization rates are not observed in ELE-3, which is why I only include up to lag 4. However, it is measured in ELE-1 and ELE-2; those observations are aggregated into the omitted lag ≤ 5. The plot reports the point estimates and 90% confidence intervals (vertical lines) obtained from the dynamic two-way fixed-effects event study. Lead 1: -0.137, Lead 2: -0.099 # of firms: 244, # of obs. 813.

Figure 11: Effects on nonmanagerial wage per hour [*Back to text*]



Notes: This figure presents event study evidence on the positive effects of the reform on nonmanagerial workers' wages per hour. Worked hours are only observed for 2013, 2015, 2017, and 2019; reducing the observations to 830 (1,458) in CG 1 (CG 2). Inference for all the lags and leads is possible thanks to knowing the exact year of the event (e.g. inference for lead 1 is made with observations from 2019 for treated firms in 2018). The plot reports the point estimates and 90% confidence intervals (vertical lines) obtained from the dynamic two-way fixed-effects event study. Control group 1 results are presented in black (244, # of obs. 830), and control group 2 results are presented in red (# of firms: 442, # of obs. 1,458).

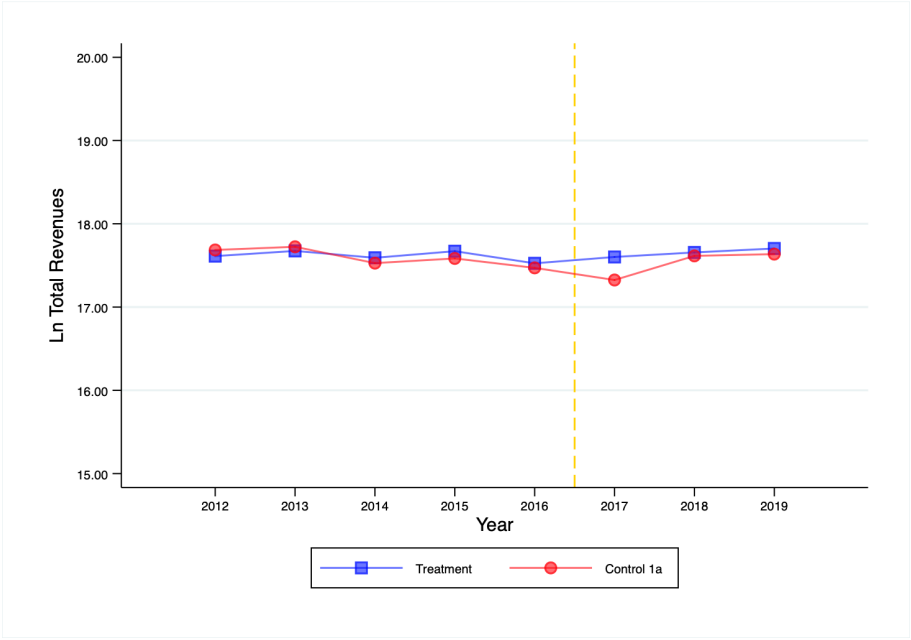
Figure 12: Evolution of nonmanagerial wage per hour [*Back to text*]



Notes: This figure presents the evolution over time of the logarithms of nonmanagerial remuneration expenses for treated firms and those never treated (at the time of the survey fieldwork) included in subgroup 1.a. The fact that both lines overlap before the policy was enacted provides evidence in favor of the quasi-random assignment of the treatment for these two groups.

Figure 13: Evolution of Revenues and Expenses [*Back to text*]

(a) Evolution of log total revenues



(b) Evolution of log total expenses

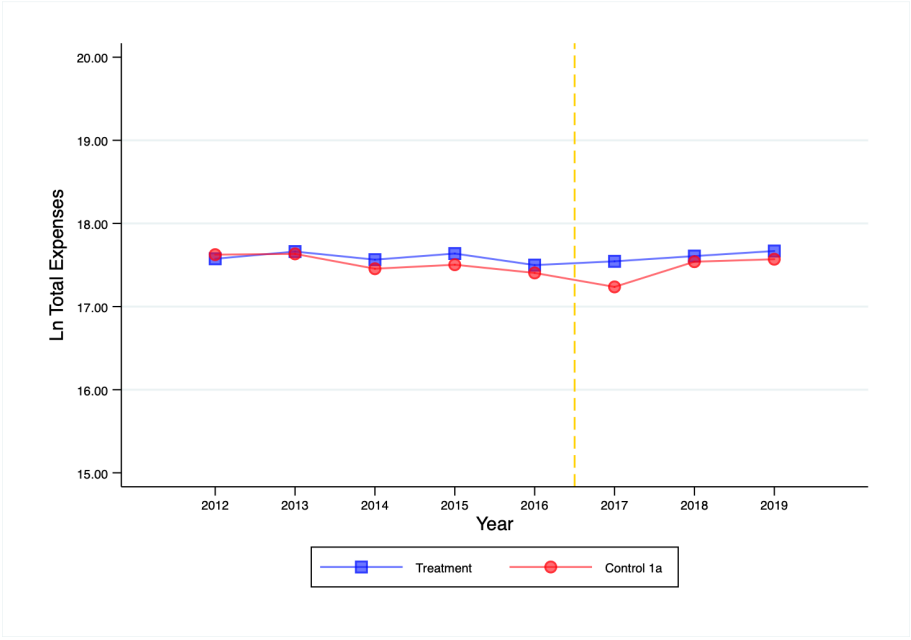
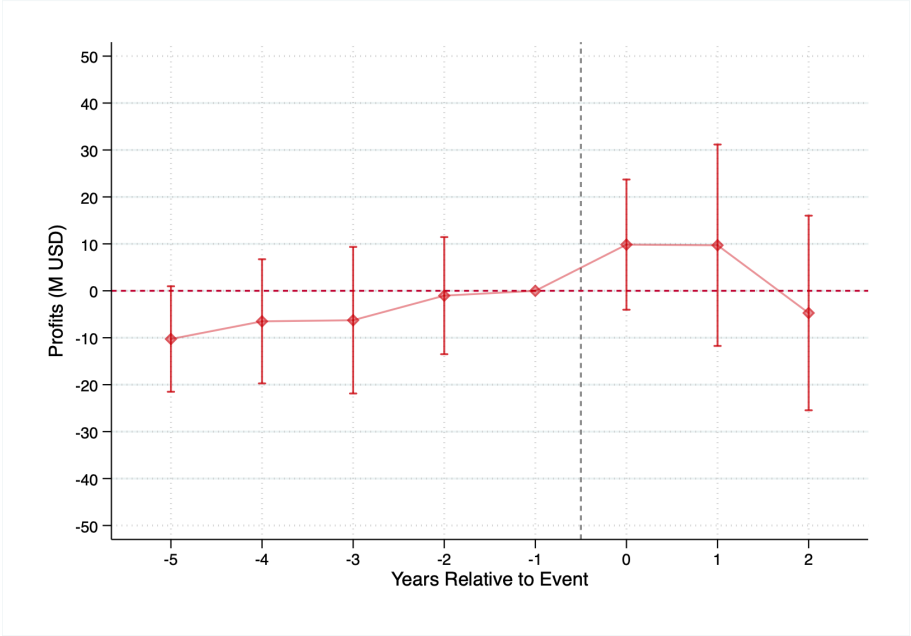


Figure 14: Effects on profits by union's bargaining power (Ctrl. Grp. 2) [*Back to text*]

(a) Regression for "Weak Union" = 1



(b) Regression for "Weak Union" = 0

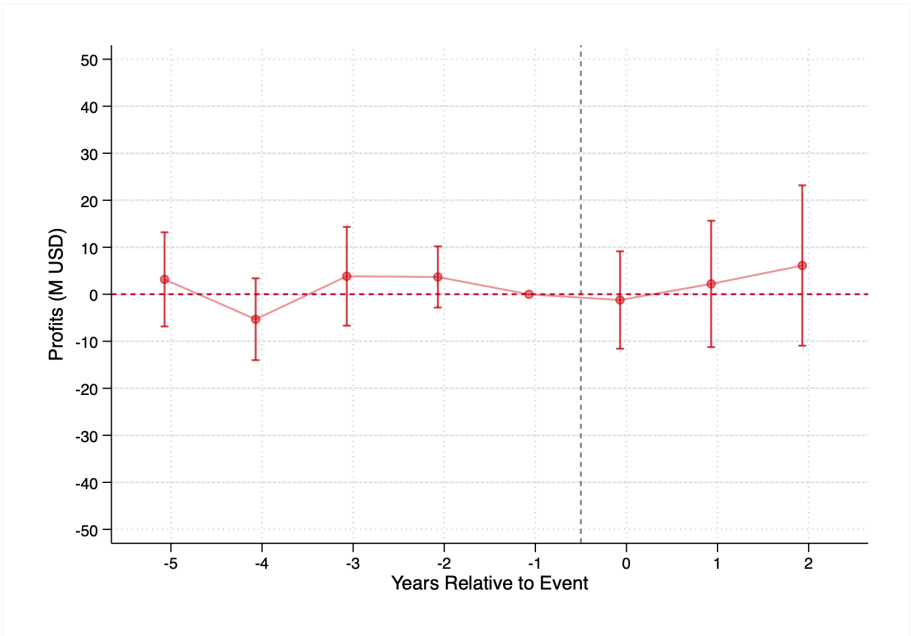
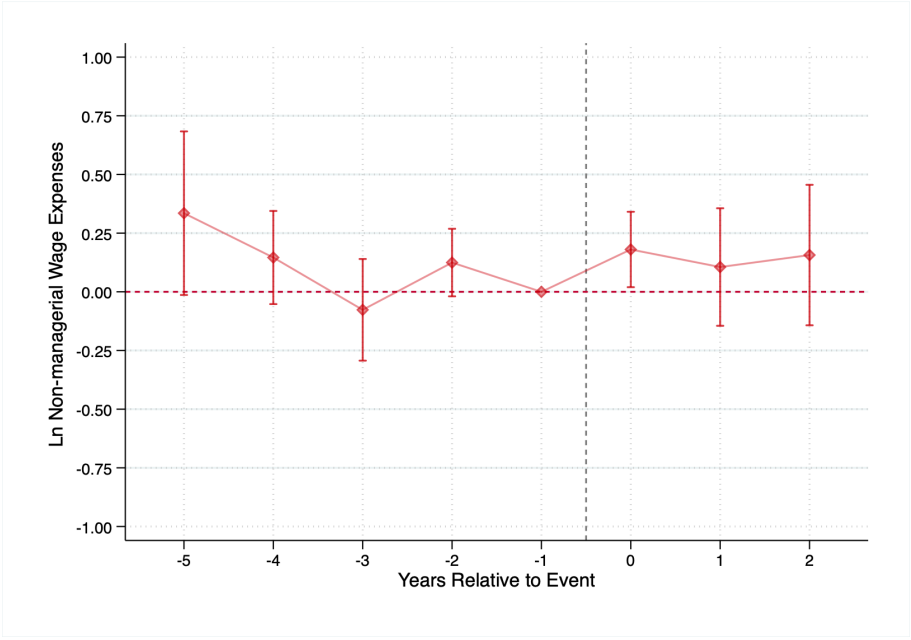


Figure 15: Effects on nonmanagerial remuneration expenses by union's bargaining power (CG 2)

[*Back to text*]

(a) Regression for "Weak Union" = 1



(b) Regression for "Weak Union" = 0

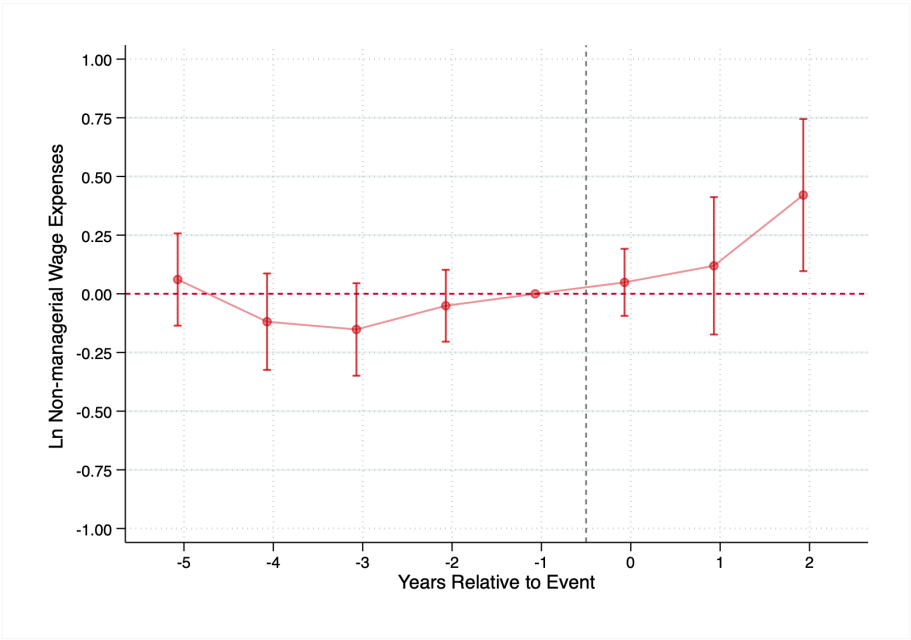
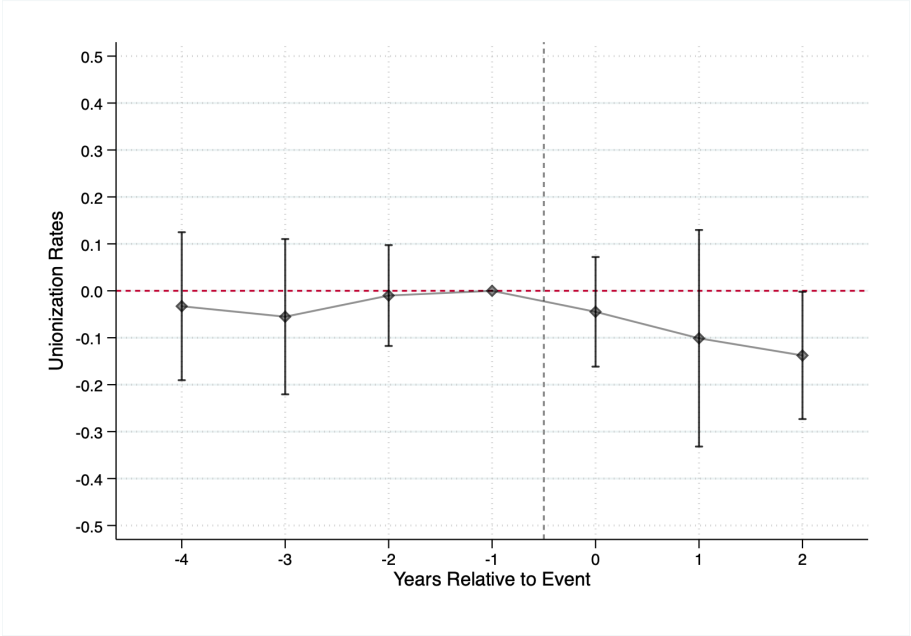


Figure 16: Effects on unionization rates by union's bargaining power [*Back to text*]

(a) Regression for "Weak Union" = 1



(b) Regression for "Weak Union" = 0

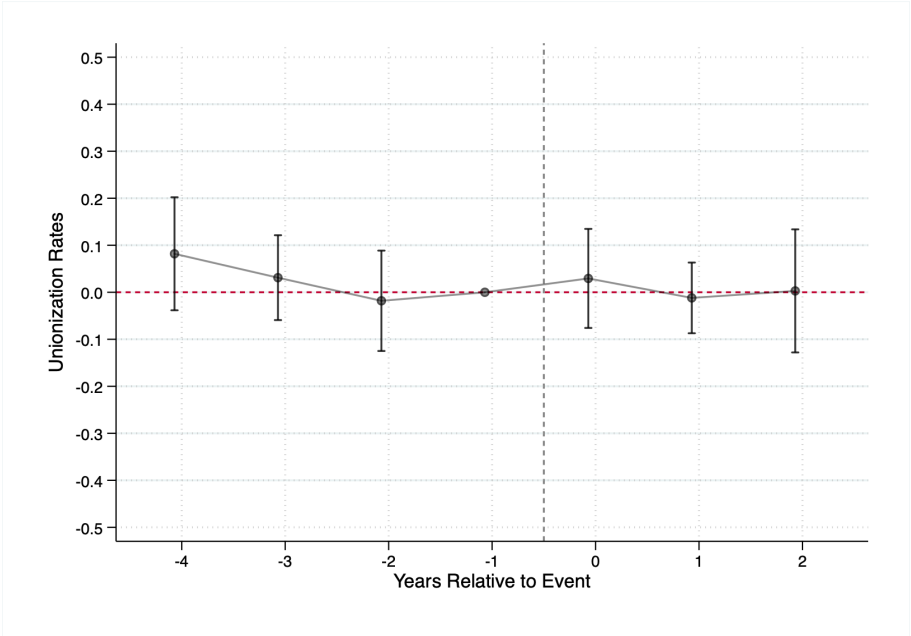
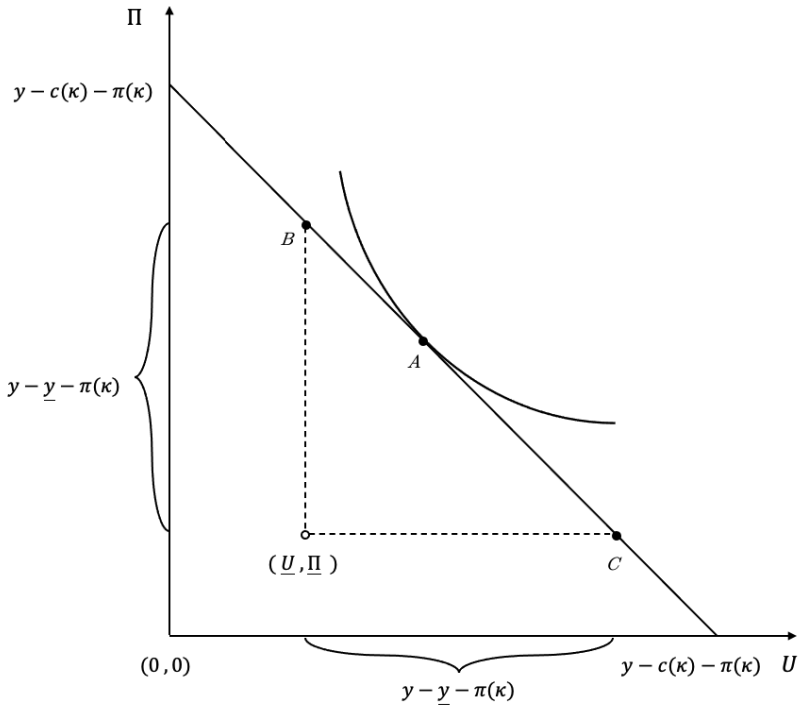
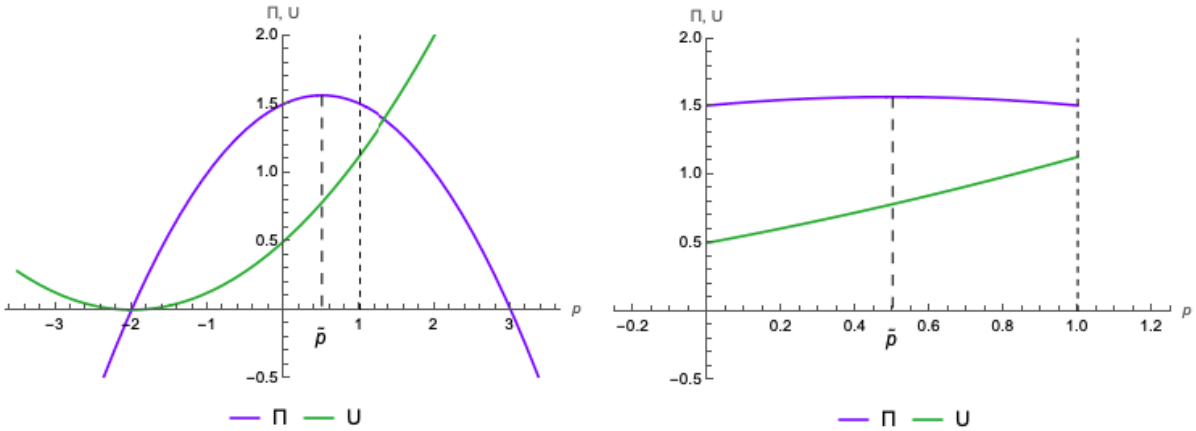


Figure 17: Nash bargaining with coercion [*Back to text*]



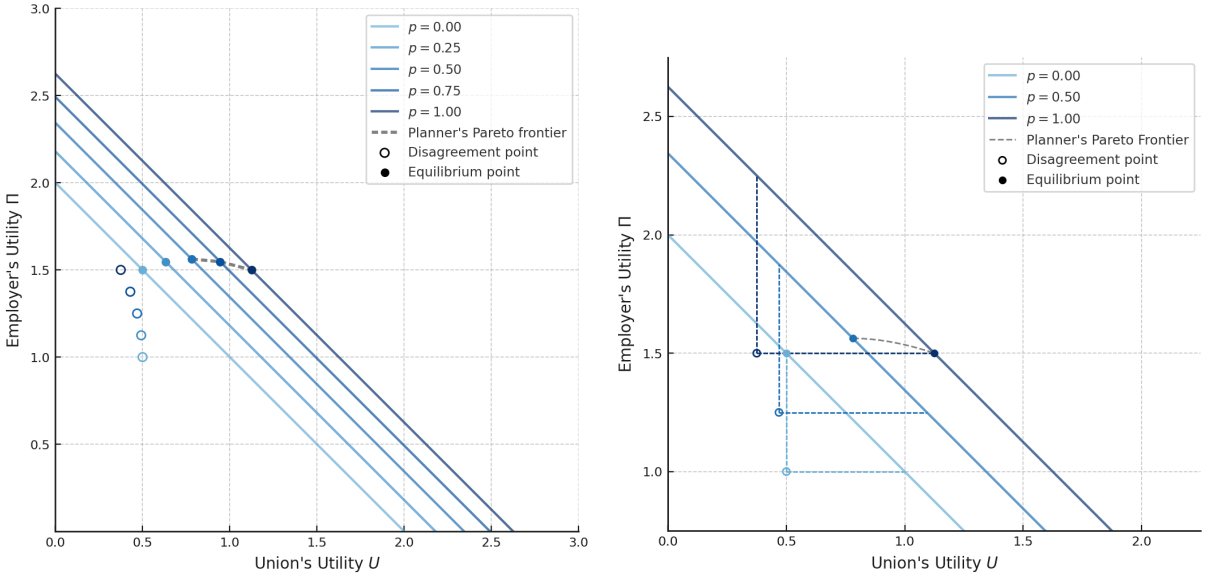
Note: Points A, B, C represent the different equilibrium points for $p \in (0,1)$, $p = 0$, and $p = 1$, respectively. The triangle formed by the dashed lines and the BC segment represents the bargaining problem described by V and $\underline{v} = (\underline{U}, \underline{\Pi})$.

Figure 18: Firm's Profits and Union's Utility [*Back to text*]



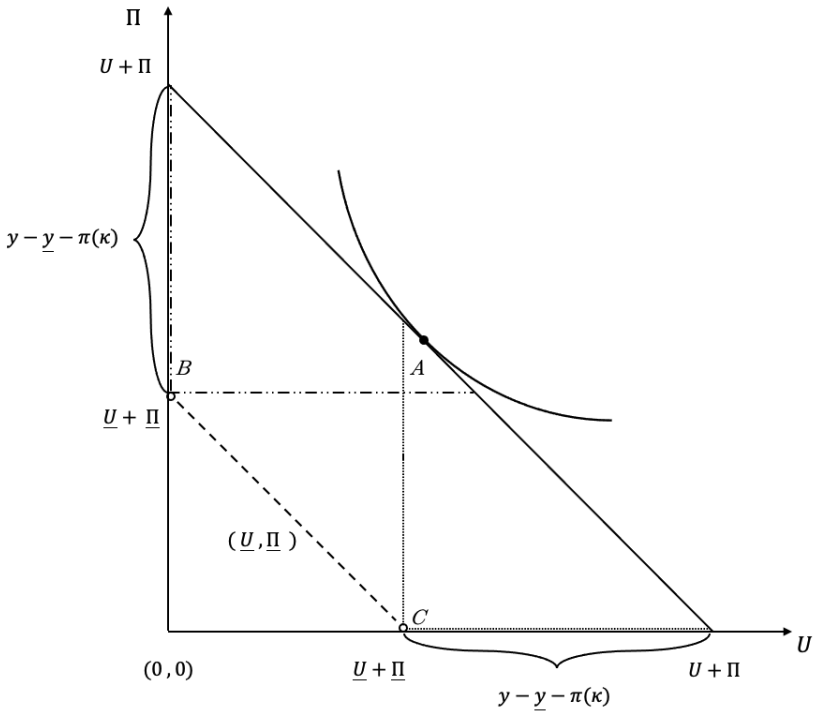
Note: The figure on the left displays profits and Union's utility curves for unrestricted support of p to show the strict concavity of the former and the strict convexity of the latter. The figure on the right zooms in for the relevant support of p.

Figure 19: Bargaining problem for different values of p [*Back to text*]



Note: The negative sloping curves are the Pareto frontier of each of the UPS, V, for each level of Union's bargaining power, p. The blank and filled points are the disagreement and equilibrium points, respectively, for each p. Equilibrium points correspond to the Nash bargaining solution to each bargaining problem. The gray-dashed line displays the locus of utility pairs obtained as p ranges from $\widetilde{p}$ to 1. The figure on the right, zooms in for selected values of p. The blue-toned dashed lines represent the different bargaining problems induced at each p. We see that as p increases, union's coercion goes down and the disagreement point favors the employer.

Figure 20: Surplus Shares, Bargaining Power, and Disagreement Point [*Back to text*]



Note: Point A displays an equilibrium point for some $p \in (0,1)$. Points B and C represent the disagreement points for $q(\kappa) = \frac{c(\kappa)}{\underline{y}}$ and $q(\kappa) = 1$, respectively, where $c(\kappa) < \underline{y}$. Between B and C there are an infinite number of bargaining problems consistent with the equilibrium at A.

Table 2: Two-sample t-test: consulting on hiring/firing [*Back to text*]

Group	Sample Size	Mean	p-value
0	354	0.113	
1	639	0.067	
Difference		0.046	0.0127

Table 3: Two-sample t-test: occurrence of conflict outside the CB [*Back to text*]

Group	Sample Size	Mean	p-value
0	123	0.829	
1	301	0.651	
Difference		0.178	0.0003

Table 4: Summary of Main Results [*Back to text*]

Variable	Group		
	Overall	Firms with Weak Unions	Firms with Strong Unions
Profits	$=$	$\uparrow$ (not significant)	$=$
Remunerations	$\uparrow$ (significant)	$=$	$\uparrow$ (significant)
Unionization Rates	$\downarrow$ (not significant)	$\downarrow$ (significant)	$=$
Operating Expenses	$\downarrow$ (significant)	$\downarrow\downarrow$ (not significant)	$\downarrow$ (not significant)

Table 5: Observed and Inferred Equilibrium Outcomes [*Back to text*]

Variable / Parameter	Pre-Reform Value ($k=-1$)	Post-Reform Value ($k=2$)	Description
Π	15,468	18,505	Direct use of Profits variable.
w	20,843	26,085	Direct use of Non-managerial Wage Expenses variable.
κ	49.4	43.7	Constructed as specified in the assumptions.
$c(\kappa)$	10,966	9,121	Constructed as specified in the assumptions, with $\alpha = 1.5$.
$\underline{y}$	14,003	14,003	Constructed as specified in the assumptions.
U	9,876	16,963	$= w - c(\kappa)$
$\underline{\Pi} + \underline{U}$	3,036	4,881	$= \underline{y} - c(\kappa)$
$y - \pi(\kappa)$	36,312	44,591	$= \Pi + w$

Note: Values are in Thousands of USD. Unionization rates (used in the construction of κ) at $k=-1$ and $k=2$ are 0.402 and 0.356, respectively. The choice of $\alpha = 1.5$ comes from the theory; $c(\kappa)$ is defined as a strictly convex function, which is a necessary condition for all the results in the Propositions. However, for $\alpha > 1.52$ we would observe $\underline{\Pi} + \underline{U} < 0$. Therefore, $\alpha = 1.5$ allows positive outside options while making $c(\kappa)$ as convex as possible.

Table 6: Calibration Main Results [*Back to text*]

Main Results	Pre-Reform Value ($k=-1$)	Post-Reform Value ($k=2$)
Total Cooperation Surplus $y-\pi(\kappa)-c(\kappa)$	25,345	35,469
Net Cooperation Surplus $y-\pi(\kappa)-\underline{y}$	22,309	30,588
Union's Surplus Share $\frac{U}{U+\Pi}$	0.390	0.478
Employer's Surplus Share $\frac{\Pi}{U+\Pi}$	0.610	0.522

Note: The first two rows are in Thousands of USD. $U+\Pi=y-\pi(\kappa)-c(\kappa)$.

Appendix Contents

A Theory Appendix: Proofs

A.1 Proof of Proposition 1

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Proof. By differentiating Equation 10 with respect to p and solving for $\frac{dt}{dp}$, we arrive to

$$\frac{d\kappa}{dp} = -\frac{\frac{d\pi}{d\kappa}}{\frac{d^2c}{d\kappa^2} + p\,\frac{d^2\pi}{d\kappa^2} - \underline{y}\,\frac{d^2q}{d\kappa^2}} \tag{16}$$

Therefore, to prove that coercion is decreasing when the bargaining power of the Union increases, it suffices to show that $\frac{d\kappa}{dp} < 0$. We can see that this is indeed the case. First, the numerator of Equation 16 is positive since $\pi(\kappa)$ is strictly increasing. In turn, the denominator is also positive since the first term is positive due to $c(\kappa)$ being strictly convex, the second term is non-negative due to $\pi(\kappa)$ being convex and $p \in [0,1]$, and the third term is also non-negative due to $q(\kappa)$ being concave and $\underline{y} \in (0, y)$. Since the whole fraction is positive, the minus sign in front of it guarantees $\frac{d\kappa}{dp} < 0$. □

A.2 Proof of Proposition 2

[*Back to text*]

Proof. First, to see that U is strictly increasing when p increases, we need to show that $\frac{dU}{dp} > 0$. Hence, differentiating U with respect to p and factoring, we get:

$$\frac{dU}{dp} = \frac{\partial w}{\partial p} + \frac{d\kappa}{dp}\left(\frac{\partial w}{\partial \kappa} - \frac{dc}{d\kappa}\right) \tag{17}$$

The first term on the right-hand side is equal to $y - \underline{y} - \pi(\kappa)$ which is greater than zero since it is the net (of outside options) cooperation surplus. The second term is equal to zero since $\frac{\partial w}{\partial \kappa} - \frac{dc}{d\kappa} = 0$ from the first-order condition of the Union with respect to κ (Equation 10). Therefore, $\frac{dU}{dp} > 0$.

Second, to see that the effect on Π is uncertain after an increase in p, we study the sign of $\frac{d\Pi}{dp}$:

$$\frac{d\Pi}{dp} = -\frac{\partial w}{\partial p} - \frac{d\kappa}{dp}\left(\frac{\partial w}{\partial \kappa} + \frac{d\pi}{d\kappa}\right) \tag{18}$$

While the first term of (18) is negative since $\frac{\partial w}{\partial p} > 0$, the second term is positive. To show the latter, we use the additional fact that for $\kappa > 0$. If that is the case, then $\frac{\partial w}{\partial \kappa} > 0$ (this follows from Equation 10). $\frac{d\pi}{d\kappa} > 0$ since $\pi(\kappa)$ is strictly increasing. Thus, the factor in parenthesis is positive. The second term becomes positive after using the result from Proposition 1 which states that $\frac{d\kappa}{dp} < 0$. Therefore, the sign of

$\frac{d\Pi}{dp}$ depends on which of these two terms is larger in magnitude.

Lastly, to see that if the crowding-out effects on wages are smaller than the net cooperation surplus, then $\frac{dw}{dp} > 0$, we look at the equation:

$$\frac{dw}{dp} = \frac{\partial w}{\partial p} + \frac{d\kappa}{dp}\left(\underline{y}\frac{dq}{d\kappa} - p\frac{d\pi}{d\kappa}\right) \tag{19}$$

From the previous discussion, the first term of (19) is positive and the second is negative (guaranteed by $\kappa > 0$). Hence, for $\frac{dw}{dp} > 0$ it has to be the case that the first term (which corresponds to the net cooperation surplus: $\frac{\partial w}{\partial p} = y - \underline{y} - \pi(\kappa)$), is larger than the second (the crowding-out effects on wages). To elaborate on the latter, $\frac{d\kappa}{dp} < 0$ is what I call the crowding-out effect. Its effect on wages comes from the decrease in wages produced by a drop in the level of coercion after the increase in the Union's bargaining power, which is captured by the factor next to the crowding-out effect. □

A.3 Proof of Proposition 3

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Proof. First, strict convexity of U is obtained when $\frac{d^2U}{dp^2} > 0$. From the proof of Proposition 2, we know that if κ is optimally chosen, then Equation 10 guarantees that $\frac{dU}{dp} = \frac{\partial w}{\partial p} = y - \underline{y} - \pi(\kappa)$. Thus, we get:

$$\frac{d^2U}{dp^2} = -\frac{d\pi}{d\kappa}\frac{d\kappa}{dp} \tag{20}$$

Given that $\pi(\kappa)$ is strictly increasing and the result from Proposition 1, the right-hand side of (20) is positive.

Second, we can differentiate Equation 19 with respect to p to get:

$$\frac{d^2w}{dp^2} = \frac{d^2\kappa}{dp^2}\left(\underline{y}\frac{dq}{d\kappa} - p\frac{d\pi}{d\kappa}\right) + \frac{d\kappa}{dp}\left(-2\frac{d\pi}{d\kappa} + \frac{d\kappa}{dp}\left(\underline{y}\frac{d^2q}{d\kappa^2} - p\frac{d^2\pi}{d\kappa^2}\right)\right) \tag{21}$$

The first term on the right-hand side of (21) is non-negative. To show that, I use the assumption of coercion being convex on p and the fact that $\kappa > 0$ (which guarantees that the factor in parenthesis is positive). The sign of the second term is positive since $\frac{d\kappa}{dp} < 0$ and the factor in the outer parenthesis is negative due to the inequality in the Proposition statement.

Third, we can differentiate Equation 18 with respect to p to get:

$$\frac{d^2\Pi}{dp^2} = -\frac{\partial^2 w}{\partial p^2} - \frac{d\pi}{d\kappa}\frac{d^2\kappa}{dp^2} - \frac{d^2\pi}{d\kappa^2}\left(\frac{d\kappa}{dp}\right)^2 \tag{22}$$

The first term on the right-hand side of (22) is negative since $\frac{\partial^2 w}{\partial p^2} > 0$. The second term is non-positive

since $\pi(\kappa)$ is strictly increasing and coercion is convex on p. The third term is non-positive since $\pi(\kappa)$ is convex and the last factor is squared. Therefore, since the right-hand side of Equation 22 is negative, then profits are strictly concave on p. □

A.4 Proof of Proposition 4

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Proof. Strict concavity of the profits over p when $p \in [0,1]$ guarantees the existence of a maximum for the Employer's welfare. To demonstrate that it does not happen when $p = 0$, we just need to show that profits are increasing at $p = 0$. This would mean that a marginal decrease in the Employer's bargaining power (thus, an increase in Union's) would generate an increment in the Employer's welfare. Hence, we just need to prove that $\frac{d\Pi}{dp}\big|_{p=0} > 0$.

$$\frac{d\Pi}{dp}\bigg|_{p=0} = \left[-\left(y - \underline{y} - \pi(\kappa)\right) - \frac{d\kappa}{dp}\left(\underline{y}\,\frac{dq}{d\kappa} + \frac{d\pi}{d\kappa}\right)\right]\bigg|_{p=0} \tag{23}$$

If the crowding-out effects on profits (the last term in the squared bracket) are larger than the net cooperation surplus $(y - \underline{y} - \pi(\kappa))$ when the Employer holds all the bargaining power (i.e. at $p = 0$), then the right-hand side of Equation 23 would be positive. Consequently, a marginal increase in p could increase profits. Therefore, the Employer's welfare is not maximized at $p = 0$. □

A.5 Proof of Proposition 5

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Proof. First of all, since U is strictly increasing in p for all $p \in [0,1]$, then the set of bargaining distributions satisfying the Pareto property, call it $\widetilde{P}$, will be given by all the distributions of power larger or equal than the distribution of power that maximizes Employer's welfare, call it $\widetilde{p}$. In such a case, then $\widetilde{P} = [\widetilde{p}, 1]$.

To prove this claim, suppose by contradiction that $\exists p \in [0, \widetilde{p})$ at which the Pareto property is satisfied. We know that $\widetilde{p} = \operatorname{argmax} \Pi(p), \forall p \in [0,1]$ (this holds because $\Pi(p)$ is strictly concave and $p \in [0,1]$, which guarantees a maximum over the support of p) and that $p = 1 = \operatorname{argmax} U(p), \forall p \in [0,1]$ (this holds since U is strictly increasing in p and $\kappa > 0$ provides strict convexity of U). Thus, if $p < \widetilde{p}$, then we could increase p and enhance both agents' welfare. Therefore, violating the Pareto property a contradiction. However, this only proves that points smaller than $\widetilde{p}$ do not satisfy the Pareto property. Now, I need to prove that every $p \in [\widetilde{p}, 1]$ satisfies it. To prove that, I can just take any arbitrary point, say $p' \in [\widetilde{p}, 1]$ and show that $\Pi(p') < \Pi(p)$ or $U(p') < U(p)$, for any $p \in [\widetilde{p}, 1]$, such that $p \neq p'$. Notice that for all $p \in [\widetilde{p}, 1]$ this is indeed the case. Suppose we take some $p \in [\widetilde{p}, p')$, then $\Pi(p') < \Pi(p)$ (due to $\Pi(p)$ being strictly concave and being maximized at). In turn, if we take some $p \in (p', 1]$, then $U(p') < U(p)$. Since p' was chosen arbitrarily, then it holds for all $p \in [\widetilde{p}, 1]$.

Now that I have proved that $\widetilde{P} = [\widetilde{p}, 1]$ characterizes the set of distributions of power satisfying the Pareto property, I proceed to identify the conditions under which $\widetilde{p}$ is in each of the corners and when it is an interior point in the support of p.

Whenever I mention that the crowding-out effects on profits are larger than the net cooperation surplus, I am just referring to the case in which the second term of Equation 18 is larger than the first one, that is, the condition under which profits are increasing in p. I proceed now to prove each of the three statements of Proposition 5.

Statement [i.]: If $\frac{d\Pi}{dp} > 0\Big|_{p=1}$ (i.e., evaluated at the point in which the Union has full bargaining power), then this means that profits are increasing at $p = 1$. Now, since profits are strictly concave, this implies that the Employer's welfare is maximized at $p = 1$. Therefore, $\widetilde{p} = 1$ and $\widetilde{P} = \{\widetilde{p}\}$.

Statement [ii.]: If $\frac{d\Pi}{dp} \leq 0\Big|_{p=0}$ (i.e., evaluated at the point in which the Employer has full bargaining power), then this means that profits are non-increasing at $p = 0$. Now, since profits are strictly concave, this implies that the Employer's welfare is maximized at $p = 0$. Therefore, $\widetilde{p} = 0$ and $\widetilde{P} = [0, 1]$.

Statement [iii.]: If $\frac{d\Pi}{dp} > 0\Big|_{p=0}$ and $\frac{d\Pi}{dp} \leq 0\Big|_{p=1}$, then this means that profits are not maximized at $p = 0$ or $p = 1$. Moreover, profits are increasing at $p = 0$ and decreasing at $p = 1$. Thus, since profits are strictly concave, this implies that the Employer's welfare is maximized at some $p \in (0, 1)$. Therefore, $\widetilde{p} \in (0, 1)$ and $\widetilde{P} = [\widetilde{p}, 1]$.

□

B Empirical Appendix: Additional Tables and Figures

Table B.1: Logistic Regression for Merged Dataset Presence (ENCLA 2019) [*Back to text*]

Logistic Regression for Merged Dataset Presence (ENCLA 2019)	
	Merged Dataset Presence [*1 if Yes*]
ENCLA 2019 Variables:	
Large Firm [*1 if Yes*]	1.318***
(> 199 Workers)	(0.110)
Central Chile [*1 if Yes*]	0.195
(Geographical location)	(0.162)
Southern Chile [*1 if Yes*]	-0.131
(Geographical location)	(0.195)
Wage Adjustment [*1 if Yes*]	0.129
(In survey year)	(0.160)
Firm Performance [*1 if Better*]	-0.118
(Perception relative to previous year)	(0.102)
Secondary Sector [*1 if Yes*]	-0.797***
(Manufacturing & Construction)	(0.216)
Tertiary Sector [*1 if Yes*]	-0.178
(Service Provision)	(0.182)
Firm with Foreign Capitals [*1 if Yes*]	0.393
	(0.341)
# of Firms	3,604
Pseudo R2	0.083

Notes: This table presents the coefficients and standard errors of a logistic regression of a dummy indicating whether the observation is present in the merged dataset or not (1 if it is). ***p<0.01,** p<0.05,*p<0.1.

Table B.2: Logistic Regression for Merged Dataset Presence (ELE - 5) [*Back to text*]

Logistic Regression for Merged Dataset Presence (ELE - 5)	
	Merged Dataset Presence [*1 if Yes*]
ELE - 5 Variables:	
Large Firm [*1 if Yes*]	2.5581***
(> 199 Workers)	(0.1036)
Age of the firm (years)	0.0131***
	(0.0033)
Total Revenues (Millions USD)	0.0007
	(0.0007)
Total Expenses (Millions USD)	-0.0007
	(0.0008)
Remuneration and Labor Cost Expenses	2.40E-06
(Thous. USD)	(1.51E-06)
Operating Expenses (Thous. USD)	-4.15E-08
	(3.00E-07)
Fixed Assets (Thous. USD)	-1.37E-07
	-9.58E-08
# of Firms	6,480
Pseudo R2	0.205

Notes: This table presents the coefficients and standard errors of a logistic regression of a dummy indicating whether the observation is present in the merged dataset or not (1 if it is). ***p<0.01,** p<0.05,*p<0.1.

Table B.3: Description for Main Variables [*Back to text*]

Data Description for Selected Variables

Variable	Description
Profits (Millions USD)	Firm's total revenues minus firm's total expenses.
Total Revenues (Thousands USD)	Firm's total income from its main activity, and other operating and non-operating revenues.
Total Expenses (Thousands USD)	Firm's total expenses (e.g. cost of sales/production, remunerations and labor costs, operating and non-operating expenses).
Non-managerial Wage Expenses (Thousands USD)	Gross payments before taxes and deductions (including bonuses, overtime, in-kind payments) plus other gross labor expenses (non-contributory remunerations, compensations, board member allowances) for all workers except excecutives and managers.
Managerial Wage Expenses (Thousands USD)	Gross payments before taxes and deductions (including bonuses, overtime, in-kind payments) plus other gross labor expenses (non-contributory remunerations, compensations, board member allowances) for excecutives and managers only.
Non-Managerial Work Hours/Month	Average number of total worked hours per month by all workers except executives and managers.
Managerial Work Hours/Month	Average number of total worked hours per month by executives and managers.
Non-managerial Wage/hr (USD)	Non-managerial Wage Expenses divided by the total number of yearly worked hours by all workers except executives and managers.
Managerial Wage/hr (USD)	Managerial Wage Expenses divided by the total number of yearly worked hours by all workers except executives and managers.
Operating Expenses [selected items] (Thousands USD)	Related to a company's day-to-day business operations or manufacturing: Overhead expenses (e.g. office supplies, insurances, maintenance/reparation), energy (fuel, electricity), depreciation expenses (reduction in value of assets: usage, wear and tear, obsolescence), administrative and financial (legal services, HR expenses, financing costs). Does not include sales/production costs.
Fixed Assets (Thousands USD)	Value of firm's land, buildings, machinery.
Unionization Rate	Ratio of the number of workers that are union members over the total workers of the firm.
Weak Union	Dummy: 1 if the outcomes of the CB were not more favorable for the workers than the firm (union leader and employer assessments) and the union did not hire consulting services for the CB.

Table B.4: Balance between Treatment and Control Groups 1 and 2 [*Back to text*]

Balance Test between Treated and Control Firms

	Avg. treated	Avg. never treated (Control Group 1)	Avg. never treated (Control Group 2)	First-Diff (Treated - CG1)	First-Diff (Treated - CG2)
	(1)	(2)	(3)	(4)	(5)
Firm Characteristics:					
Age of the firm (years)	23.17	26.87	20.50	-3.702	2.666
				(2.722)	(1.784)
Primary Sector [*1 if Yes*]	0.055	0.055	0.103	0.000	-0.048*
(Raw Material Extraction)				(0.029)	(0.028)
Secondary Sector [*1 if Yes*]	0.151	0.073	0.125	0.077*	0.025
(Manufacturing & Construction)				(0.04)	(0.034)
Tertiary Sector [*1 if Yes*]	0.795	0.873	0.772	-0.078	0.023
(Service Provision)				(0.048)	(0.042)
Share of Women	0.389	0.387	0.361	0.002	0.028
				(0.031)	(0.024)
Weak Union [*1 if Yes*]	0.247	0.436	N/A	-0.189***	N/A
				(0.058)	
Firm Outcomes:					
Profits (Millions USD)	15.10	45.92	17.76	-30.81***	-2.66
				(11.57)	(7.14)
Total Revenues (Millions USD)	300.88	982.71	378.39	-681.83*	-77.51
				(376.51)	(226.8)
Total Expenses (Millions USD)	285.78	936.79	360.62	-651.01*	-74.85
				(370.36)	(222.94)
Non-managerial Wage Expenses	19,380	36,848	15,224	-17467.64**	4,156
(Thous. USD)				(7900.27)	(4969.73)
Managerial Wage Expenses	1,896	4,791	1,986	-2895.18***	-90
(Thous. USD)				(947.64)	(600.7)
Non-Managerial Work Hours/Mont	212,034	230,741	107,701	-18,706	104,333***
				(53940.44)	(33639.93)
Managerial Work Hours/Month	2,764	3,367	1,716	-602	1,048**
				(850.03)	(526.55)
Non-managerial Wage/hr (USD)	8.02	10.21	8.17	-2.18***	-0.14
				(0.77)	(0.79)
Managerial Wage/hr (USD)	44.01	59.25	42.95	-15.24***	1.06
				(4.99)	(4.09)
Operating Expenses	33,727	282,841	103,488	-249,114	-69,761
(Thous. USD)				(170007.2)	(101299.5)
Fixed Assets (Thous. USD)	133,979	352,750	127,624	-218771.2**	6,355
				(96294.13)	(58653.07)
Unionization Rate	0.394	0.380	N/A	0.014	N/A
				(0.039)	

*Note:*This table studies the difference between treated and never-treated (at the moment of the survey) firms in terms of predetermined characteristics. Variables are measured for the year before the reform was enacted (2016). Column (1) shows the average of each variable for treated firms, and columns (2) and (3) do it for firms in control group 1 and control group 2, respectively. Columns (4) and (5) present the difference between the average in column (1) with those in (2) and (3), respectively. ***p<0.01,** p<0.05,*p<0.1.

Table B.5: Composition Test for Treated and Control Groups [*Back to text*]

Composition Test pre- and post-Treatment

	Avg. Treated (2015)	Avg. Treated (2019)	Avg. Control Group 1 (2015)	Avg. Control Group 1 (2019)	Avg. Control Group 2 (2015)	Avg. Control Group 2 (2019)
	(1)	(2)	(3)	(4)	(5)	(6)
Firm Characteristics:						
Age of the Firm	26.95	25.27	30.36	30.54	22.78	23.28
(At the Survey Fieldwork)						
Primary Sector [*1 if Yes*]	0.070	0.052	0.053	0.061	0.091	0.092
(Raw Material Extraction)						
Secondary Sector [*1 if Yes*]	0.109	0.121	0.074	0.049	0.129	0.112
(Manufacturing & Construction)						
Tertiary Sector [*1 if Yes*]	0.822	0.828	0.874	0.890	0.779	0.797
(Services & Commerce)						
Small Firm [*1 if Yes*]	0.016	0.026	0.011	0.024	0.243	0.263
(less than 50 workers)						
Medium Firm [*1 if Yes*]	0.109	0.155	0.095	0.122	0.221	0.199
(between 50 and 199 workers)						
Large Firm [*1 if Yes*]	0.876	0.819	0.895	0.854	0.536	0.538
(200 or more workers)						
# Firms	129	116	95	82	263	251

Table B.6: OLS estimates of Coercive Actions on Operating Expenses and Unionization Rates [*Back to text*]

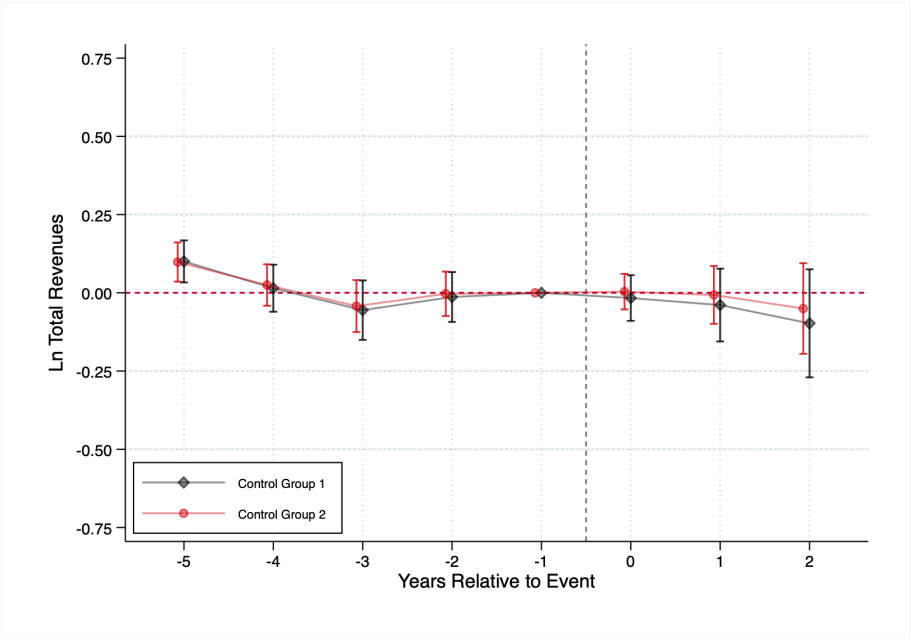
OLS estimates of Coercive Actions on Operating Expenses and Unionization Rates

	Ln Operating Expenses	Ln Operating Expenses	Unionization Rates	Unionization Rates
	(1)	(2)	(3)	(4)
Variables:				
Coercive Actions [*1 if Yes*]	0.571	0.762**	0.069*	0.071*
(e.g. slowdowns, lawsuits, sabotage)	(0.405)	(0.390)	(0.037)	(0.039)
Controls		*Yes*		*Yes*
# of Firms	216	216	279	279
R2	0.009	0.155	0.009	0.047

Note: This table presents the coefficients for a direct OLS regression (no causality implied) of log operating expenses and unionization rates on an indicator for the presence of coercive actions and control variables. The indicator takes value one if the workers of a firm performed either lawsuits, slowdowns, sabotage, complaints, "work-to-rule" campaigns, among other tactics during the year covered by the ENCLA survey. Only columns (2) and (4) include controls. The set of controls includes the age of the firm, economic sector, number of workers of the firm (to control for its size), and share of women working in the firm. ***p<0.01,** p<0.05,*p<0.1.

Figure B.1: Effects on total revenues and total expenses [*Back to text*]

(a) Effects on total revenues



(b) Effects on total expenses

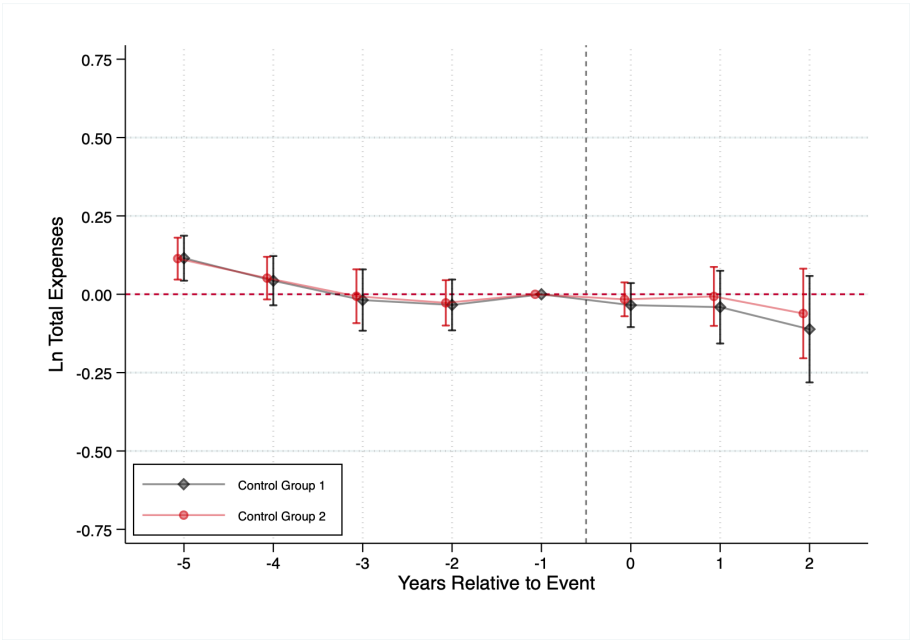


Figure B.2: Effects on profits (balanced panel) [*Back to text*]

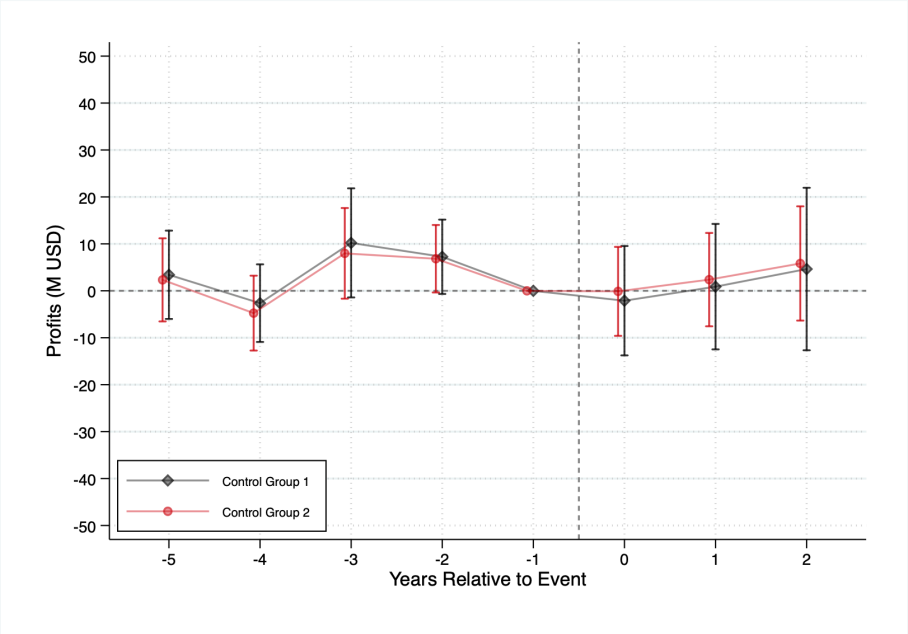


Figure B.3: Effects on nonmanagerial remuneration expenses (balanced panel) [*Back to text*]

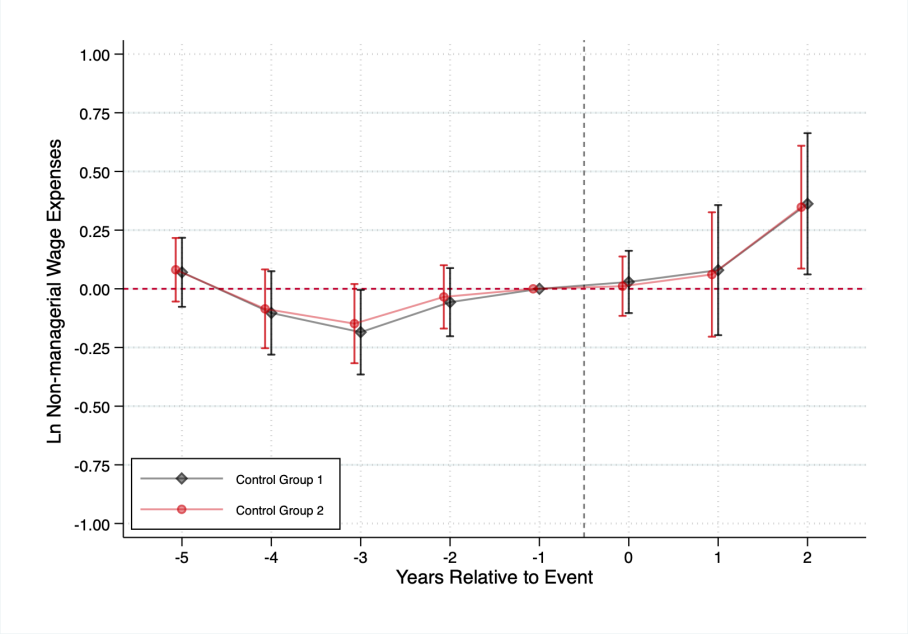


Figure B.4: Effect on unionization rates (balanced panel) [*Back to text*]

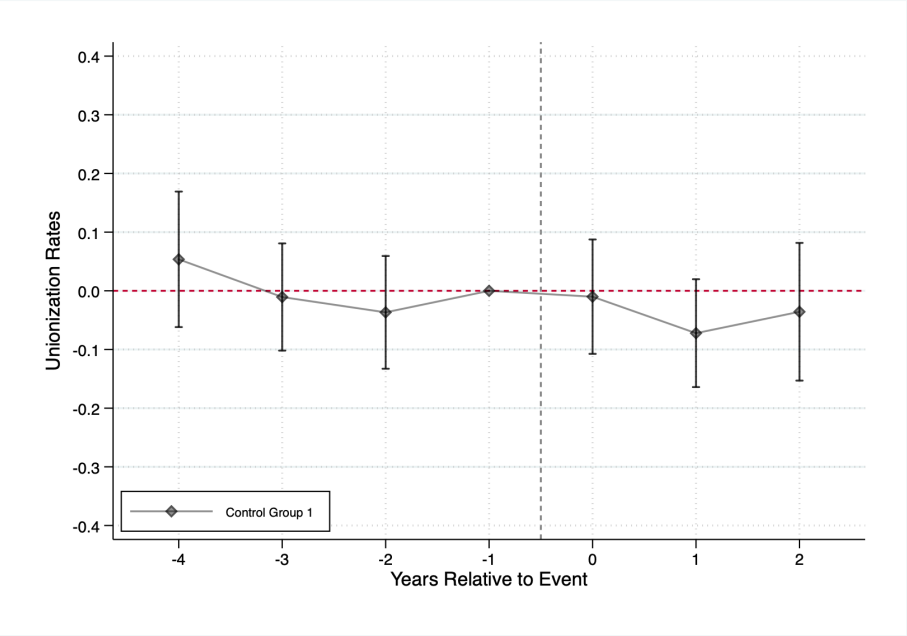
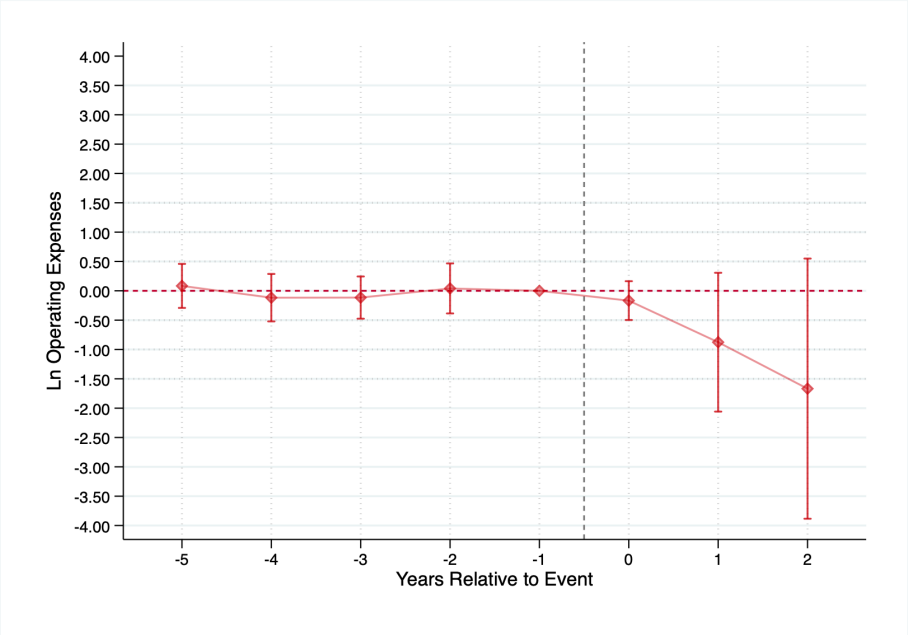
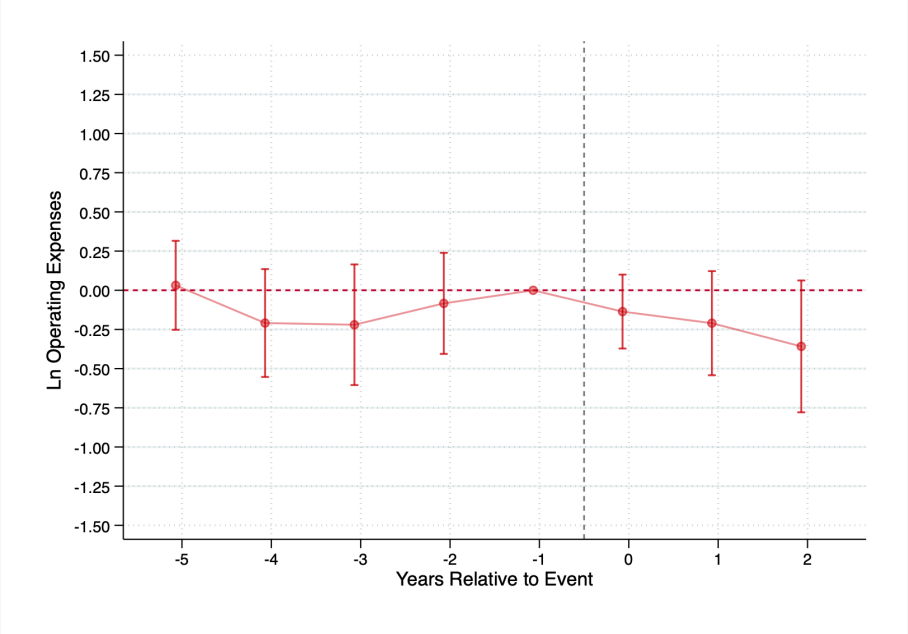


Figure B.5: Effect on operating expenses by union's bargaining power [*Back to text*]



(a) Regression for "Weak Union" = 1

Note: Standard errors are large since the regression is run with 84 firms (542 observations) only.



(b) Regression for "Weak Union" = 0

Table B.7: Description for Main Variables [*Back to text*]

Data Source	**Key Information or Metrics**
Surveys merged to administrative records from Department of Social Security	
Workers' social security contributions (pensions, health insurance)	In 2018 by firm
SSC as % of workers' wages	10%
Firm-Level Comparison	
Correlation between SSC and firms' total expenses in remunerations and labor costs in 2018	0.941
Average ratio between SSC and firms' remunerations expenses	10.12%