Resilience in Collective Bargaining*

Carlos F. Avenancio-León   Alessio Piccolo   Roberto Pinto

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A central finding of the theoretical literature on bargaining is that parties' attitudes towards delay influence bargaining outcomes. However, the ability to endure delays, resilience, is often private information and hard to measure in most real-world contexts. In the context of collective bargaining, we show firms actively attempt to become *financially* resilient in anticipation of labor negotiations. Firms adjust their financial resilience to respond to the passage of right-to-work laws (RWLs). Unions' financial structure also responds to RWLs. Our findings suggest resilience is key to understanding the process through which collective bargaining determines wages.

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"The length of the walkout may hinge on the answers to two crucial questions: How long can the United Auto Workers afford to stay out? And how long can General Motors endure a strike?"

'In GM strike, both sides see defining moment,' *The New York Times*, September 2007

1 Introduction

A central finding of the theoretical literature on bargaining is that parties' attitudes towards delay influence bargaining outcomes: parties for whom haggling is less costly (i.e., more resilient) are able to refuse unfavorable offers and, therefore, are better able to extract more favorable concessions during negotiations (Rubinstein 1982; Rubinstein and Wolinsky 1985; Abreu and Gul 2000). Resilience in negotiations, however, is often private information and consequently hard to measure in most real-world contexts. It is thus unsurprising that there is little empirical evidence on the connection between resilience and negotiations and, specifically, evidence on whether, in practice, parties do actively try to strengthen their resilience to negotiations.

To make progress on this question, we revisit collective bargaining, a classic bargaining setting by antonomasia. Labor union support is at its highest point since the 1960s[1] while strike activity has been near its 30-year high.[2] And labor costs are meaningful for firms and the economy: the labor share of GDP is around 50%; for publicly-traded firms, labor costs represent around 60% of expenses (Donangelo, Gourio, Kehrig, and Palacios 2019). Prior work has documented that unionization is associated with higher wages (e.g., Blanchflower and Bryson 2003; Card, Lemieux, and Riddell 2003) and lower wage inequality (Fortin and Lemieux 1997; Card, Lemieux, and Riddell 2004). Yet, the effect on wages may understate the total effects of collective bargaining as firms and unions attempt to increase resilience to help them improve their position during negotiations. Firms' anticipatory measures in particular can then affect workers indirectly, for example, through changes in unemployment risk.[3] Echoing Freeman and Medoff (1984), it seems

[1]Gallup (2022); `https://news.gallup.com/poll/398303/approval-labor-unions-highest-point-1965.aspx`

[2]'A Summer of Strikes,' *New York Times*, September 2023. See also, 'Auto Strike Looms, Threatening to Shut Detroit's Big 3,' *New York Times*, September 2023.

[3]Giroud and Mueller (2017) document that local consumer demand shocks during the financial crisis led to sharper declines in employment for highly levered firms. Benmelech, Frydman, and Papanikolaou (2019) showed that, during

that assessing the collective bargaining process itself is critical for our understanding of "under what conditions" and "with what effects to the economy" firms and unions determine wages.[4]

In this article, we theoretically and empirically evaluate firms' attempts to gain resilience and unions' financial response in the context of collective bargaining. We identify financial resilience as the key lever firms target in anticipation of labor negotiations, and union fee increases as the unions' main channel of response. Financial resilience is key to firms because financial obligations make firms more financially vulnerable during strikes (DiNardo and Hallock 2002; Becker and Olson 1986; Figure 1). Firm financial resilience can take on many forms, including changes in the debt structure, and accumulation of inventory or cash. A key finding of this paper is that financial resilience operates mostly through extending the term to maturity. For unions, we identify changes in total fees and fees per member as the key margin of adjustment to changes in the collective bargaining environment, with total fees decreasing for unions in the bottom half of size distribution but significantly increasing for the largest ones.

To illustrate the relationship between resilience and bargaining in our setting, we incorporate financial default into a traditional model of non-cooperative bargaining (Rubinstein 1982; Binmore 1987).[5] The model describes how the possibility of default can act as a double-edged sword in negotiations: on the one hand, committing resources to prevent default (e.g., repayment of debt (Bronars and Deere 1991)) helps firms push surplus off the bargaining table; on the other hand, being vulnerable to default during a strike reduces their ability to push back on the workers' demands over the surplus left on the table. We then show this relationship empirically by showing

the Great Depression, greater need to refinance maturing bonds was linked to larger reductions in a firm's workforce.

[4]"Everyone "knows" that unions raise wages. The questions are how much, under what conditions, and with what effects on the overall performance of the economy" (Freeman and Medoff 1984).

[5]The role of resilience is often observed anecdotally in collective bargaining events. For instance, during General Motors (GM) 2019 workers' strike, financial analysts and rating companies worried about the impact of a prolonged strike on the firm's ability to fulfill its obligations, as GM entered the talks with a large outstanding debt (i.e., high leverage) with a significant portion due just months later (i.e., short debt maturity). Moody's, for example, stated that GM's rating could topple into junk bond status if the strike lasted more than a week or two. Shortly thereafter, the strike ended with the company urging the union to "engage in 'around-the-clock' bargaining to reach a deal." (See 'GM strike, Day 2: Nearly 50,000 workers off the job in 19 states,' *CNN Business*, September 2019; 'GM urges UAW to engage in 'around-the-clock' bargaining to reach a deal, potentially end strike,' *CNBC*, October 2019.) Other salient collective bargaining events have shown similar narratives (e.g., 'GM 2007 strike,' *New York Times*, 2007).

firms aim to improve resilience following changes in the collective bargaining environment: the passage of right-to-work laws (RWLs). Our findings showcase financial resilience as an important margin of response to changes in labor regulation, which has important implications for understanding the collective bargaining process as well as exposure to unemployment risk (Giroud and Mueller 2017; Benmelech, Frydman, and Papanikolaou 2019).

Our theoretical model features workers and shareholders bargaining over the partition of a firm's surplus. Workers halt production until they secure an agreement, so the longer it takes to finalize a deal, the less revenues the firm generates. A debt obligation poses a limit to the length of negotiations: if production is delayed for too long, the firm cannot meet its debt obligation and goes bankrupt. We refer to this limit as the firm's *resilience to negotiations*. Workers discount future payments more than shareholders, so that they are (all else being equal) relatively more eager to reach an agreement. Shareholders can then use the threat of long negotiations to hold back workers' wage demands in equilibrium. Since this threat is only credible when long negotiations are feasible, workers obtain lower wages when the firm is more resilient to negotiations.

We model two dimensions of the firm's debt structure: debt maturity and leverage. Resilience increases with debt maturity (the firm has more time to pay its debt as maturity increases),[6] and it decreases with leverage (a more levered firm can afford fewer losses from strikes). By increasing resilience, longer maturity unambiguously reduces equilibrium wages. Leverage has two contrasting effects: on the one hand, it reduces the surplus available for negotiations (say x), which, all else equal, decreases wages.[7] This first effect captures the idea of "strategic leverage", which also arises in static bargaining models (e.g., Bronars and Deere 1991). On the other hand, workers receive a larger fraction of x when leverage increases, as the firm becomes less resilient. This second effect uncovers a strategic cost for firms of using leverage as a bargaining tool, which

[6]Longer debt maturity also reduces the frequency of refinancing, since the firm has to roll over on its debt less frequently when maturity is longer (He and Xiong 2012). Less frequent refinancing reduces the likelihood of having to raise capital in the middle or the aftermath of negotiations.

[7]That wage bargaining does take place within firms, and that financial distress plays a role in negotiations is supported by previous work. Hall and Krueger (2012) found evidence supporting bargaining for wages inside firms. Using a detailed dataset on wages in the airline industry, Benmelech, Bergman, and Enriquez (2012) show that firms in financial distress obtain more wage concessions.

derives from its impact on the negotiation dynamics. While building resilience to strikes, firms also gain resilience to other potential cash flow shocks. Thus, bargaining with strong labor can make firms *safer* in our model, with implications for our understanding of unemployment risk.

Following the insights of our theoretical model, our strategy is to empirically measure the relationship between worker bargaining power and financial resilience. We do so in three steps. First, we evaluate the firm's financial resilience response to the adoption of RWLs. We interpret these changes in financial resilience as the firms' response to changes in the collective bargaining environment, and provide empirical support to the mechanism formalized in the model. Second, we evaluate unions' financial response to the adoption of RWLs. Lastly, we show that other potential mechanisms that may connect RWLs and financial resilience fail to have empirical support in the data.

First, we evaluate firms' financial resilience responses in anticipation of future labor negotiations. We follow the common approach in the literature (Matsa 2010; Fortin, Lemieux, and Lloyd 2023) and examine the effects of an exogenous decrease in workers' bargaining power (α) using the introduction of state RWLs. We show that firms unambiguously reduce their debt maturity after the passage of RWLs (decrease in α). Importantly, the reduction in debt maturity is more pronounced for (a) firms in highly unionized industries and unionized firms themselves, and (b) firms for which strikes are more costly, as they are less able to access additional borrowing or liquidate inventory during or following a strike. This set of results strengthens the interpretation of collective bargaining as the trigger catalizing financial resilience following RWLs.

Second, we evaluate unions' financial resilience response following hostile legislation. Using data on union financials from the Office of Labor-Management Standards (OLMS) of the U.S. Department of Labor, we evaluate unions' margins of response following the passage of RWLs. We find that unions keep cash constant despite, on average, experiencing a drop in membership and total fees. Instead, large unions increase their fees per member, which leads them to raise higher total fees than prior to the passage of RWLs; meanwhile, smaller unions increase leverage. This suggests that larger unions are better able to retain support following the passage of RWLs and thus mitigate the legislation's impact.

Third, we evaluate other potential mechanisms that may connect RWLs to financial resilience. We do not find empirical support for changes in credit conditions; among other tests, we show that there is no significant change in debt pricing around the passage of RWLs, which supports the view that changes in debt structure are directly taken in response to labor negotiations rather than being indirectly mediated by credit markets' response to negotiations. We also fail to find supporting evidence for operating flexibility materializing as a mechanism.

Contributions. We make three main contributions to the literature. First, we provide, to the best of our knowledge, the first study of financial resilience of firms and unions during collective bargaining and provide a theoretical framework that incorporates financial resilience into the wage-setting process. While the relationship between unions and wages has been long-studied (Freeman and Medoff 1984; Card, Lemieux, and Riddell 2003; Fortin and Lemieux 1997; Card, Lemieux, and Riddell 2004), the conditions under which collective bargaining leads to higher wages is less understood. Because financial resilience is specific to each firm and union, understanding its role in bargaining also offers an alternative mechanism through which firm-specific heterogeneity spills over to wages (Abowd, Kramarz, and Margolis 1999; Card, Cardoso, Heining, and Kline 2018; Bonhomme, Holzheu, Lamadon, Manresa, Mogstad, and Setzler 2023). Other work has shown that financial frictions affect wages, but not directly through the collective bargaining process (Michelacci and Quadrini 2005; Michaels, Page, and Whited 2019; Schoefer 2022).

Second, we contribute to a growing literature on the effects of nonfinancial stakeholders on firms' decision-making (e.g., Matsa 2010; Berk, Stanton, and Zechner 2010; Agrawal and Matsa 2013; Simintzi, Vig, and Volpin 2015; Brown and Matsa 2016; Serfling 2016; Ellul and Pagano 2019; Chava, Danis, and Hsu 2020; Graham, Kim, Li, and Qiu 2023). From a theoretical angle, our contribution is to offer a general theory of the link between financial decisions and labor negotiations, by blending the dynamics inherent to noncooperative bargaining (Rubinstein 1982; Binmore 1987) against the intuition of strategic leverage that arises in Nash-Bargaining frameworks (Bronars and Deere 1991; Perotti and Spier 1993; Matsa 2010). We show that these are sometimes at odds: In our model, financial obligations affect both the surplus available to negotiate *and* how this surplus is allocated across parties. Accounting for the latter effect, we uncover a tension between the traditional idea of strategic leverage, where firms increase debt strategically to obtain concessions during negotiations, and that of financial resilience, where firms shape their financial obligations to make strikes less costly and, thus, limit workers' ability to obtain wage increases.

Our model harmonizes this tension and offers comparative statics that can then be used to shed light on the empirical relationship between labor and financial decisions. We document how this tension shapes firms' financing decisions in the data, by showing that firms tend to borrow at longer maturities when dealing with more powerful workers. Importantly, we also shed light into the *union's* efforts to remain financially resilient, and show there is substantial heterogeneity across size in the levers they use to stay resilient. Our results offer a more nuanced view of the relationship between organized labor and financing decisions, both in terms of more general mechanics that parsimoniously account for the tradeoff between strategic leverage and resilience, and also in including the financial response of unions as part of the collective bargaining process.

Last, we contribute to the literature on bargaining games. By showing that firms (and unions) actively attempt to become resilient in anticipation of collective bargaining, we provide evidence that parties' ability to delay the resolution of negotiations influences their outcomes (Rubinstein 1982; Rubinstein and Wolinsky 1985; Abreu and Gul 2000). Our theoretical model is also of interest in itself. A number of papers show that players may make costly commitments to refuse certain offers to improve their bargaining position in negotiations (Schelling 1956; Crawford 1982). More recent work argues that the pressure to reach an agreement may force players to accept bad deals, so they may choose to pay a cost to maintain the flexibility to reject unfavorable offers (Spier 1992; Ma and Manove 1993). In the context of financial obligations, we show that there is an inherent tension between these two objectives (commitment and flexibility) and characterize how this tension shapes firms' financing decisions in anticipation of collective bargaining.

2 Bargaining with Financial Resilience

This section illustrates the role of financial resilience in collective bargaining. To simplify the exposition, the model described here focuses on the firm's (or shareholder's) choice of resilience and abstracts from the union's (or workers') response. In Appendix B.1, we allow both parties to choose their resilience to negotiations; we show that our main insights continue to hold.

The model features two types of risk-neutral agents: the shareholders (s) and workers (w) of a firm. Time is discrete, indexed by $t = 0, 1, ..$, and the horizon is infinite. The firm has access to an investment project that generates a revenue 1 and requires both a capital investment k, where $1 > k > 0$, and w's labor input. Shareholders use both equity e and debt to fund the project. They raise an amount $d \in [0, k]$ in debt at $t = 0$, against a promise to pay back to debtholders an amount $D \geq 0$ at some time $T \leq \overline{T}$, where T is a nonnegative integer that captures debt maturity. Shareholders set the firm's debt structure (D, T) at the beginning of time $t = 0$, before negotiations with w start. Given this debt structure, a credit market pins down the amount d raised by the firm.

Our objective is to explore how s chooses (D, T) strategically to influence the outcome of the wage negotiations with workers. For simplicity, here we capture the *nonstrategic* costs of leverage and maturity – due, for example, to bankruptcy costs or information frictions – in a reduced-form way, through Assumption 1 below. Appendix B.2 considers a simple extension of the model where these nonstrategic costs arise endogenously and shows that our results carry through.

Assumption 1. *The amount raised in debt d is a continuous, increasing, and concave function of D, and a decreasing function of T, and it satisfies $d \leq D$ and $d(D = 0) = 0$ for any value of T.*

Assumption 1 implies that debtholders require a premium $D - d$ that increases in the amount of borrowing d and in the debt maturity T. The firm's leverage is $\frac{d}{k}$. Since d increases with D, we will use the terms leverage, debt level, and D interchangeably in the remainder of this section. We allow for the possibility that s incurs nonstrategic costs also when raising equity – due, for example, to transaction costs and information frictions. The overall cost to shareholders of raising an amount e in equity is κe, where $\kappa \in [1, \infty)$ and $\kappa - 1$ represents the transaction cost.

The bargaining between s and w unfolds according to a dynamic version of the random-proposer model of Binmore (1987). At time $t = 0$, with probability α, w makes an offer to s, where an offer is a proposed partition of the firm's profits. If s accepts the offer, then an agreement is struck: w engages in production and a revenue of 1 is realized; D is paid back to creditors, and $1 - D$ is distributed among s and w according to the accepted offer. With probability $1 - \alpha$, s makes the offer at time $t = 0$, and w decides whether to accept. If the party receiving the offer at time $t = 0$ declines it, another round of negotiations takes place at time $t = 1$, with w and s having again probabilities α and $1 - \alpha$ of making an offer, respectively. If the offer made at time $t = 1$ is accepted, an agreement is struck then: w engages in production and the revenue δ is realized, where $\delta \in (0, 1)$; D is paid back to creditors, and $\delta - D$ is distributed among s and w according to the accepted offer. The delay in reaching an agreement reduces the firm's revenue: w halts production until an agreement is reached, resulting in foregone revenues $1 - \delta$.

This process of making offers and counteroffers continues until an offer is accepted. An agreement reached at time t consists of a sharing rule y_t of the residual surplus $\delta^t - D$. We adopt the convention that y_t is the share of surplus that goes to s. The share of surplus that goes to w is $\delta^t - D - y_t$. As is typical in bargaining models, making offers grants relatively greater bargaining power than responding to offers. The probability with which each player makes offers at each period thus captures its relative (exogenous) bargaining power in the negotiations.

A key feature of the model is that the firm's ability to meet its debt obligations depends on the unfolding of negotiations. If an agreement between s and w is yet to be reached at time T, the firm cannot repay D to debtholders and goes bankrupt, in which case both s and w receive a payoff of 0. If an agreement is yet to be reached at time $\bar{t}$ such that $\delta^{\bar{t}} \geq D$ but $\delta^{\bar{t}+1} < D$, the firm cannot repay its future obligations and goes bankrupt as well, even if $\bar{t} < T$. If $D = 0$, there is no debt obligation, so the firm never goes bankrupt. The maximal length of negotiations is thus $t^* = \min\left\{\bar{t}, T\right\}$ if $D > 0$, and $t^* = \infty$ if $D = 0$. We refer to t^* as the firm's resilience to negotiations.

Shareholders and workers are impatient, as they discount future payoffs. The delay in reaching an agreement has, thus, private costs for both parties, on top of the destruction of revenues due to walkouts. Let $(\delta_s, \delta_w) \in [0,1]^2$ denote s's and w's discount factors, respectively.

Assumption 2. *Shareholders are more patient than workers, that is, $\delta_s > \delta_w$.*

The assumption that workers are more impatient than shareholders is common in the literature on contracting (e.g., DeMarzo and Sannikov 2006; Opp and Zhu 2015) and reflects a lower degree of diversification for workers.[8] If an agreement y_t is reached at time $t \leq t^*$, s's payoff is $u_s = \delta_s^t y_t - \kappa e$, where e is the equity s has invested into the project, and w's payoff is $u_w = \delta_w^t \left(\delta^t - D - y_t\right)$. Otherwise, the firm goes bankrupt, and s's and w's payoffs are equal to 0. The equilibrium concept is Subgame Perfect Equilibrium (SPE).

In the baseline model described above, we make a number of simplifying assumptions to streamline the exposition. Appendix B shows that our main insights are robust to relaxing many of these assumptions. Appendix B.1 studies the choice of resilience of a union that represents w in the negotiation with s. Appendix B.2 adds credit market frictions to endogenize the interest rate on debt. Appendix B.3 studies the role of outside options. Finally, Appendix B.4 and Appendix B.5 allow for the possibility of debt rollover and debt renegotiation, respectively.

2.1 Equilibrium Analysis

Proceeding by backward induction, we first characterize the equilibrium of the bargaining game for given values of the debt structure D and T. We then use this characterization to describe how the debt structure that maximizes s's total payoffs changes with w's bargaining power.

Proposition 1. *Fix (D, T) and let t^* denote the firm's resilience to negotiations – the last period before the firm goes bankrupt. An equilibrium always exists, is unique, and has the following features:*

[8] Workers rely more heavily on labor income for their livelihood, so they are (all else equal) arguably more eager to end a strike than shareholders. In practice, however, a firm's management negotiates on behalf of its shareholders, so δ_s may represent a weighted average of the shareholders' and management's discount factors. If managers are relatively more eager to end a strike, and δ_s is sufficiently close to the managers' discount factors, we may then have $\delta_s < \delta_w$. In the model with union's resilience in Appendix B.1, we show that our main qualitative predictions continue to hold also if $\delta_s < \delta_w$ but the two are sufficiently close to each other. In Appendix D, we present empirical analysis where we proxy for heterogeneity in δ_s. In particular, in Appendix Tables IA4 and IA5, we use empirical proxies for shareholders' and management's discount factors and show that the resilience response to changes in α is more pronounced in firms where shareholders or management are more patient.

1. *An agreement y_0^* is reached immediately, that is, at time $t = 0$.*

2. *For any time $t \leq t^*$, the equilibrium offers are such that the player receiving the offer is indifferent between accepting and refusing. If $t^* = \infty$, each player makes the same offer at each time.*

To build intuition, first consider the case where t^* is finite, so that there is a limit to the length of negotiations. At each period $t < t^*$, the player receiving an offer chooses between: (i) accepting the offer; (ii) refusing the offer, and having a chance to make its own offer in the next round. The offer made at t^* is always accepted, since the alternative is to decline the offer and drive the firm to bankruptcy. The equilibrium is then obtained moving *backward*, as a sequence of offers that make players indifferent between accepting and refusing the offer at each period.

The equilibrium outcome is Pareto efficient: the two parties avoid the costs of delay and reach an agreement immediately in equilibrium. The equilibrium allocation of surplus, however, depends on the sequence of offers players would make if a deal was not struck until the last possible period t^*. The agreed-upon allocation then reflects the relative costs that a prolonged negotiation would impose on each party, even though the first offer is always accepted in equilibrium.

Since making an offer confers relative bargaining power, the exact value of y_0^* depends on which of the two players is selected to make the offer at $t = 0$. Let $\mathbb{E}[y_0^*]$ denote the expected share of surplus s receives in equilibrium; we have:

$$\mathbb{E}[y_0^*] = (1-\alpha)\left\{1 - D + \alpha\,(\delta_s - \delta_w)\sum_{j=1}^{t^*}\left(\delta^j - D\right)\left[(1-\alpha)\,\delta_w + \alpha\delta_s\right]^{j-1}\right\}, \tag{1}$$

for $t^* > 0$, and $\mathbb{E}[y_0^*] = (1-\alpha)(1-D)$ for $t^* = 0$. For any $t^* \geq 0$, the expected amount of surplus that goes to w is then $1 - D - \mathbb{E}[y_0^*]$.

For the sake of exposition, first treat t^* as a parameter that does not depend on (D, T). Since $\delta_s > \delta_w$ and $\delta^t - D \geq 0$ for any $t \leq t^*$, the expected surplus s receives from negotiations $\mathbb{E}[y_0^*]$ increases with t^*. Being more patient than w gives s a relative advantage: refusing an offer and waiting for the next round of negotiations is relatively less costly for s. This is reflected in the equilibrium allocation, with s receiving, all else being equal, a relatively larger share of surplus for any $t^* > 0$. The more rounds of negotiations are potentially feasible (i.e., the larger t^*), the more surplus s receives in equilibrium: the threat of prolonged negotiations helps shareholders to hold back workers' wage demands. So s receives more surplus when the firm is more resilient.

In equilibrium, t^* is a function of the firm's debt structure, so it varies when D or T change. Debt maturity only affects $\mathbb{E}[y_0^*]$ through its effect on t^* (t^* increases with T). Leverage instead also directly affects the firm's equilibrium surplus $1 - D$. $\mathbb{E}[y_0^*]$ thus decreases when D goes up both because (a) there is less surplus on the bargaining table and (b) the firm is less resilient to strikes (t^* decreases with D), so s extracts less of the surplus available in the negotiations with w.

If $t^* = \infty$, there is no limit to the length of negotiations. Players' equilibrium strategies are stationary in this case, with each player making the same offer whenever it's its turn to make one. Similar to before, an agreement is reached immediately, but the equilibrium allocation reflects the relative costs that continuing the negotiation indefinitely would impose on each party.

It is worth noticing that, when $t^* = 0$, $\mathbb{E}[y_0^*]$ corresponds to the expected surplus s would receive in a traditional *static* bargaining game (e.g., one where the protocol is Nash Bargaining or players make take-it-or-leave-it offers). The firm approaches an infinitely resilient debt structure ($t^* \to \infty$) in the limit as D tends to 0 and T tends to infinity. In this case, $\mathbb{E}[y_0^*]$ converges to the expected surplus s receives when the firm is fully equity funded and there is no limit to the length of negotiations. So our model collapses to a static bargaining model when only a single round of negotiations is feasible, and it converges to the model with infinite horizon as t^* tends to infinity.

In equilibrium, s's total expected payoff $\mathbb{E}[u_s^*]$ equals the sum of its expected share of surplus net of the equity s has invested in the firm. That is, $\mathbb{E}[u_s^*] = \mathbb{E}[y_0^*] - \kappa e$, where $e = k - d$. Next, we describe how the firm's debt structure impacts $\mathbb{E}[u_s^*]$ through its effect on negotiation outcomes.

Proposition 2. *Suppose $d = D$ for any (D, T) and $\kappa = 1$; shareholders' expected equilibrium payoff $\mathbb{E}[u_s^*]$ always increases with the debt maturity T, while it may increase or decrease with the debt level D.*

To focus on the strategic effects, Proposition 2 assumes that $d = D$ and $\kappa = 1$ for any value of (D, T). This corresponds to the case where there are no direct costs of raising debt or equity, so the firm's financing choices affect s's payoff only through their effect on negotiations. Longer debt maturity increases the firm's resilience to negotiations, as it delays the date D is due to debtholders. Since s extracts more surplus when t^* is larger, $\mathbb{E}[u_s^*]$ always increases with T.

Higher leverage has instead two contrasting effects on $\mathbb{E}[u_s^*]$. On the one hand, due to the negotiation with w, s earns only a fraction of the return on the equity invested in the project. Holding the firm's resilience fixed, a debt-for-equity swap (i.e., increasing D) thus increases s's payoff. This first effect captures the traditional idea of strategic leverage, which also arises in static models of bargaining (see, e.g., Bronars and Deere 1991; Perotti and Spier 1993). On the other hand, a higher D reduces the firm's resilience, as it lowers the revenue losses the firm can withstand before going bankrupt ($\bar{t}$ and, thus, t^* decrease with D). Since s captures a smaller share of the surplus available for negotiations when t^* is smaller, this second effect is negative. Put differently, when leverage increases: less of the firm's revenue is exposed to wage negotiations, but shareholders capture a smaller share of the revenue on the negotiation table. We show that either of these two effects can be stronger, so that $\mathbb{E}[u_s^*]$ may increase or decrease with D.

Notice that maturity and leverage work as (imperfect) substitutes as strategic tools in our model. If $D > \delta^{T+1}$, we have $t^* = \bar{t}$, which does not depend on T. In this case, if negotiations go on for too long, the firm goes bankrupt before its debt expires – due to the loss in revenues. Longer debt maturity then improves s's bargaining position only if the firm is not too levered and can withstand a relatively long negotiation (at least longer than T). Similarly, if $T < \bar{t}$, an increase in leverage does not shorten negotiations, as the firm's debt is due before $\bar{t}$. Hence, when the firm's debt expires very close to negotiations, increasing leverage does not hurt s's bargaining position.

Having characterized how shareholders' payoff depends on the firm's debt structure, we can now describe how their choice of D and T changes with the workers' bargaining power (α).

Proposition 3. *Consider $\alpha \in [0, \frac{1}{2})$; the following comparative statics results hold in equilibrium:*

1. *Holding the debt level D fixed, the debt maturity T that maximizes shareholders' expected payoff $\mathbb{E}[u_s^*]$ increases with the workers' bargaining power α.*

2. *Holding T fixed, the value of D that maximizes $\mathbb{E}[u_s^*]$ may increase or decrease with α.*

Proposition 3 studies how s's choice of debt structure changes with α for a generic function d

satisfying Assumption 1 and any value of $\kappa \geq 1$. That is, when the firm's borrowing cost $D - d$ depends on the choices of D and T, and there are transaction costs associated with raising equity.[9] The proposition focuses on the conditional responses, that is, holding fixed D, how the optimal choice of T changes with α, and vice-versa. Debt maturity increases the firm's resilience and, thus, s's expected share of surplus in the negotiations. Holding fixed D, s can then increase T to curb the effects of an increase in w's bargaining power. As discussed before, leverage has an ambiguous effect on shareholders' expected equilibrium payoff. It follows that s's best response to an increase in α may be instead to increase *or* decrease D, depending on the parameters of the model.[10,11]

The joint responses of D and T to changes in α are more nuanced. Suppose debtholders require a larger premium for longer maturity when the firm is more levered (for example, because shorter maturity facilitates monitoring by lenders (Flannery 1986; Diamond 1991)). Suppose also that s finds it optimal to increase D when α goes up. s may then also choose to *decrease* T, since long maturity may be too costly at the new choice of D. It is worth emphasizing, however, that a decrease in maturity is never a *direct* strategic response to the wage negotiations, since shorter maturity always hurts shareholders' bargaining position (at least weakly) for any value of D.

By a similar logic, the leverage reaction to changes in α may be an indirect effect of the strategic response in debt maturity. Suppose the interest rate $D - d$ increases less with leverage when T is larger (for example, because the firm is less exposed to rollover risk when its debt has longer maturity (e.g., He and Xiong 2012)). When α goes up, all else equal, s wants to increase T to gain bargaining power with w. Since increasing leverage is cheaper when T is larger, s may then also increase D as an indirect effect of the strategic response in T. We prove the results discussed above, about the joint responses of D and T to changes in α, in Appendix A.4. Of course, D and T may also both increase with α for strategic considerations: s may prefer to increase D to reduce

[9] As α approaches 1, shareholders' share of surplus vanishes in equilibrium, so that s has lower incentives to take costly actions to affect the negotiations. Therefore, we restrict our attention to values of α between 0 and $\frac{1}{2}$.

[10] In Appendix B.1, we model an alternative measure of workers' bargaining power: their ability to organize and sustain a walkout (t_w). Our qualitative results about the response of D and T to an increase in α also apply to an exogenous increase in t_w.

[11] In Appendix B.2, we introduce a stochastic component to the firm's revenue, which allows for the possibility of bankruptcy on the equilibrium path. When α increases and s responds by choosing a more resilient debt structure, the firm becomes *safer* in that version of the model, as bankruptcy occurs with a smaller probability.

surplus on the negotiation table, while at the same time increasing T to gain resilience to strikes.

Altogether, our results suggest that the conditional responses of D and T to changes in α (i.e., the response in T holding fixed D, and vice-versa) are generally more informative about the firm's strategic motive, as it is otherwise hard to disentangle whether one moves for strategic reasons and the other follows mechanically through the interest rate channel.

2.2 From Theory to Empirics: Measuring Resilience

Our model links the firm's financing choices to the frequency α with which workers make offers in the negotiation, where α captures the bargaining power of workers. The model has two main empirical implications regarding the two components of resilience:

P1. **Resilience's Maturity Component (Intensive Margin).** In response to an increase in α, holding leverage fixed, firms increase their debt maturity.

P2. **Resilience's Leverage Component (Extensive Margin).** In response to an increase in α, firms either increase leverage (consistent with the strategic leverage channel) or reduce leverage (consistent with the resilience channel).

The main object of our model is the firm's resilience to negotiations (t^*), which is a function of both leverage (D) and debt maturity (T). Formally, we have

$$t^* : \mathcal{D} \times \mathcal{T} \to \mathbb{Z}^+, \quad \text{with} \quad \frac{\partial t^*}{\partial D} \leq 0 \quad \text{and} \quad \frac{\partial t^*}{\partial T} \geq 0, \tag{2}$$

where $\mathcal{T}$ and $\mathcal{D}$ denote the set of possible choices for D and T, respectively.

Intuitively, a high-leverage firm is less resilient than a low-leverage firm, and long-term maturity provides more resilience than short-term maturity. A simple and intuitive way to account for t^* in the data is based on the maturity profile of *all* outstanding liabilities of the firm, which includes both debt maturity (calculated as the firm's debt maturities T_q weighted by amounts D_q, where q is an index for different debt instruments) and the implied equity maturity T_E, weighted by equity, all as a fraction of assets A.[12] This writes as

$$Resilience := \sum_q \frac{D_q}{A} T_q + \frac{A - \sum_q D_q}{A} T_E = \underbrace{\frac{\sum_q D_q T_q}{A}}_{\text{Maturity Component}} + \underbrace{(1 - Lev) T_E}_{\text{Leverage Component}}. \tag{3}$$

Eqn. (3) provides an accounting decomposition of resilience into maturity and leverage components that map to the predictions of our model summarized in P1 and P2. In the model, we implicitly assume $T_E > \max_q T_q$, so that, when leverage (Lev) increases, the weight on equity decreases and the firm's resilience is reduced. In the empirical analysis, D_q, T_q, and A are observed by the econometrician, but T_E is not. However, the resilience's leverage component can be evaluated by directly estimating effects on leverage. In addition, in line with with the theoretical framework, estimating the effects of RWLs on the resilience's maturity component conditional on leverage provides an estimate that is consistent. We describe these estimations in Section 3.

To test P1 and P2, we measure resilience using the decomposition in Eqn. (3), and use changes in α stemming from changes in the collective bargaining environment. As we discuss in the next section, RWLs reduce the bargaining power of unions. Thus, we interpret the passage of RWLs as a decrease in the value of α in future negotiations with management.

3 Data Description and Empirical Methodology

The adverse effect of RWLs on union power has been documented in the literature (Ellwood and Fine, 1987; Abraham and Voos, 2000; Chava, Danis, and Hsu, 2020). RWLs forbid union security agreements between unions and employers, which compel employees to join the union or pay union dues as a condition in the employment contract. In states with RWLs, unions then cannot force new employees to join a union or pay union dues. Employees have little private incentives to join a union, since they can enjoy the potential benefits of collective bargaining without having to contribute to the funding of the union. Therefore, unions have fewer members and less funding

[12] Debt maturity measures alone are not well suited to describe firms' resilience, since they cannot capture the idea that firms are more resilient when they have less debt. This problem is overcome when we consider a weighted average of the maturity of *all* the firm's liabilities, which include equity and its contribution to the firm's resilience T_E. A different line of literature (e.g., Dechow, Sloan, and Soliman 2004) directly evaluates the implied duration dimension of equity.

when employees are not forced to join a union (Moore and Newman, 1985; Fortin, Lemieux, and Lloyd, 2023). Both these effects limit the bargaining power of unions, since they can convince fewer workers to join a strike and have less funding to sustain operations and those that participate in strikes.[13]

Our analysis follows Fortin, Lemieux, and Lloyd (2023), who use the adoption of RWLs in five U.S. states since 2011 to estimate the effect of these laws on wages and unionization rates. Their findings indicate that RWLs lower both wages and unionization rates. We use the same sample period and methodologies but focus on different outcome variables: firms' debt structures and union financials. Our estimation strategy exploits the staggered adoption of RWLs to estimate a difference-in-differences model. The model compares the debt structures of firms headquartered in states introducing RWLs with those of firms headquartered in states that did not adopt these laws. Specifically, we estimate the following fixed effects model:

$$y_{ijst} = a_i + a_{jt} + \beta_1 RWL_{st} + \gamma X_{ijst} + \nu_{ijst}, \tag{4}$$

where the variable RWL is a state-level indicator that takes value one since the year a state s introduces these laws, and zero otherwise. We saturate the model by including firm controls X, firm fixed-effects a_i to absorb unobservable time-invariant firm heterogeneity, and industry-by-year fixed effects a_{jt} to capture time-varying unobservable industry characteristics. The error term ν contains the unexplained variation of the dependent variable y (e.g., leverage or debt maturity). The coefficient β_1 has a causal interpretation if the residual variation in ν is uncorrelated with states' decisions to introduce RWLs.

When our outcome of interest is assessing resilience, the dependent variable y takes on each of the components prescribed by Eqn. (3), which are captured by a firm's leverage and debt maturity relative to assets. In addition, when measuring jointly the two components of resilience, Eqn. (4) takes the form:

$$Resilience_{ijst} = a_i + a_{jt} + \beta_1 RWL_{st} + \gamma X_{ijst} + \nu_{ijst},$$

where $Resilience = \frac{\sum_q D_q T_q}{A} + (1 - Lev)T_E$ as defined in Section 2.2.

[13]Unions typically distribute funds (strike funds) to striking workers to partially substitute their regular paychecks.

Since T_E is unknown, it needs to be accounted for in the estimation. Rewriting $Resilience = R^D + (1 - Lev)T_E$, with $R^D = \frac{\sum_q D_q T_q}{A}$, our estimating equation becomes:

$$R^D_{ijst} = a_i + a_{jt} + \beta_1 RWL_{st} - \eta Lev_{it} + \gamma X_{ijst} + \nu_{ijst}, \tag{5}$$

We can interpret the effects of RWL on R^D according to Eqn. (5) as the effects on resilience's maturity component, or intensive margin. While η is not a consistent estimate of T_E (e.g., RWL will have effects on resilience's leverage component/extensive margin), β_1 is still a consistent estimate of the intensive margin effects of RWL on $Resilience$. Debt maturity relative to assets can be measured with error in our data. Alternatively, we can simplify the analysis by measuring the long-term debt ratio, thus avoiding the mismeasurement inherent in refined measures of maturity (i.e., T_q). Throughout the paper, we include both measures (in addition to leverage).

To prevent cross-contamination between treatment and control groups, we estimate the model using all the firms in Compustat whose historical headquarter location did not change during our sample period,[14] and use the information about their headquarter locations to match companies and US states.[15] Data on firms' historical headquarter locations are sourced from the SEC Analytics Suite database provided by Wharton Research Data Services, which extracts this information from companies' 10-K filings, similar to Ellul, Wang, and Zhang (2024) and Bena, Ortiz-Molina, and Simintzi (2022). Currently, 26 US states have RWLs in place.[16] A total of 14 states adopted RWLs between 1950 and 2019, with 8 of these adoptions occurring after 1974 (the data about firms' debt maturity is available starting in 1974). Following Fortin, Lemieux, and Lloyd (2023), we focus our estimation on a recent wave of RWLs adoptions: Indiana, Michigan, Kentucky, West Virginia, and Wisconsin (see details in Table IA3). We restrict our sample period to 2007–2019 and exclude states that introduced RWLs before 2007. Table 1 contains detailed statistics. For some analyses, using company names, we matched Compustat data with data on all union certifications of establishments within US firms. The data is collected from two different sources: data from

[14]Our results carry through almost identically if we do not adjust for historical headquarter location.

[15]A similar matching strategy can be found in Matsa (2010), Agrawal and Matsa (2013), Heider and Ljungqvist (2015), and Klasa, Ortiz-Molina, Serfling, and Srinivasan (2018), among others.

[16]Table IA3 reports the list of states and the year of adoption of RWLs. Missouri passed a right-to-work bill in 2017, but the bill never became effective as it was blocked by a popular referendum in 2018.

1977 to 1999 is provided by Holmes (2006), and data from 2000 to 2020 is hand-collected from the National Labor Relations Board (NLRB).

The internal validity of our DID model relies on the assumption that, absent the adoption of RWLs, the differences in the outcome variables are likely to remain constant (*parallel trends* assumption). To investigate the validity of this assumption in our setting, we estimate a dynamic version of the model in Eqn. (4) by introducing state-specific relative time indicator variables up to four years before and after the RWLs adoptions. A recent literature argues that two-way fixed effects models in frameworks with staggered treatments can be biased in the presence of treatment effect heterogeneity (e.g., Callaway and Sant'Anna, 2021; Sun and Abraham, 2021; Goodman-Bacon, 2021; Borusyak, Jaravel, and Spiess, 2024; Baker, Larcker, and Wang, 2022; Cengiz, Dube, Lindner, and Zipperer, 2019). This bias undermines the testing of pretrends using lead and lag coefficients.[17] To alleviate these concerns, and given the unbalanced nature of our panel dataset, we estimate the dynamic DID model based on Sun and Abraham (2021).

Figures 2 plots the point estimates for every indicator variable in our dynamic DID model, and the 95% confidence interval using alternative measures of financial resilience as the dependent variable. None of the specifications display pretrends. There is no statistical difference between measures of financial resilience for treated and controls firms before the RWLs' adoptions.

4 Empirical Analysis: Financial Responses to the Passage of RWLs

In this section, we empirically test the implications of the model. Section 4.1 shows that firms adjust their financial resilience when the bargaining power of workers decreases: following the passage of RWLs, firms decrease the maturity length of their debt obligations. We also show that the main lever for changing financial resilience is adjusting debt, rather than hoarding cash or building inventory. Altogether, the evidence presented in this section is consistent with firms increasing financial resilience in response to, or in anticipation of, labor negotiations. Finally, Section 4.2 evaluates the unions' financial response to the passage of RWLs.

[17]It is worth noting that bias is unlikely to be large in our setting since most control observations are in "never-treated states", which provides a large number of controls throughout the 2007–19 period.

4.1 Firms' Financial Response

4.1.1 DID Results: Direct Response

According to our model, in response to an increase in unions' bargaining power, firms should increase debt maturity to become more resilient. Conversely, in response to a decrease in unions' bargaining power, firms would decrease maturity. In contrast, responses through leverage are indeterminate, because the firm can choose to increase leverage strategically to push surplus off the bargaining table or decrease leverage to become more resilient.

We evaluate this direct response in Table 3. Because leverage and maturity are jointly determined, Proposition 3 of our theoretical framework shows that the conditional response of maturity holding leverage fixed, and leverage holding maturity fixed are the objects of interest. A similar logic holds when we measure the maturity component of our measure of firms' resilience (R^D in Eqn. 5; Resilience Intensive Margin in Table 3). For completeness, we present both conditional and unconditional estimates. Both sets of results tell a very similar story.

Panel A of Table 3 presents unconditional estimates of the debt structure response of firms to the passage of RWLs, which we interpret as a decrease in the bargaining power of workers. A decrease in workers' bargaining power implies that firms will reduce their debt maturity. Columns (1) and (2) show that firms reduce their long-term debt ratio (LT debt ratio (>5Y) dependent variable) by between 2.0 and 2.3 percentage points, which corresponds to approximately 31% of the sample mean (6.4%). Unconditionally, that reduction in long-term debt is achieved through an overall reduction in leverage of about 2.9–3.0 percentage points (columns 3 and 4). These unconditional estimates on leverage are in line with prior estimates reported in Chava, Danis, and Hsu (2020) who, using a different set of RWL adoptions, find a reduction of 2.8 percentage points. The intensive margin of firms' resilience also decreases: 0.23 years across all liabilities, which corresponds to around 27% of the sample mean (columns 5 and 6). These results are economically meaningful: When translated in terms of average maturity of debt specifically, this corresponds to the maturity of preexisting debt decreasing by over 1 year. The change in debt maturity does not reflect changes in the composition of debt caused by a substitution of public debt with private debt (Appendix

E.2). In addition, Figure IA3 provides evidence on alternative margins of response to increase financial resilience following changes in RWLs. Inventory and cash are not the main margins of response following the passage of RWLs.

As we discussed in Section 2.1 of our theoretical framework, the joint response of leverage and maturity is confounded by the fact that the strategic use of leverage must accommodate changes in maturity and, conversely, increased resilience must accommodate changes in leverage. The more theoretically precise object to look at is the responses of maturity and leverage conditioning on each other (Proposition 3). Still, Panel A serves an important function as it shows that firms' interest in increasing resilience is indeed accommodating changes in leverage, and it is thus a first-order channel of response within our framework.

To directly test Proposition 3, Panel B of Table 3 presents conditional estimates of the debt structure response of firms to the passage of RWLs. This empirical specification stems directly from the model. This is fundamental, as leverage and maturity are jointly determined in equilibrium and, thus, exhibit simultaneous causality (Heckman and Pinto, 2024).[18] In columns (1) and (2), we show that, conditioning on leverage, firms reduce their long-term debt ratio (LT debt ratio (>5Y) dependent variable) by a statistically significant 1.1 percentage points. Leverage declines by about 1.6–1.7 percentage points (columns 3 and 4); however, this decline is not statistically significant once we condition on long-term debt. In the conditional specification, the coefficients in Columns (5) and (6) represent a consistent estimate of the effect of RWLs on the intensive margin of resilience (see the discussion below Eqn. 5). The intensive margin of resilience decreases by 0.106 years across all liabilities (around 12% of the sample mean). Translated in terms of average maturity of debt specifically, this corresponds to the maturity of preexisting debt changing by around 6 months.

[18]Using economic theory to determine the accurate empirical specification describing a problem is commonplace in economics (Heckman and Pinto 2024). For a recent example in labor economics, see Beaudry, Green, and Sand (2012).

4.1.2 Heterogeneous Response to RWLs Conditional on Unionization Exposure

Incentives to adjust resilience are likely to be stronger in firms that are more exposed to the collective bargaining process.[19] In this section, we present estimates of firms' debt structure response to the passage of RWLs conditional on different proxies for their exposure to collective bargaining. Figure 3 presents results for *industries* with low and high levels of unionization (similar to Matsa 2010 and Fortin, Lemieux, and Lloyd 2023). Figure 4 presents results for unionized *firms*, which are the most directly exposed to collective bargaining.

In Figure 3, panels (a), (c) and (e) show results for low-union industries, while panels (b), (d), and (f) show results for high-union industries. For all outcome variables (long-term debt, leverage, and the intensive margin of resilience), firms in low-union industries show smaller effects than high-union industries, and the effects for the maturity measures are statistically indistinguishable from zero. In contrast, high-union industries show significantly larger maturity responses relative to our baseline estimates (Figure 2). Table 4 paints a similar picture, showing that the maturity responses in Table 3 are driven by high-union industries. In terms of average debt maturity, our estimates for the intensive margin of resilience correspond to the maturity of preexisting debt changing by around 2.1 years for firms in highly unionized industries.[20]

In Figure 4, panels (a), (c), and (e) show effects on a sample restricted to only unionized firms, regardless of industry. Results show a large maturity response (panels a and e), while the effects on leverage are significantly smaller and indistinguishable from zero (Panel c). In panels (b), (d), and (f), we pool unionized firms with those in high-union industries, to increase precision, and obtain qualitatively similar results.

In general, our results so far show that leverage and resilience do not need to go hand in hand. For unionized firms or firms in industries with high levels of unionization, the maturity response is significantly larger than the leverage response. It is worth emphasizing that our evidence speaks only about the resilience channel, and is not evidence against the strategic use of debt. In fact,

[19]This likelihood relies, of course, on several other variables being kept constant, including, for example, a monotonic relationship between the likelihood and cost of negotiations, and the degree of network effects.

[20]This takes into account that the average leverage for firms in highly unionized industries is 21%.

as we argued and showed formally in our model, effects on leverage should be ambiguous when both resilience and strategic use of debt are operating.

4.1.3 Heterogeneous Response to RWLs Conditional on Firm-Level Built-in Resilience

In the last subsection, we showed that industry-level exposure to unionization and firm-level unionization status affects firms' debt structure decisions. Another way to evaluate the importance of resilience for firms' debt structure decisions is to examine how specific firms have built-in resilience that lowers their need to build resilience through debt structure.

We use three dimensions that capture this firm-specific built-in resilience: asset tangibility, collateral, and inventory differences across firms within the same industry. Firms with more access to debt markets are less exposed to the costs of strikes, since, on the margin, they are better able to obtain additional borrowing in the aftermath of a strike (see Appendix B.4 for a formal analysis in the context of debt roll-over). Following the literature (Williamson 1988; Shleifer and Vishny 1992), we use asset tangibility and collateral as proxies for access to debt markets. Similarly, firms with higher levels of inventory are also ex-ante more resilient, as they can stabilize their cash flows following production disruptions (Reder and Neumann 1980; Coles and Hildreth 2000). Since these firms have more built-in resilience, their financing choices should be less responsive to changes in the collective bargaining environment. Consequently, the incentives to shorten debt maturity and/or increase leverage (consistently with the resilience motive) following the passage of RWLs should be more muted in these firms.

To evaluate the effect of firm-specific built-in resilience on mitigating the firm's financial resilience response, we implement a model extending Eqn. (4) to include heterogeneity across firms built-in resilience. In particular, we estimate the following equation:

$$y_{ijst} = a_i + a_{sjt} + \beta_1 RWL_{st} \times BuiltIn_{pre} + \gamma X_{ijst} + \nu_{ijst}, \tag{6}$$

where we add $BuiltIn_{pre}$ to capture firm-specific asset tangibility, collateral, or inventory the year prior to treatment, and state-industry-year fixed effects, a_{sjt}, to capture industry-state responses to RWLs due to other factors – e.g., last section's union exposure effects – that are triggered by RWLs and correlated with $BuiltIn_{pre}$, but are not the main mechanism of interest for this subanalysis. Our hypothesis is that, for measures of maturity, $\beta_1 > 0$; that is, built-in resilience mitigates any response through the resilience channel we document throughout the paper.[21]

Table 5 presents heterogeneity estimates of RWLs on maturity, leverage, and resilience across measures of firm-specific, pre-RWL levels of asset tangibility, collateral, and inventory. We find that tangibility, collateral, and inventory all generally have a mitigating effect on firms' response through the use of long-term debt and our resilience measure. For long-term debt (columns 1–2) and resilience intensive margin (columns 5–6), the mitigating effect of tangibility is statistically significant (Panel A); that of collateral is positive but statistically significant only when we include firm controls (Panel B); and that of inventory is statistically significant for long-term debt, but only marginally so for our resilience measure (Panel C). In contrast, the mitigating effect of these measures on leverage is always statistically insignificant. And while some estimates are not necessarily economically insignificant, their magnitudes are strictly smaller than those of long-term debt across all specifications, highlighting the role of maturity.

4.2 Unions' Financial Response

All our analysis so far, as well as the literature on RWLs at large, assumes that, consistent with intent, RWLs decrease the bargaining power of unions.[22] Nevertheless, it is worth evaluating the process and degree through which unions' financials are affected, as it is possible that unions could adjust their financials to mitigate the impact of RWLs, just as firms do adjust their financials differently in the presence or absence of RWLs. Using data on union financials from the Office of Labor-Management Standards (OLMS) of the U.S. Department of Labor, we evaluate changes in membership and changes in the fee structure of unions. We find significant and sharp declines in overall membership. We also find that unions' fee structure is significantly changed after the passage of RWLs, with an expected average drop in total fees driven by the bottom half of unions

[21] Since changes in leverage can reflect either strategic or resilience motives, the sign of β_1 is ex-ante ambiguous for leverage.

[22] See, for example, Ellwood and Fine (1987), Farber, Herbst, Kuziemko, and Naidu (2021), and Fortin, Lemieux, and Lloyd (2023).

in terms of total fees but with statistically significant increases in fees for the largest unions. Union dues are used to finance the operations of the union, including bargaining on behalf of workers, providing member benefits, organizing efforts, legal representation, and other union activities.

First, we confirm that union membership does indeed decline following the passage of RWLs, which lends support to a decline in α in our theoretical framework. Results are presented in Figure 5. Panel A presents declines in membership for unions that survive for at least four years following the passage of RWLs. Panel B accounts for declines in membership due to union exits by assigning zero membership to a union that ceased to exist after the passage of RWLs. Panel A shows that surviving unions become progressively weaker, with drops in membership reaching approximately 7 log points after year four. Panel B shows that this effect is significantly larger if we account for declines in membership due to some unions disappearing entirely. Total decline in membership including union exits is around 12 log points after year four.

Second, we evaluate whether RWLs affect other key direct measures of union health (total fees and fees per member) as well as potential variables they could have adjusted to mitigate the impact of RWLs. Results are shown on Table 6. Panel A presents the relationship between RWLs and union financials. As expected, the total number of members and the total fees collected decreases significantly. This decrease is to the tune of 3.5 and 3.7 log points, respectively (columns 1 and 2). While statistically insignificant, there seems to also be a slightly smaller, but of similar order, drop in the average assets and average cash of unions (columns 3 and 4). While the decline in average cash of unions of 2.4 log points is statistically indistinguishable from the decline in fees (t-stat of differences in means: −0.316), the small differences between fees and cash can correspond to differences in past fee revenue. In contrast to our results for firms, there does not appear to be a change in unions' financial leverage (column 5).

4.2.1 Heterogeneous Union Response by Size

Looking at unions of different sizes, however, paints a slightly more nuanced picture. Panel B in Table 6 presents heterogeneity by union size as measured by total fees just prior to the passage of RWLs. As before, effects on assets (column 3), cash (column 4), total cash per member (column

6), fees relative to receipts (column 8), and funds used to support strikers (column 9) are all statistically insignificant. However, the drop in membership and fees that we document in Panel A is stronger for smaller unions, although that relationship is statistically significant only for fees. In fact, for the top 10% largest unions, total fees actually exhibit a statistically significant increase (Figure 6), both in terms of total fees and fees per member. In terms of total fees, each log point increase in pre-RWLs total fees is linked to an increase of 2 basis points in total fees. This effect is not just mechanically linked to changes in membership: in contrast to Panel A, fees per member exhibit statistically significant effects, there is a drop of 212 dollars for the average union, but each log point increase in pre-RWLs total fees is associated with an increase in fees per member of about 19 dollars. These increases are monotonically increasing in the pre-RWLs size of the union, as measured by total fees (Figure 6). In contrast, smaller unions exhibit large declines in membership, total fees, and fees per member. These differences in response are also seen in leverage, as expected, in an opposite direction: smaller unions significantly increase leverage but this increase is significantly mitigated the larger the union is.

4.2.2 Other Margins of Adjustment for Unions

It is worth highlighting that unions' cash per member (column 6), fees relative to receipts (column 8), and funds used to support strikers (column 9) do not respond to RWLs and do not present heterogeneous responses by size.[23] This is in contrast to what we observe for fees per member (column 7) and leverage (column 5). The results above would suggest that the main margins of response for unions are their dues and membership, and that unions jointly adjust their fee and debt structure to keep short-term funds relatively stable. Fees relative to total receipts (column 8) is particularly informative of this – when we consider receipts (all cash inflows and outflows, including fees but also other revenues and paying off liabilities), the fee to receipt structure stays constant, indicating a matching of inflows and outflows, regardless of union size. Overall, larger unions appear to be better able to retain support following the passage of RWLs, mitigate some of

[23]The estimates capturing a decline in cash-to-members and its positive interaction with union size, although both statistically insignificant, are consistent with a reduction in fees that is heterogeneous across union size.

the legislation's impact and, for a nonnegligible number of unions improve their financial position.

5 Mechanisms with No Response and Potential Confounders

In this section, we briefly examine other potential mechanisms connecting RWLs and financial resilience for which we find no empirical support, and additional confounders to our analysis. We reserve a more detailed discussion of these results to the Appendices (see Appendix E).

Credit Markets. One major concern in our setting is the possibility that RWLs might produce changes in how creditors perceive the creditworthiness of firms. To the extent that these laws reduce labor rigidities within the firm, creditors might perceive the firm to be less risky, lowering the cost of debt and potentially leading to more and riskier borrowing by the firm. We provide several pieces of evidence, however, that weigh against credit markets mediating our results.

We first explore the relevance of this channel by directly looking at the response of credit ratings, bond prices, and CDS spreads following the passage of RWLs. Changes in the perceived riskiness of a firm's debt are likely to be reflected in its credit ratings, bond prices, or CDS spreads. In Table IA7, we show that credit ratings remain unchanged following the passage of RWLs, which suggests that these laws did not change rating agencies' assessment of firm risk. Still, it is possible that markets differ from rating agencies in their perception of firms' creditworthiness. To evaluate this possibility, we explore the response of bond prices following the passage of RWLs. In Figure 7, we present results showing that bond prices do not change either post RWLs.[24]

RWLs may have affected the price differential for similar quality bonds at different maturities (by changing the relative riskiness of debt with longer maturity compared to debt with shorter maturity), even though they did not affect average bond prices or ratings. The post-RWLs adjustments in firms' debt maturity could be then driven by changes in the cost of maturity rather than firms' attempt to improve their bargaining position in negotiations with labor. To inquire this possibility, we use the spread differentials across CDS contracts with different maturities as

[24]We must note that bonds might be less liquid than other instruments. However, that would also mitigate their effects on the firm.

proxies for the perceived differences in the credit risk of the underlying debt contracts. Table IA8 shows that these spread differentials do not meaningfully change post RWLs, which suggests that the passage of these laws did not have a significant effect on firms' cost of maturity either.[25]

A more subtle version of credit markets as a potential confounder is that firms might optimize differently across *sources* of debt, regardless of the effect that RWLs may have on the cost of credit for each of these sources. The argument runs as follows: firms facing more powerful employees may substitute bank loans with public debt, since the latter is harder to renegotiate with creditors and is thus more effective in pushing surplus off the negotiation table with workers (Qiu 2016). Given that public debt tends to have longer maturity, our results may be driven by this substitution rather than the firms' interest in financial resilience. To test for this alternative mechanism, we use data on firms' debt structure to separate different sources of financing. Results in Table IA6 show that firms do not adjust the relative weights of their sources of debt (including the fractions of bank and public debt), which suggests that this alternative mechanism is not at play either.

Operating Flexibility. A different potential concern is that the connection between firms' financing choices and labor negotiations might be driven to some degree by substitution between operational and financial leverage (Simintzi, Vig, and Volpin, 2015; Serfling, 2016). Simintzi, Vig, and Volpin (2015) argue for this trade-off using cross-country variation in employment protection. In Appendix E.5, we test for this by evaluating whether there exists a heterogeneous response to the passage of RWLs in firms that have high fixed costs and thus higher operational leverage. Following the literature standard (e.g., Gorodnichenko and Weber, 2016), we measure fixed costs by using Compustat variables: selling, general and administrative expenditures (Compustat item XSGA), advertising (Compustat item XAD), and research and development expenses (Compustat item XRD). We then normalize these by sales. We report results in Table IA10. Firms with high fixed costs do not respond differently to the passage of RWLs than other firms.

[25]The lack of credit market response is consistent with the documented lack of short-term equity response and subsequent long-term slow equity market response following unionization events (Lee and Mas 2012), response that takes over a year to materialize. We show that this lack of short-term equity market response extends to passage of RWLs (Appendix Table IA9). Slow diffusion of information to investors or slow resolution of uncertainty are consistent with the empirical patterns documented here and in Lee and Mas (2012).

6 Conclusion

This paper investigates the use of financial resilience as a strategic tool in labor negotiations. We develop a dynamic model of employer-employee negotiations and derive two main results. Longer debt maturity improves financial resilience and, thus, shareholders' bargaining position. Increasing debt reduces financial resilience and, thus, may hurt shareholders in the negotiations, contrary to the standard intuition of strategic leverage. As a consequence of the interplay of these two factors, leverage has an ambiguous effect on shareholders' bargaining position

We empirically show that changes in the bargaining power of workers lead to changes in the financial resilience of the firm: firms decrease their debt maturity following the passage of RWLs, which decrease workers' ability to organize. These results demonstrate that firms respond to more powerful employees by increasing their financial resilience to negotiations and strikes and, hence, that regulation that decreases the bargaining power of workers, such as RWLs, has potential pernicious implication of increasing unemployment risk for workers.

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Figures

Figure 1. (Firm operating profitability around strikes) The figure displays the average profitability of firms five quarters before and after a labor strike. Strikes are centered at date zero, and the average profitability is computed for firms that have experienced such an event. The data on strikes is sourced from the Work Stoppages database available on the US Bureau of Labor Statistics website. We use the detailed monthly listing for work stoppages involving 1,000 or more workers spanning from 1993 to 2019. The Compustat quarterly database is used to compute the operating profitability variable, defined as the ratio between Operating Income Before Depreciation and Amortization (oibda variable in Compustat) and total asset value. The figure is based on 57 strikes, with an average duration of 20 days.

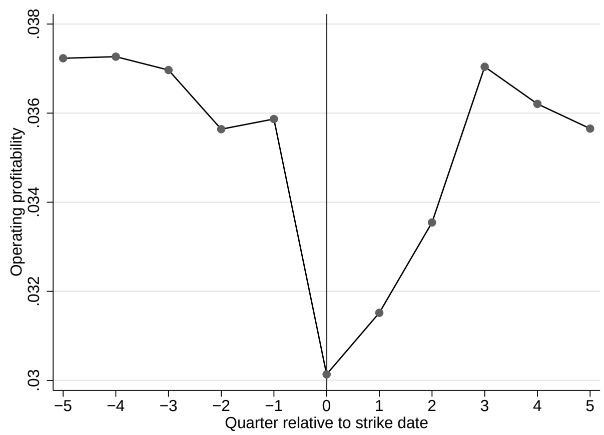
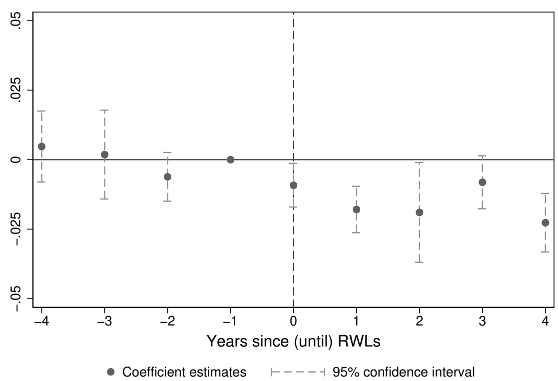
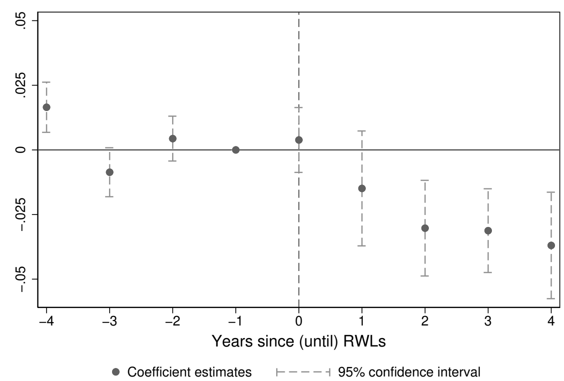


Figure 2. (Parallel trends DiD - All industries) The figure depicts the dynamic effect of RWLs using the estimation procedure outlined in Sun and Abraham (2021). Panel (a) plots the dynamic effect of RWLs the long-term debt ratio (i.e, LT debt ratio > 5Y variable). Panel (b) plots the dynamic effect of RWLs on book leverage (i.e., Leverage variable). Panel (c) plots the dynamic effect of RWLs on the debt maturity component of resilience (i.e., Resilience Intensive Margin variable), which measures the fraction of debt × maturity at different maturity intervals scaled by the total value of firm assets (see details in Section 2.2). We centered the Right-to-Work law in the year before its adoption and estimated a model with indicators for each year relative to that reference date. Consistent with Fortin, Lemieux, and Lloyd (2023), the sample excludes states that adopted RWLs before 2007. The regressions include industry-by-year and firm fixed effects, with standard errors clustered at the state level. Refer to the Variable List and Description table for more details about variables' definition and computation.

(a) LT debt ratio(>5Y)



(b) Leverage



(c) Resilience Intensive Margin

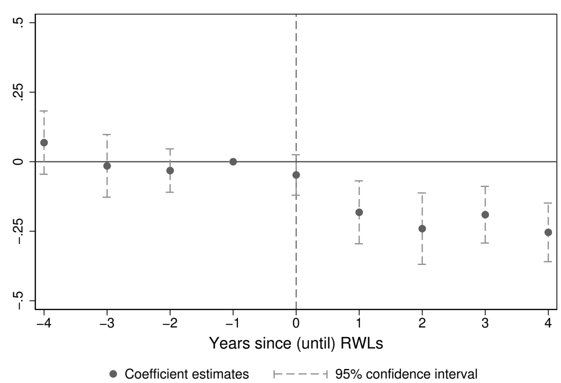
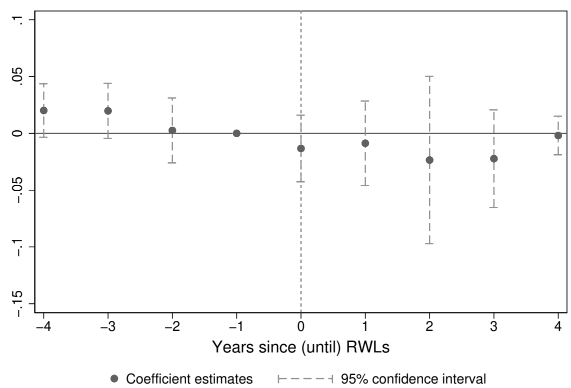
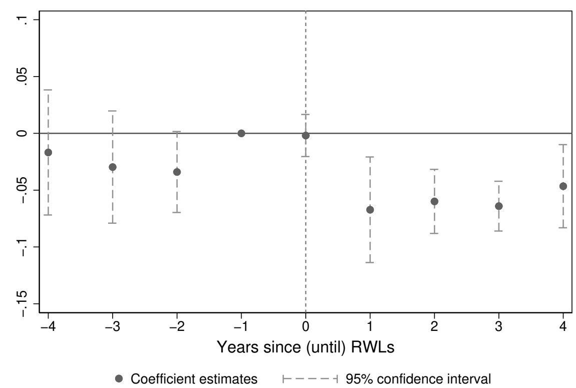


Figure 3. (Parallel trends DiD - High and Low Industry Unionization Coverage) The figure depicts the dynamic effect of RWLs using the estimation procedure outlined in Sun and Abraham (2021). Figures on the left column, (a), (c), and (e), plot the dynamic effect of RWLs estimated on firms in industries with a low union coverage. Figures on the right column, (b), (d), and (f), plot the dynamic effect of RWLs estimated on firms in industries with a high union coverage. As in Fortin, Lemieux, and Lloyd (2023), we define high-union industries using the CIC industry code; we categorize industries by using firm-level unionization activity obtained from the Union elections data to compute industry-level rates of union prevalence. We centered the Right-to-Work law in the year before its adoption and estimated a model with indicators for each year relative to that reference date. Consistent with Fortin, Lemieux, and Lloyd (2023), the sample excludes states that adopted RWLs before 2007. The regressions include industry-by-year and firm fixed effects, with standard errors clustered at the state level. Refer to the Variable List and Description table for more details about variables' definition and computation.

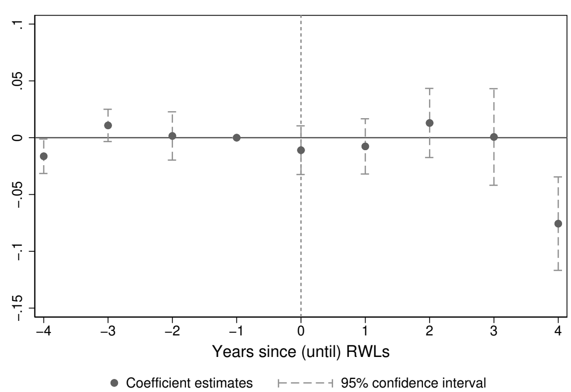
(a) Low Union - LT Debt Ratio (>5Y)



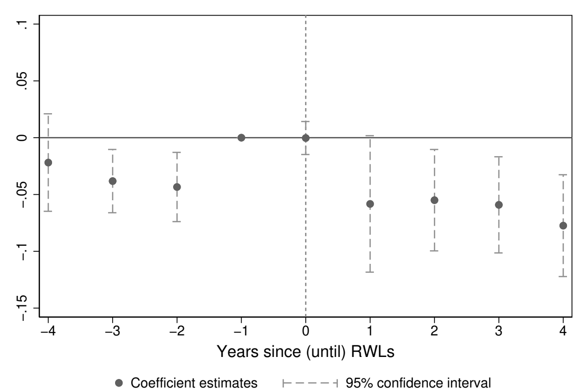
(b) High Union - LT Debt Ratio (>5Y)



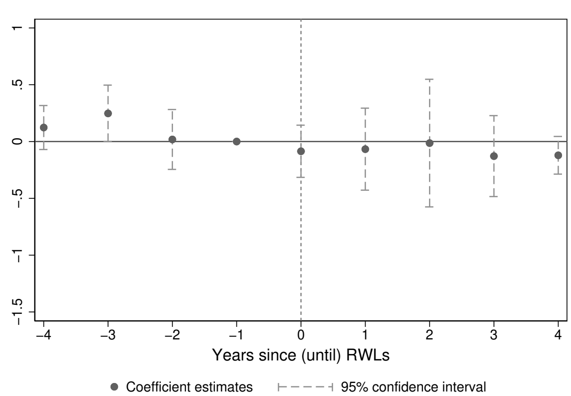
(c) Low Union - Leverage



(d) High Union - Leverage



(e) Low Union - Resilience Intensive Margin



(f) High Union - Resilience Intensive Margin

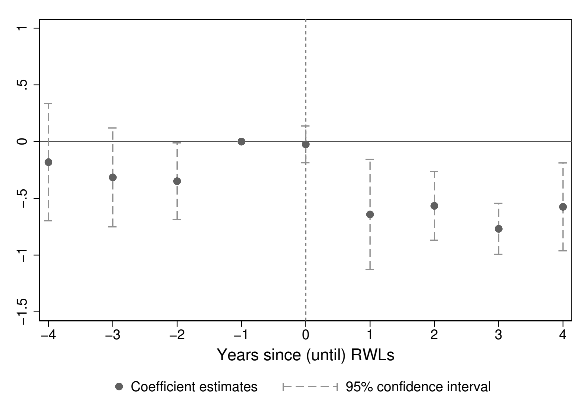
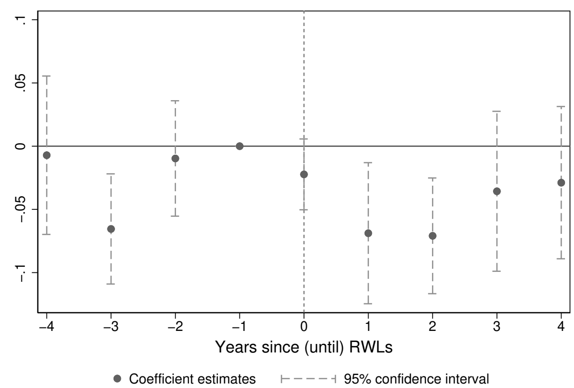
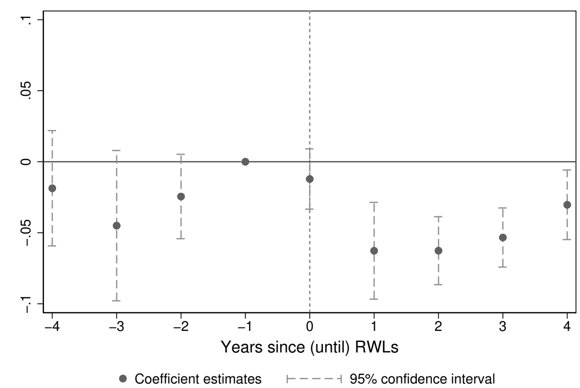


Figure 4. (Parallel trends DiD - Unionized Firms) The figure depicts the dynamic effect of RWLs using the estimation procedure outlined in Sun and Abraham (2021). Figures on the left column, (a), (c), and (e), plot the dynamic effect of RWLs estimated on a sample of unionized firms. Figures on the right column, (b), (d), and (f), plot the dynamic effect of RWLs estimated on a pooled sample of unionized firms and firms in industries with high union coverage. As in Fortin, Lemieux, and Lloyd (2023), we define high-union industries using the CIC industry code; we categorize industries by using firm-level unionization activity obtained from the Union elections data to compute industry-level rates of union prevalence. We centered the Right-to-Work law in the year before its adoption and estimated a model with indicators for each year relative to that reference date. Consistent with Fortin, Lemieux, and Lloyd (2023), the sample excludes states that adopted RWLs before 2007. The regressions include industry-by-year and firm fixed effects, with standard errors clustered at the state level. Refer to the Variable List and Description table for more details about variables' definition and computation.

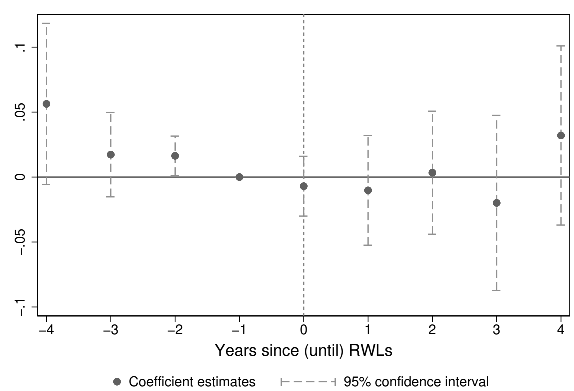
(a) Unionized - LT Debt Ratio (>5Y)



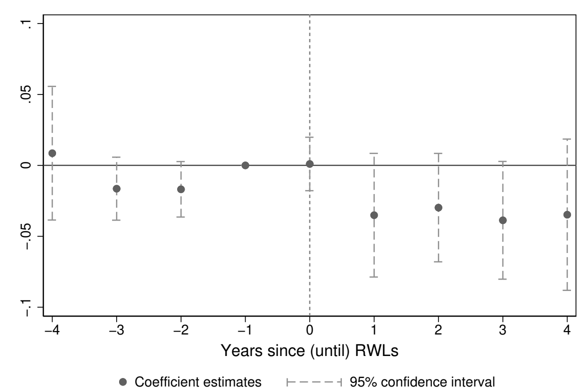
(b) Unionized or High Union Industry - LT Debt Ratio (>5Y)



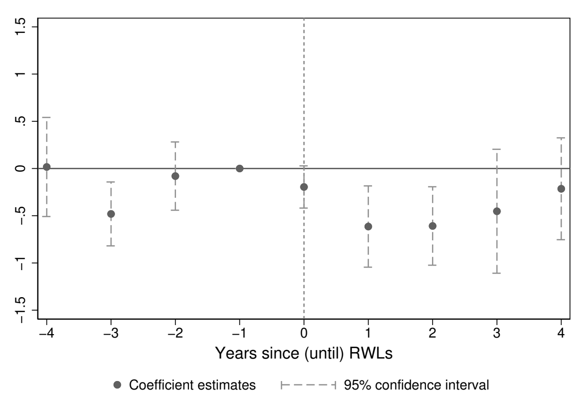
(c) Unionized - Leverage



(d) Unionized or High Union Industry - Leverage



(e) Unionized - Resilience Intensive Margin



(f) Unionized or High Union Industry - Resilience Intensive Margin

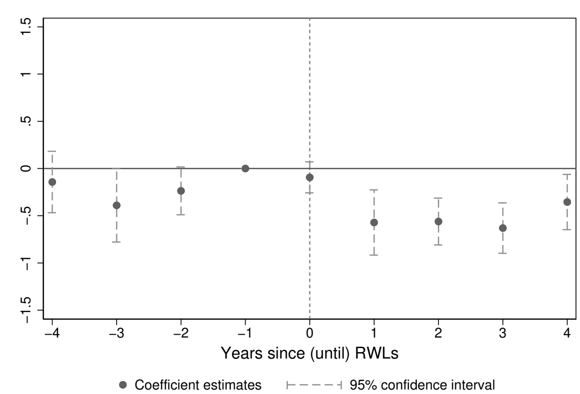


Figure 5. (Parallel trends DiD – Union memberships) The figure shows the dynamic effect of RWLs on union membership (computed as the natural logarithm of the number of union members) using the estimation procedure described in Sun and Abraham (2021). We centered the adoption of the Right-to-Work law in the year prior to its implementation and estimated a model with indicators for each year relative to that reference date. In panel (a), the model is estimated using only unions with non-missing observations within the estimation window. In panel (b), the model is estimated by replacing zero members for unions that exited the sample anytime from the RWLs adoption date onward (e.g., if a union is in the sample until time $t = +1$, then from $t = +2$ onward, union membership is recorded as zero). Consistent with Fortin, Lemieux, and Lloyd (2023), the sample excludes states that adopted RWLs before 2007. The regressions include year and union fixed effects, with standard errors clustered at the state level.

(a) Non-missing observations within estimation window

(b) Zero members for exiting unions

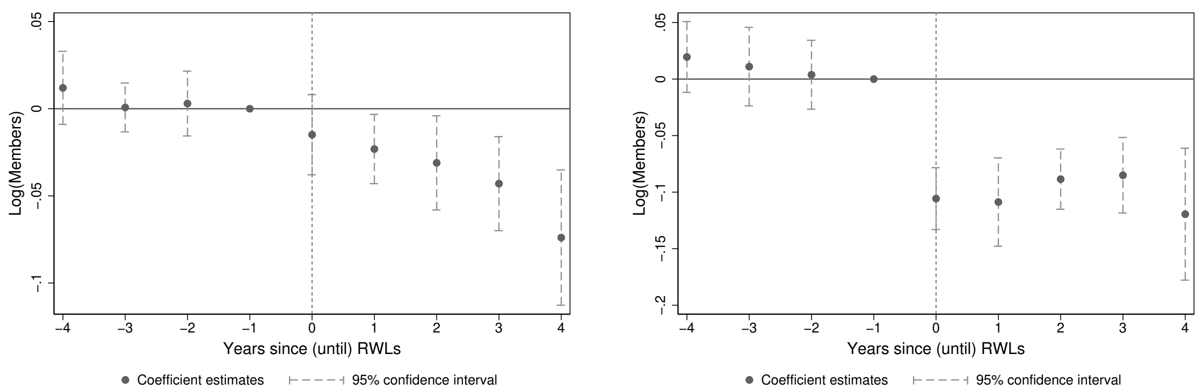


Figure 6. (Heterogeneous response in union fees after RWLs adoptions) The figure displays the coefficient estimates of the DiD model in Eqn. (4), where we interact the explanatory variable with dummies capturing heterogeneity in union fees. Unions are divided into 20 groups based on their fee levels one year before the adoption of RWLs. The Low group consists of unions with the lowest fees, while the High group includes those with the highest fees. We estimate the model using the logarithm of union fees (Panel a) and the ratio between fees and the number of union members (Panel b) as outcome variables. Each coefficient represents the sum of the baseline effect and the interaction term. Vertical lines indicate a 95% confidence interval. Consistent with Fortin, Lemieux, and Lloyd (2023), the sample excludes states that adopted RWLs before 2007. The regressions include year and union fixed effects, with standard errors clustered at the state level.

(a) Log(Fees)

(b) Fees-to-members

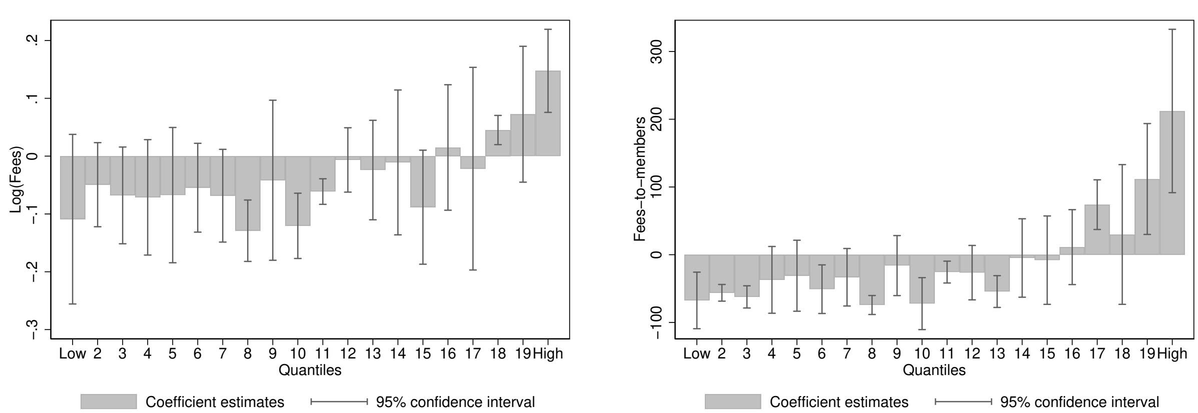
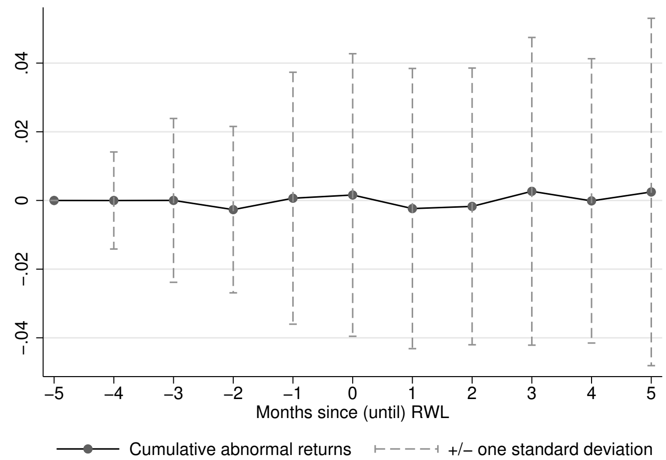


Figure 7. (Bond pricing around RWLs' adoptions) The figure plots averages and standard deviations of firms' cumulative abnormal bond returns for a five-month window around the RWLs' adoptions. Consistent with Fortin, Lemieux, and Lloyd (2023), the sample excludes states that adopted RWLs before 2007. Corporate bond data is from TRACE. Refer to the Variable List and Description table for details about variables' definition and computation.



Tables

Table 1. (Summary statistics - Compustat) The table presents summary statistics for the sample used in the difference-in-differences analysis discussed in Section 4.1. The statistics are derived from a sample of firms with complete data for the maturity and leverage variables, which are our main outcome variables. We follow the approach of Fortin, Lemieux, and Lloyd (2023) and analyze data from 2007 to 2019, excluding states that implemented RWLs laws before 2007. This sample is used to estimate the difference-in-differences specification presented in Eqn. (4). Financial variables are winsorized at the 1% tails. Refer to the Variable List and Description table for more details about variables' definition and computation.

	Mean	Std. Dev.	Min	Median	Max
	Panel A. Dependent variables				
Book leverage	0.163	0.216	0.000	0.033	0.998
LT debt ratio (>3Y)	0.097	0.161	0.000	0.000	0.989
LT debt ratio (>5Y)	0.064	0.122	0.000	0.000	0.989
Resilience Intensive Margin	0.863	1.411	0.000	0.031	10.145
	Panel B. Firm characteristics				
Total asset ($M)	3197.434	7728.518	0.361	236.269	37125.238
Total Debt ($M)	885.468	2204.452	0.000	1.169	10445.342
Firm size	5.342	2.906	-2.364	5.536	10.361
Cash	0.322	0.295	0.000	0.221	0.952
Investment	0.040	0.058	0.000	0.023	0.436
Profitability (ROA)	-0.015	0.350	-1.995	0.089	0.625
Market-to-book	2.780	3.566	0.520	1.680	23.209
Collateral	0.259	0.242	0.000	0.188	1.000
Tangibility	0.194	0.225	0.000	0.104	0.919
Inventory	0.091	0.182	0.000	0.056	2.316

Table 2. (Summary statistics – Labor organizations membership and financials) This table reports summary statistics for labor organization variables. Data is collected from the U.S. Department of Labor website: https://www.dol.gov/agencies/olms/Regs/Compliance/formspage. Labor organizations are required to file the forms LM-2 and LM-3 according to their total annual receipts. The term "*total annual receipts*" refers to all financial receipts of the labor organization during its fiscal year, regardless of the source. The form LM-2 is required for labor organizations with $250,000 or more in total annual receipts, the form LM-3 is required for labor organizations with total annual receipts of $10,000 or more, but less than $250,000 and the form LM-4 is required for labor organizations which have total annual receipts of less than $10,000. Our sample includes all labor organizations filing forms LM-2 and LM-3. We follow the approach of Fortin, Lemieux, and Lloyd (2023) and analyze data from 2007 to 2019, excluding states that implemented RWLs laws before 2007. The sample comprises 717 unique labor organizations, 13,447 union-filing pairs, and 132,088 union-filing-year observations with no missing total assets. Financial variables are winsorized at 1% tails. Refer to the Variable List and Description table for more details about variables' definition and computation.

	Mean	Std. Dev.	Min	Median	Max
Assets ($M)	1.058	3.060	0.000	0.092	19.152
Cash ($K)	423.122	1069.662	0.000	69.596	6496.515
Members	1709.454	5274.532	0.000	254.000	36083.000
Fees ($K)	541.121	1406.982	0.000	66.731	8529.291
Leverage	0.060	0.178	0.000	0.000	1.122
Cash-to-assets	0.780	0.304	0.029	0.963	1.000
Cash-to-members	591.360	998.322	0.406	262.198	6350.002
Fees-to-members	528.541	597.682	0.000	359.555	3475.877
Assets-to-members	1014.446	1820.205	1.198	384.038	11130.178
Strike funds	0.043	0.204	0.000	0.000	1.000
Fees-to-receipts	0.803	0.291	0.000	0.937	1.000

Table 3. (Debt structure response to RWLs) The table presents results from a difference-in-differences estimation, specifically Eqn. (4), which exploits staggered adoptions of RWLs at the state level. The table includes results for two measures of debt maturity. In columns (1) and (2), the results are displayed for debt with maturity longer than five years, labeled as LT debt ratio(>5Y). Columns (3) and (4) show the findings for book leverage, while columns (5) and (6) present the results for the debt maturity component of resilience (i.e., Resilience Intensive Margin variable), which measures the fraction of debt $\times$ maturity at different maturity intervals scaled by the total value of firm assets (see details in Section 2.2). Panel A reports baseline estimates, while Panel B regression specifications are based on our theoretical model and condition on leverage or maturity, according to each comparative static. We follow the approach of Fortin, Lemieux, and Lloyd (2023) and analyze data from 2007 to 2019, excluding states that implemented RWLs laws before 2007. Some specifications include financial controls such as Size, Profitability (ROA), Collateral, and Market-to-book ratio. Refer to the Variable List and Description table for more details about variables' definition and computation. All regressions include two-digit SIC industry-by-year and firm fixed effects, with standard errors clustered at the state level. $***$, $**$, and $*$ indicate significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	LT debt ratio(>5Y)		Book leverage		Resilience Intensive Margin	
A. Unconditional Specification						
RWL	-0.020***	-0.023***	-0.029*	-0.030*	-0.232**	-0.246**
	(0.007)	(0.008)	(0.015)	(0.016)	(0.090)	(0.094)
B. Theory-driven Specification						
RWL	-0.011***	-0.011***	-0.017	-0.016	-0.106***	-0.096**
	(0.003)	(0.004)	(0.011)	(0.012)	(0.035)	(0.035)
Book Leverage	0.328***	0.391***			4.292***	5.000***
	(0.021)	(0.022)			(0.237)	(0.180)
LT debt ratio(>5Y)			0.620***	0.611***		
			(0.050)	(0.061)		
Firm controls	No	Yes	No	Yes	No	Yes
Obs.	15,200	12,507	15,200	12,507	15,200	12,507
Cluster	28	28	28	28	28	28

Table 4. (Debt structure response to RWLs - Heterogeneity by industry unionization) The table presents results from a difference-in-differences estimation, specifically Eqn. (4), which exploits staggered adoptions of RWLs at the state level. The table includes results for long-term debt ratio (i.e., LT debt ratio(>5Y) variable), book leverage, and the debt maturity component of resilience (i.e., Resilience Intensive Margin variable), which measures the fraction of debt × maturity at different maturity intervals scaled by the total value of firm assets (see details in Section 2.2). As in Fortin, Lemieux, and Lloyd (2023), we define high-union industries using the CIC industry code; we categorize industries by using firm-level unionization activity obtained from the Union elections data to compute industry-level rates of union prevalence. Panel A reports baseline estimates, while Panel B regression specifications are based on our theoretical model and condition on leverage or maturity, according to each comparative static. We follow the approach of Fortin, Lemieux, and Lloyd (2023) and analyze data from 2007 to 2019, excluding states that implemented RWLs laws before 2007. Some specifications include financial controls such as Size, Profitability (ROA), Collateral, and Market-to-book ratio. Refer to the Variable List and Description table for more details about variables' definition and computation. All regressions include industry-by-year and firm fixed effects, with standard errors clustered at the state level. ∗∗∗, ∗∗, and ∗ indicate significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Baseline		High		Medium		Low		Medium + Low	
A. Unconditional Specification										
	A.1 – LT debt ratio(>5Y)									
RWL	-0.020***	-0.023***	-0.037	-0.045**	-0.017	-0.019*	-0.023	-0.021	-0.018*	-0.019**
	(0.007)	(0.008)	(0.030)	(0.018)	(0.011)	(0.010)	(0.017)	(0.018)	(0.009)	(0.009)
	A.2 – Book Leverage									
RWL	-0.029*	-0.030*	-0.012	-0.015	-0.036*	-0.037*	-0.013	-0.004	-0.032*	-0.032*
	(0.015)	(0.016)	(0.016)	(0.015)	(0.019)	(0.019)	(0.022)	(0.020)	(0.019)	(0.018)
	A.3 – Resilience Intensive Margin									
RWL	-0.232**	-0.246**	-0.367	-0.448**	-0.220*	-0.225*	-0.183	-0.134	-0.214*	-0.212*
	(0.090)	(0.094)	(0.283)	(0.178)	(0.129)	(0.125)	(0.194)	(0.194)	(0.115)	(0.108)
B. Theory-driven Specification										
	B.1 – LT debt ratio(>5Y)									
RWL	-0.011***	-0.011***	-0.031	-0.039**	-0.005	-0.004	-0.019	-0.020	-0.007*	-0.007*
	(0.003)	(0.004)	(0.025)	(0.017)	(0.005)	(0.004)	(0.014)	(0.017)	(0.004)	(0.004)
	B.2 – Book Leverage									
RWL	-0.017	-0.016	0.008	0.009	-0.024*	-0.024*	-0.001	0.006	-0.021	-0.019
	(0.011)	(0.012)	(0.011)	(0.015)	(0.013)	(0.013)	(0.018)	(0.019)	(0.013)	(0.013)
	B.3 – Resilience Intensive Margin									
RWL	-0.106***	-0.096**	-0.299	-0.369**	-0.060	-0.040	-0.123	-0.113	-0.069	-0.054
	(0.035)	(0.035)	(0.214)	(0.152)	(0.050)	(0.041)	(0.159)	(0.187)	(0.041)	(0.041)
Firm controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Obs.	15,200	12,507	1,434	1,258	9,613	8,042	3,309	2,796	12,943	10,856
Cluster	28	28	23	22	27	27	26	26	28	28

Table 5. (Debt structure response to RWLs - Heterogeneity by built-in resilience) This table presents the results from estimating the cross-sectional model specified in Eqn. (6). We interact our main explanatory variable, RWL, with firm-level measures of tangibility, collateral, and inventory, all measured in the year prior to the implementation of Right-to-Work laws. We follow the approach of Fortin, Lemieux, and Lloyd (2023) and analyze data from 2007 to 2019, excluding states that implemented RWLs laws before 2007. Some specifications include financial controls such as Size, Profitability (ROA), and Market-to-book ratio. Refer to the Variable List and Description table for more details about variables' definition and computation. All regressions include two-digit SIC state-industry-year and firm fixed effects, with standard errors clustered at the state level. ***, **, and * indicate significance at the 1%, 5%, and 10% level, respectively. Sample means for tangibility, collateral, and inventory are 0.19, 0.26, and 0.09, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	LT debt ratio(>5Y)		Book leverage		Resilience Intensive Margin	
A. Tangibility						
RWL × Tangibility	0.077*	0.121**	0.054	0.111	1.017***	1.504***
	(0.043)	(0.046)	(0.053)	(0.089)	(0.347)	(0.425)
B. Collateral						
RWL × Collateral	0.045	0.075***	0.017	0.049	0.530	0.835**
	(0.026)	(0.022)	(0.051)	(0.061)	(0.332)	(0.309)
C. Inventory						
RWL × Inventory	0.200**	0.248***	0.120	0.111	1.827	2.179*
	(0.087)	(0.068)	(0.247)	(0.246)	(1.315)	(1.163)
Firm controls	No	Yes	No	Yes	No	Yes
Obs.	12,937	10,476	12,937	10,476	12,937	10,476
Cluster	22	22	22	22	22	22

Table 6. (DiD: Effects of RWLs on labor organizations memberships and financials) The table presents the results of the difference-in-differences estimation, Eqn. (4), using labor organization characteristics as outcome variables. The main explanatory variable, RWL, is an indicator at the state level that takes a value of one from the year a state introduces RWLs onward, and zero otherwise. We follow the approach of Fortin, Lemieux, and Lloyd (2023) and analyze data from 2007 to 2019, excluding states that implemented RWLs laws before 2007. Panel A displays the results of the baseline specification for each outcome variable. Panel B presents the results of the cross-sectional analysis, where the RWL indicator interacts with the natural logarithm of union fees in the year before the law is adopted. Labor organizations' data is sourced from Form LM-2 and LM-3 filed with the Office of Labor-Management Standards (OLMS) and maintained by the U.S. Department of Labor. Panel F of the Variable List and Description table provides definitions for all outcome variables. All regressions include two-digit SIC industry-by-year and firm fixed effects, with standard errors clustered at the state level. $***$, $**$, and $*$ indicate significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Log(Members)	Log(Fees)	Log(Assets)	Log(Cash)	Leverage	Cash-to-members	Fees-to-members	Fees-to-receipts	Strike funds
	Panel A: RWL Baseline Specification								
RWL	-0.035**	-0.037*	-0.023	-0.024	0.001	5.397	-11.125	-0.000	-0.005
	(0.013)	(0.021)	(0.016)	(0.032)	(0.002)	(15.702)	(7.009)	(0.004)	(0.004)
Obs.	127,467	122,709	128,167	127,827	127,850	127,282	127,288	129,848	45,110
Cluster	28	28	28	28	28	28	28	28	28
	Panel B: Cross-sectional using Pre-RWL Log(Fees)								
RWL	-0.088*	-0.253***	-0.102	-0.118	0.022***	-99.645	-211.731***	-0.012	-0.014
	(0.043)	(0.056)	(0.080)	(0.075)	(0.007)	(73.584)	(35.298)	(0.007)	(0.031)
RWL × Pre-RWL fees	0.005	0.020***	0.008	0.009	-0.002**	9.737	18.564***	0.001	0.001
	(0.003)	(0.004)	(0.006)	(0.007)	(0.001)	(7.965)	(3.263)	(0.001)	(0.002)
Obs.	124,599	120,516	125,191	124,871	124,884	124,418	124,447	126,786	44,476
Cluster	28	28	28	28	28	28	28	28	28

Part

Internet Appendix

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A Proofs

A.1 Proof of Proposition 1

Game with Finite Horizon. We first characterize the equilibrium when t^* is finite. We consider the case $t^* = \infty$ at the end of this section. When $t^* < \infty$, the equilibrium is characterized by backward induction, starting from the last period before the firm goes bankrupt. The party making the last offer extracts all of the remaining surplus, i.e., $\delta^{t^*} - D$ (any offer that would leave the party making the offer a lower fraction of surplus would be suboptimal). The party receiving the offer always accepts it, as this party is indifferent between the offer and the bankruptcy payoff of 0.

Let $v_i(x, t^*)$ denote player i's expected payoff from negotiations if an agreement was struck at time x, when t^* is the maximal length of negotiations, with $i \in \{s, w\}$. Since w makes an offer with probability α and s with probability $1 - \alpha$, we have:

$$v_s(t^*, t^*) = (1-\alpha)\left(\delta^{t^*} - D\right); \;\; v_w(t^*, t^*) = \alpha\left(\delta^{t^*} - D\right).$$

Continuing our way backward, the previous round of negotiations (i.e., at time $t^* - 1$) follows the same logic. The party making the offer extracts as much surplus as possible, which implies making an offer that makes the party receiving the offer indifferent between accepting or refusing it. If s makes the offer y_{t^*-1}, this is such that $\delta^{t^*-1} - D - y_{t^*-1} = \delta_w \alpha\left(\delta^{t^*} - D\right)$ and, thus, $y_{t^*-1} = \delta^{t^*-1} - D - \delta_w \alpha\left(\delta^{t^*} - D\right)$. Similarly, w's offer would be $y_{t^*-1} = \delta_s(1-\alpha)\left(\delta^{t^*} - D\right)$.

It follows that we have:

$$\begin{aligned} v_s(t^*-1, t^*) &= (1-\alpha)\left[\delta^{t^*-1} - D - \delta_w v_w(t^*, t^*)\right] + \alpha\delta_s v_s(t^*, t^*) \\ &= (1-\alpha)\left(\delta^{t^*-1} - D\right) - (1-\alpha)\delta_w v_w(t^*, t^*) + \alpha\delta_s v_s(t^*, t^*) \\ &= (1-\alpha)\left(\delta^{t^*-1} - D\right) + \Delta(t^*); \end{aligned}$$

$$v_w(t^*-1, t^*) = \alpha\left(\delta^{t^*-1} - D\right) - \Delta(t^*),$$

where $\Delta(t^*) \equiv (1-\alpha)\alpha(\delta_s - \delta_w)\left(\delta^{t^*} - D\right)$.

Going one more period backward, we have:

$$\begin{aligned}
v_s\left(t^*-2,t^*\right) &= (1-\alpha)\left[\delta^{t^*-2}-D-\delta_w v_w\left(t^*-1,t^*\right)\right]+\alpha\delta_s v_s\left(t^*-1,t^*\right)\\
&= (1-\alpha)\left(\delta^{t^*-2}-D\right)-(1-\alpha)\,\delta_w\left[\alpha\left(\delta^{t^*-1}-D\right)-\Delta\left(t^*\right)\right]\\
&\quad +\alpha\delta_s\left[(1-\alpha)\left(\delta^{t^*-1}-D\right)+\Delta\left(t^*\right)\right]\\
&= (1-\alpha)\left(\delta^{t^*-2}-D\right)-\delta_w\,(1-\alpha)\,\alpha\left(\delta^{t^*-1}-D\right)\\
&\quad +\delta_s\alpha\,(1-\alpha)\left(\delta^{t^*-1}-D\right)+\left[(1-\alpha)\,\delta_w+\alpha\delta_s\right]\Delta\left(t^*\right)\\
&= (1-\alpha)\left(\delta^{t^*-2}-D\right)+\Delta\left(t^*-1\right)+\left[(1-\alpha)\,\delta_w+\alpha\delta_s\right]\Delta\left(t^*\right);
\end{aligned}$$

$$v_w\left(t^*-2,t^*\right) = \alpha\left(\delta^{t^*-2}-D\right)-\Delta\left(t^*-1\right)-\left[(1-\alpha)\,\delta_w+\alpha\delta_s\right]\Delta\left(t^*\right),$$

where $\Delta\left(t^*-1\right)\equiv(1-\alpha)\,\alpha\left(\delta_s-\delta_w\right)\left(\delta^{t^*-1}-D\right)$.

Following the same logic, we obtain:

$$\begin{aligned}
v_s\left(t^*-3,t^*\right) &= (1-\alpha)\left[\delta^{t^*-3}-D-\delta_w v_w\left(t^*-2,t^*\right)\right]+\alpha\delta_s v_s\left(t^*-2,t^*\right)\\
&= (1-\alpha)\left(\delta^{t^*-3}-D\right)-(1-\alpha)\,\delta_w\left\{\alpha\left(\delta^{t^*-2}-D\right)-\Delta\left(t^*-1\right)-\left[(1-\alpha)\,\delta_w+\alpha\delta_s\right]\Delta\left(t^*\right)\right\}\\
&\quad +\alpha\delta_s\left\{(1-\alpha)\left(\delta^{t^*-2}-D\right)+\Delta\left(t^*-1\right)+\left[(1-\alpha)\,\delta_w+\alpha\delta_s\right]\Delta\left(t^*\right)\right\}\\
&= (1-\alpha)\left(\delta^{t^*-3}-D\right)+\Delta\left(t^*-2\right)+\left[(1-\alpha)\,\delta_w+\alpha\delta_s\right]\Delta\left(t^*-1\right)\\
&\quad +\left[(1-\alpha)\,\delta_w+\alpha\delta_s\right]^2\Delta\left(t^*\right);
\end{aligned}$$

$$\begin{aligned}
v_w\left(t^*-3,t^*\right) &= \alpha\left(\delta^{t^*-3}-D\right)-\Delta\left(t^*-2\right)-\left[(1-\alpha)\,\delta_w+\alpha\delta_s\right]\Delta\left(t^*-1\right)\\
&\quad -\left[(1-\alpha)\,\delta_w+\alpha\delta_s\right]^2\Delta\left(t^*\right),
\end{aligned}$$

where $\Delta\left(t^*-2\right)\equiv(1-\alpha)\,\alpha\left(\delta_s-\delta_w\right)\left(\delta^{t^*-2}-D\right)$.

Continuing the sequence until time 0, we have:

$$v_s\left(0,t^*>0\right)=(1-\alpha)\,(1-D)+(1-\alpha)\,\alpha\left(\delta_s-\delta_w\right)\sum_{j=1}^{t^*}\left(\delta^j-D\right)\left[(1-\alpha)\,\delta_w+\alpha\delta_s\right]^{j-1}, \tag{7}$$

$v_s\left(0,0\right)=(1-\alpha)\,(1-D)$, and $v_w(0,t^*)=1-D-v_s\left(0,t^*\right)$ for $t^*\geq 0$.

Since all offers players make in equilibrium are accepted, an agreement is reached immediately (i.e., at time $t = 0$) along the equilibrium path. $v_s(0, t^*)$ thus corresponds to s's expected share of surplus in equilibrium, that is, $v_s(0, t^*) = \mathbb{E}[y_0^*]$. The exact value of the equilibrium offer y_0^* depends on which player is selected to make the first offer. If $t^* = 0$, we have $y_0^* = 1 - D$ if s makes the offer, and $y_0^* = 0$ otherwise. If $t^* > 0$, we have $y_0^* = 1 - D - \delta_w v_w(1, t^*)$ if s makes the offer, and $y_0^* = \delta_s v_s(1, t^*)$ otherwise, where

$$v_s(1, t^* > 0) = (1-\alpha)(\delta - D) + (1-\alpha)\alpha(\delta_s - \delta_w)\sum_{j=2}^{t^*}\left(\delta^j - D\right)[(1-\alpha)\delta_w + \alpha\delta_s]^{j-1}, \tag{8}$$

and $v_w(1, t^* > 0) = \delta - D - v_s(1, t^* > 0)$.

Game with Infinite Horizon. The firm approaches an infinitely resilient debt structure, i.e., $t^* \to \infty$, when $(D, T) \to (0, \infty)$. Notice that $v_s(0, t^*)$ corresponds to $\mathbb{E}[y_0^*]$ in equilibrium. Taking the limit for $(D, T) \to (0, \infty)$ of the expression for $v_s(0, t^*)$ in Eqn. (7) yields:

$$\begin{aligned}\lim_{(D,T)\to(0,\infty)} v_s(0, t^*) &= 1 - \alpha + (1-\alpha)\alpha(\delta_s - \delta_w)\delta \lim_{t^*\to\infty}\sum_{j=1}^{t^*}\delta^{j-1}[(1-\alpha)\delta_w + \alpha\delta_s]^{j-1} \\ &= \frac{(1-\alpha)(1-\delta\delta_w)}{1 - \alpha\delta\delta_s - (1-\alpha)\delta\delta_w}. \end{aligned}\tag{9}$$

Next, we show that the expression for $v_s(0, t^*)$ in Eqn. (9) is the same we obtain when $D = 0$ and there is no time limit to negotiations (that is, $t^* = \infty$). It follows that the equilibrium expressions described above converge to their equivalent in the game with infinite horizon as $t^* \to \infty$.

The construction of the equilibrium with infinite horizon is the same as in the random-proposers model in Muthoo (1999) (Section 7.2.4), so we defer to their manuscript for the proof of equilibrium uniqueness. The equilibrium strategies here are stationary, meaning that each player always makes the same offer whenever is its turn to make one. Since the first offer is always accepted, an agreement is reached immediately on the equilibrium path.

Since $D = 0$, if an agreement is reached at time t, the firm's surplus is δ_t. Let y^i describes the fraction of δ_t that goes to s, and $1 - y^i$ the fraction to w, when player $i \in \{s, w\}$ makes the offer. In equilibrium, each player offers a partition of surplus that leaves the other player indifferent between accepting or rejecting the offer. It follows that the equilibrium values of y^s and y^w solve the following system of equations:

$$1 - y^s = \delta_w \delta[\alpha(1 - y^w) + (1 - \alpha)(1 - y^s)]; \tag{10}$$

$$y^w = \delta_s \delta[\alpha y^w + (1 - \alpha) y^s]. \tag{11}$$

It is worth stressing that, since the equilibrium strategies are stationary, the system of Eqns. (10) and (11) characterizes the equilibrium offers at any period, not just those that players make at time $t = 0$. Consider a generic time t. The players' offers at time t are such that $\delta^t(1-y^s) = \delta_w \delta^{t+1}[\alpha(1-y^w) + (1-\alpha)(1-y^s)]$ and $\delta^t y^w = \delta_s \delta^{t+1}[\alpha y^w + (1-\alpha) y^s]$, which simplify to Eqns. (10) and (11), respectively. The solution to Eqns. (10) and (11) is $y^s = \frac{(1-\alpha\delta\delta_s)(1-\delta\delta_w)}{1-\alpha\delta\delta_s-(1-\alpha)\delta\delta_w}$ and $y^w = \frac{(1-\alpha)\delta\delta_s(1-\delta\delta_w)}{1-\alpha\delta\delta_s-(1-\alpha)\delta\delta_w}$.

Since w makes the first offer with probability α, we have:

$$\mathbb{E}[y_0^*] = \alpha y^w + (1-\alpha) y^s = \frac{(1-\alpha)(1-\delta\delta_w)}{1 - \alpha\delta\delta_s - (1-\alpha)\delta\delta_w}. \tag{12}$$

A.2 Proof of Proposition 2

We prove Proposition 2 in two steps. Step One shows that $\mathbb{E}[u_s^*]$ always increases with T. Step Two proves that, depending on the model parameters, $\mathbb{E}[u_s^*]$ may increase or decrease with D.

Step One

Let $\mathbb{E}[u_s^*(T)]$ denote s's expected equilibrium payoff as a function of debt maturity T, holding fixed the value of leverage D, and consider two consecutive values of T, say T' and $T'+1$.

Recall that $t^* = \min\{T, \bar{t}\}$ if $D > 0$. If $T' + 1 > \bar{t}$, we have $t^* = \bar{t}$ at both T' and $T'+1$. In this case, an increase in T does not affect t^* and, thus, $\mathbb{E}[u_s^*(T)]$ does not depend on T. If $T' + 1 \leq \bar{t}$, we have $t^* = T$ at both T' and $T'+1$. Using the expression for $\mathbb{E}[y_0^*]$ in Eqn. (1), we can then write

$$\mathbb{E}[u_s^*(T'+1)] - \mathbb{E}[u_s^*(T')] = (1-\alpha)\,\alpha\,(\delta_s - \delta_w)\left(\delta^{T'+1} - D\right)[(1-\alpha)\,\delta_w + \alpha\delta_s]^{T'}. \tag{13}$$

Note that $T' + 1 \leq \bar{t}$ implies $\delta^{T'+1} \geq D$, with strict inequality if either $T' + 1 < \bar{t}$ or $\delta^{\bar{t}} > D$. Since $\delta_s > \delta_w$, the expression above is then always positive. It follows that $\mathbb{E}[u_s^*]$ always strictly increases with T for $T \leq \bar{t} - 1$, and it does not change with T for $T > \bar{t} - 1$. Finally, since $\bar{t}$ is such that $\delta^{\bar{t}} \geq D > \delta^{\bar{t}+1}$, the inequality $T \leq \bar{t} - 1$ holds if and only if $\delta^{T+1} \geq D$.

Step Two

Let $\mathbb{E}[u_s^*(D)]$ denote s's expected equilibrium payoff as a function of leverage D. We consider three different levels of leverage, $D \in \{0, D', D''\}$, with $\delta > D'' > D' > 0$, and hold fixed the debt maturity at $T = 1$. It follows that, when $D > 0$, the firm goes bankrupt if a deal is not reached within two rounds of negotiations (i.e., $t^* = 1$). When $D = 0$, since the project is instead fully funded by equity, the firm is infinitely resilient to negotiations (i.e., $t^* = \infty$).

Using the expression for $\mathbb{E}[y_0^*]$ in Eqn. (1), we can write:

$$\begin{aligned}
\mathbb{E}[u_s^*(D \in \{D', D''\})] &= (1-\alpha)[1 - D + \alpha(\delta_s - \delta_w)(\delta - D)] - k + D; \\
\mathbb{E}[u_s^*(0)] &= \frac{(1-\alpha)(1-\delta\delta_w)}{1 - \alpha\delta\delta_s - (1-\alpha)\delta\delta_w} - k.
\end{aligned}$$

First, we compare $\mathbb{E}[u_s^*(D'')]$ and $\mathbb{E}[u_s^*(D')]$. We can write their difference as $\mathbb{E}[u_s^*(D'')] - \mathbb{E}[u_s^*(D')] = \alpha^2(D'' - D') > 0$, so we have $\mathbb{E}[u_s^*(D'')] > \mathbb{E}[u_s^*(D')]$ for any value of (δ_s, δ_w). Intuitively, the length of negotiations is the same for D'' and D', but D'' reduces the surplus exposed to the wage negotiations and, therefore, benefits s.

Second, we compare $\mathbb{E}[u_s^*(D'')]$ and $\mathbb{E}[u_s^*(0)]$. For simplicity, set $\delta_s = 1$ and $\delta_w = 0$:

$$\mathbb{E}[u_s^*(0)] - \mathbb{E}[u_s^*(D'')] = \frac{1-\alpha}{1-\alpha\delta} - (1-\alpha)[1 - D'' + \alpha(\delta - D'')] + D''. \tag{14}$$

If $D'' \leq \frac{\delta^2}{2-\delta}$, the expression above is positive for any $\alpha \in \left(0, \frac{1}{2}\right)$, so we have $\mathbb{E}[u_s^*(0)] > \mathbb{E}[u_s^*(D'')]$. It follows that $\mathbb{E}[u_s^*]$ is generally nonmonotone in D.

A.3 Proof of Proposition 3

We prove Proposition 3 in two steps. Step One demonstrates that, holding fixed D, the value of T that maximizes $\mathbb{E}[u_s^*]$ always increases with α. Step Two proves that, holding fixed T, the value of D that maximizes $\mathbb{E}[u_s^*]$ may instead increase or decrease with α.

Step One

Note that s has to choose a value of T only if $D > 0$, so we consider $D \in (0, k]$ in what follows. For a given D, s chooses T to maximize its expected total payoff $\mathbb{E}[u_s^*] = \mathbb{E}[y_0^*] - \kappa(k - d)$, where:

$$\mathbb{E}[y_0^*] = (1-\alpha)(1-D) + (1-\alpha)\,\alpha\,(\delta_s - \delta_w)\sum_{j=1}^{t^*}\left(\delta^j - D\right)\left[(1-\alpha)\,\delta_w + \alpha\delta_s\right]^{j-1}, \tag{15}$$

if $t^* > 0$, and $\mathbb{E}[y_0^*] = (1-\alpha)(1-D)$ if $t^* = 0$.

In what follows, we consider a fixed value of D and $\alpha \in [0, 1/2)$. Let $\mathbb{E}[y_0^*(T)]$, $d(T)$, and $t^*(T)$ denote, respectively, the values of $\mathbb{E}[y_0^*]$, d, and t^* as functions of T. Notice that $\mathbb{E}[y_0^*(T)]$ and $t^*(T)$ increase with T, while $d(T)$ decreases with T. Let T' denote s's optimal choice of T when w's bargaining power is $\alpha = \alpha'$. Since T belongs to the set of positive integers lower than $\overline{T} < \infty$, and $\mathbb{E}[u_s^*]$ is finite for any value of T, T' always exists. T' is such that, for any $T \leq \overline{T}$, we must have $\mathbb{E}[y_0^*(T')] - \kappa(k - d(T')) \geq \mathbb{E}[y_0^*(T)] - \kappa(k - d(T))$, which simplifies to

$$\mathbb{E}[y_0^*(T')] - \mathbb{E}[y_0^*(T)] \geq \kappa[d(T) - d(T')]. \tag{16}$$

First, we show that s's choice of T never decreases with α. Consider $T < T'$; we have

$$\mathbb{E}[y_0^*(T')] - \mathbb{E}[y_0^*(T)] = (1-\alpha')\,\alpha'\,(\delta_s - \delta_w)\sum_{j=t^*(T)}^{t^*(T')}\left(\delta^j - D\right)\left[(1-\alpha')\,\delta_w + \alpha'\delta_s\right]^{j-1}, \tag{17}$$

if $t^*(T) < t^*(T')$, and 0 if $t^*(T) = t^*(T')$.

The expression in Eqn. (17), which corresponds to the left-hand side of Inequality (16) when $T < T'$, increases with α' for any $\alpha' \in [0, 1/2)$. The right-hand side of Inequality (16) instead does not change with α'. Therefore, Inequality (16) continues to hold when we consider a level of α higher than α'. It follows that s continues to prefer T' compared to any $T < T'$.

Next, we show that s's choice of T may instead increase with α. Consider $T > T'$; we have

$$\mathbb{E}[y_0^*(T')] - \mathbb{E}[y_0^*(T)] = -(1-\alpha')\,\alpha'\,(\delta_s - \delta_w)\sum_{j=t^*(T')}^{t^*(T)}\left(\delta^j - D\right)\left[(1-\alpha')\,\delta_w + \alpha'\delta_s\right]^{j-1}, \tag{18}$$

if $t^*(T) > t^*(T')$, and 0 if $t^*(T) = t^*(T')$.

The expression in Eqn. (18), which corresponds to the left-hand side of Inequality (16) when $T > T'$, decreases with α' for any $\alpha' \in [0, 1/2)$. Similar to before, the right-hand side of Inequality

(16) does not change with α'. Therefore, the inequality may no longer hold when we consider a level of α higher than α'. It follows that s may prefer some $T > T'$ after the increase in α.

Step Two

For a given T, s chooses D to maximize its expected total payoff $\mathbb{E}[u_s^*] = \mathbb{E}[y_0^*] - \kappa(k-d)$, where $\mathbb{E}[y_0^*]$ is as described in Eqn. (15). In what follows, we consider a fixed value of T and $\alpha \in [0, 1/2)$. Let $\mathbb{E}[u_s^*(D)]$, $\mathbb{E}[y_0^*(D)]$, $d(D)$, and $t^*(D)$ denote, respectively, the values of $\mathbb{E}[u_s^*]$, $\mathbb{E}[y_0^*]$, d, and t^* as functions of D. Notice that $\mathbb{E}[y_0^*(D)]$ and $t^*(D)$ decrease with D.

First, we prove that an optimal choice of D always exists. Note that, as D goes from 0 to $\underline{D}$, with $\underline{D}$ sufficiently close to 0, t^* goes from ∞ to $\overline{T} < \infty$. Since $\mathbb{E}[y_0^*]$ strictly increases with t^* and decreases with D, we have $\mathbb{E}[y_0^*(0)] > \mathbb{E}[y_0^*(\underline{D})]$. Notice also that d is continuous in D, and $d = D$ at $D = 0$. It follows that there always exists $\underline{D}$ sufficiently close to 0 such that $\mathbb{E}[y_0^*(0)] - \kappa > \mathbb{E}[y_0^*(\underline{D})] - \kappa(k - d(\underline{D}))$, so that s prefers $D = 0$ to $D = \underline{D}$. Now consider $D \in [\underline{D}, k]$. t^* is non-continuous in D at all the values of D such that $D = \delta^t$ with $t < T$. For such values of t and T, as D approaches δ^t from the right, we go from $t^* = t - 1$ to $t^* = t$. However, $\mathbb{E}[y_0^*]$ (and so $\mathbb{E}[u_s^*]$) is still a continuous functions of D as, when $D = \delta^t$, we have $\sum_{j=1}^{t} \left(\delta^j - D\right) [(1-\alpha)\,\delta_w + \alpha\delta_s]^{j-1} = \sum_{j=1}^{t-1} \left(\delta^j - D\right) [(1-\alpha)\,\delta_w + \alpha\delta_s]^{j-1}$. Since $\mathbb{E}[u_s^*]$ is continuous in D for $D \in [\underline{D}, k]$, and $D \in [\underline{D}, k]$ is a closed interval, $\widehat{D} = \arg\max_{D \in [\underline{D}, k]} \mathbb{E}[u_s^*]$ always exists (by the Extreme value theorem). It follows that s chooses $D = 0$ if $\mathbb{E}[u_s^*(0)] \geq \mathbb{E}[u_s^*(\widehat{D})]$, and $D = \widehat{D}$ otherwise.

Next, we prove that the optimal value of D may increase or decrease with α. For simplicity, set $T = 0$ (so that there can be only one round of negotiations if $D > 0$), $\delta_s = 1$, $\delta_w = 0$, and $D = d$ for any value of D. First, consider $\alpha = 0$. When $\alpha = 0$ and $D = d$, we have $\mathbb{E}[u_s^*] = 1 - D - \kappa(k - D)$ for any value of D. Since $\kappa > 1$, $\mathbb{E}[u_s^*]$ is maximized at $D = k$ when $\alpha = 0$.

Now consider strictly positive values of α. We have $t^*(0) = \infty$ and, thus, $\mathbb{E}[u_s^*(0)] = \frac{1-\alpha}{1-\alpha\delta} - \kappa k$. Since $T = 0$, we have instead $t^*(D > 0) = 0$ and, thus, $\mathbb{E}[u_s^*(D > 0)] = (1-\alpha)(1-D) - \kappa(k - D)$. Since $\mathbb{E}[u_s^*(D > 0)]$ strictly increases with D, s chooses between the two extreme values $D = 0$ and $D = k$. To simplify the exposition, let $\kappa \to 1$, so we can neglect κ in the expressions for $\mathbb{E}[u_s^*(0)]$

and $\mathbb{E}[u_s^*(k)]$. We have $\mathbb{E}[u_s^*(0)] > \mathbb{E}[u_s^*(k)]$ for any $\alpha \in (0, \frac{1}{2})$ if $\delta \in \left(\frac{2k}{k+1}, 1\right)$, and only for $\alpha \in (0, \overline{\alpha})$ if $\delta \in \left(k, \frac{2k}{k+1}\right)$, where $\overline{\alpha} = \frac{1}{2}\left[\sqrt{\frac{(\delta-k)^2}{\delta^2(1-k)^2}} + \frac{\delta-k}{\delta(1-k)}\right] < \frac{1}{2}$. It follows that, when $\delta \in \left(k, \frac{2k}{k+1}\right)$, s's optimal choice of D goes from k to 0 when α goes from 0 to $\alpha'' < \overline{\alpha}$, and then from 0 to k again when α goes from α'' to $\alpha''' > \overline{\alpha}$. Hence, s's choice of D may increase or decrease with α.

A.4 Joint Responses

In this section, we explore the joint response of leverage and maturity to changes in workers' bargaining power. The results we obtain here help us separate the strategic responses from their indirect effects in our empirical analysis.

Baseline Model. We first explore the joint response of D and T to α in numerical simulations of our baseline model. To find numerical solutions to s's optimization problem, we discretize the values of D and α to grids of adjacent values with 0.01 increments. The two panels in Figure IA1 plot the values of leverage D and maturity T that jointly maximize s's equilibrium payoff ($\mathbb{E}[y_0^*] - \kappa e$, where $\mathbb{E}[y_0^*]$ is as described in Eqn. 1) against α for two numerical examples.

In the left panel of Figure IA1, we set the functional form for $d(D,T)$ such that, for any $D > 0$, the interest rate $D - d$ increases with T but does not depend on D. This describes a setting where longer maturity increases the firm's cost of borrowing but increasing leverage does not. Since $\kappa > 1$, raising equity is costly for s. At $\alpha = 0$, w cannot extract any surplus from negotiations, so s chooses $D = k$ and $T = 0$ to avoid incurring financing costs. For $\alpha > 0$, the firm's surplus is exposed to the wage negotiation with w. For moderate values of α (approximately smaller than 0.2), s responds to increases in α by choosing a larger T, so as to increase the firm's resilience to negotiations t^*. As α becomes sufficiently high, however, s switches to fully funding the project with equity ($D = 0$ and $e = k$) so that t^* becomes infinity. It is worth emphasizing that equity is costlier than leverage in this example, so s chooses $D = 0$ only to gain resilience to strikes.

In the right panel of Figure IA1, we set the functional form for $d(D,T)$ such that $D - d$ increases with both T and D. Moreover, as D goes up, $D - d$ increases with T at a steeper rate, so increasing maturity is more costly when leverage is higher. Since $\kappa = 1$ here, raising equity has no direct

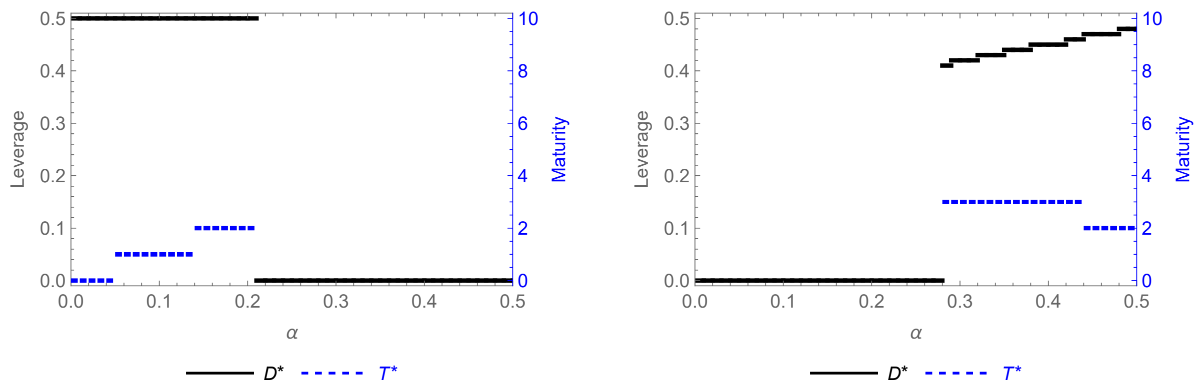


Figure IA1. (Baseline model) Both panels plot the values of D (solid black line) and T (blue dashed line) that jointly maximize s's expected equilibrium payoff against α. In each panel, the left Y-axis describes the values of D, and the right Y-axis describes the value of T. In both panels, we set $\overline{T} = 10$, $k = 0.5$, and $\delta_s = 1$. For the left panel, the other parameters are $\delta_w = 0.4$, $\delta = 0.9$, $\kappa = 1.06$, $d = D - \frac{T}{100}$ for $D > 0$, and $d = 0$ otherwise. For the right panel, the other parameters are $\delta_w = \delta = 0.85$, $\kappa = 1$, $d = D - \frac{D}{100}\left[T + \frac{1}{0.6-D}\right]$.

cost. Finally, compared to the right panel, δ_w is closer to δ_s, so $\mathbb{E}[y_0^*]$ is less sensitive to t^*. At $\alpha = 0$, here s chooses $D = 0$ to avoid paying interest. For α sufficiently large, however, s switches to $D > 0$. Compared to the left panel, resilience here is less important for s's bargaining position. So s prefers to increase D and push surplus off the bargaining table when α goes up.

The response of T to changes in α is also interesting in this example. The cost of maturity (in terms of the interest rate) increases with D here, and s prefers to increase D when α goes up. Due to the increase in the cost of maturity, s prefers to reduce T from 3 to 2 when D increases to approximately 0.46. It is worth emphasizing that the reduction in T strictly hurts s's bargaining position ($\mathbb{E}[y_0^*]$ strictly decreases).[1] However, the increase in the cost of maturity has a stronger impact on its overall payoff, so s accepts a lower share of surplus to reduce the financing cost.

Model where only Maturity impacts Negotiations. Next, we consider a variation of the model where only T affects the outcome of negotiations. Our objective is to explore the patterns of joint responses of D and T to α in a setting where only T can be used to influence negotiations. We make two slight modifications to our baseline model. First, we assume that, at each period, s and w bargain over the firm's residual surplus *gross* of the debt payment (that is, δ^t for $t \leq t^*$ and 0 for

[1] In this example, $\overline{t} = 4$ at $D = k$, so we have $t^* = T$ for any $T \leq 4$. So $\mathbb{E}[y_0^*]$ strictly decreases when T goes from 3 to 2.

$t > t^*$), so that D has no effect on the negotiation surplus. Second, we assume that the maximal length of negotiations is always T and restrict the analysis to $D \in \left[\underline{D}, k\right]$, with $\underline{D} > 0$, so that t^* also does not depend on D.[2] In this version of the model, s's equilibrium payoff $\mathbb{E}[u_s^*]$ is:

$$\mathbb{E}[u_s^*] = (1-\alpha)\left\{1 + \alpha\left(\delta_s - \delta_w\right)\sum_{j=1}^{T}\delta^j\left[(1-\alpha)\,\delta_w + \alpha\delta_s\right]^{j-1}\right\} - D - \kappa e, \tag{19}$$

for $T > 0$, and $\mathbb{E}[u_s^*] = (1-\alpha) - D - \kappa e$ for $T = 0$.

The first term in the expression for $\mathbb{E}[u_s^*]$ in Eqn. (19) is s's equilibrium share of surplus $\mathbb{E}[y_0^*]$ in this version of the model. Note that here $\mathbb{E}[y_0^*]$ does not depend on D, so D has no impact on negotiations. Even if D has no strategic value, we show below that s may still want to adjust it when α increases, as an indirect effect of the strategic response in T.

Lemma 1. *Let (D^*, T^*) denote the value of (D, T) that maximizes $\mathbb{E}[u_s^*]$ in the model where only T impacts negotiations (Eqn. 19); T^* increases with α, while D^* may increase or decrease with α, for any $\alpha \in [0, \frac{1}{2})$.*

When α increases, s chooses a larger T to curb workers' bargaining power in the negotiations. Note that the response of T to α is unambiguous here, even if we allow both D and T to vary with α. This is because D has no strategic use, so there are no indirect effects due to its strategic response to α. Holding fixed T, s chooses D to minimize the overall funding cost $D + \kappa(k - d)$, which does not depend on α. The optimal value of D, however, depends on α indirectly, since α affects the optimal choice of T, which in turn affects d. We prove the results in Lemma 1 below.

First, we show that T^* never decreases with α. Suppose, for the sake of contradiction, that (D^*, T^*) goes from (D', T') to (D'', T''), with $T' > T''$, when α goes from α' to $\alpha'' > \alpha'$. Let $\mathbb{E}[y_0^*(T)]$ denote $\mathbb{E}[y_0^*]$ as a function of T. Optimality of (D', T') implies that, at $\alpha = \alpha'$, we must have $\mathbb{E}[y_0^*(T')] - D' - \kappa(k - d(D', T') \geq \mathbb{E}[y_0^*(T'')] - D'' - \kappa(k - d(D'', T'')$, which implies

$$\mathbb{E}[y_0^*(T')] - \mathbb{E}[y_0^*(T'')] \geq D' + \kappa(k - d(D', T') - D'' - \kappa(k - d(D'', T''). \tag{20}$$

By the same logic, optimality of (D'', T'') implies, at $\alpha = \alpha''$, we must have instead

$$\mathbb{E}[y_0^*(T')] - \mathbb{E}[y_0^*(T'')] \leq D' + \kappa(k - d(D', T') - D'' - \kappa(k - d(D'', T''). \tag{21}$$

[2]When $D = 0$, there is no debt obligation, so t^* becomes ∞. To ensure t^* never depends on D, we restrict D to be positive.

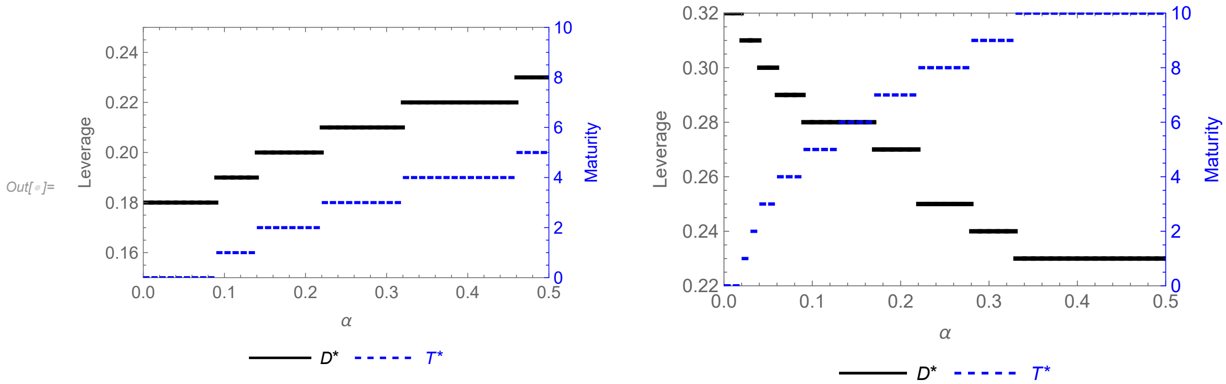


Figure IA2. (Model where only maturity impacts negotiations) Both panels plot the values of D (solid black line) and T (blue dashed line) that jointly maximize $\mathbb{E}[u_s^*]$ in Eqn. (19) against α. In each panel, the left Y-axis describes the values of D, and the right Y-axis describes the value of T. In both panels, we set $\overline{T} = 10$, $\underline{D} = 0.1$, $k = 0.5$, $\delta_s = 1$, $\delta_w = 0.7$, $\delta = 0.9$, and $\kappa = 1.2$. For the left panel, we set $d = D - \frac{1}{100}\left[2T + \frac{5D}{0.6-D} - T * D\right]$. For the right panel, we set $d = D - \frac{D}{100}\left[T + \frac{3}{0.6-D}\right]$.

Using the expression for $\mathbb{E}[y_0^*]$ in Eqn. (19), for a given value of α, we can write

$$\mathbb{E}[y_0^*(T')] - \mathbb{E}[y_0^*(T'')] = (1-\alpha)\alpha\,(\delta_s - \delta_w) \sum_{j=T''}^{T'} \delta^j \left[(1-\alpha)\,\delta_w + \alpha\delta_s\right]^{j-1}. \tag{22}$$

Note that the $\mathbb{E}[y_0^*(T')] - \mathbb{E}[y_0^*(T'')]$ increases with α for any $\alpha \in [0, \frac{1}{2})$, and it is strictly positive for any $T' > T''$. The left-hand side of Inequality (20) is thus smaller than the left-hand side of Inequality (21), since the latter is evaluated at $\alpha'' > \alpha'$. The right-hand side of the two inequalities does not depend on α, so it is the same value for both. It follows that, when Inequality (20) holds at α', Inequality (21) cannot hold at $\alpha'' > \alpha'$, which contradicts that (D'', T'') can be optimal at α''.

The numerical examples in Figure IA2 prove that T^* may increase with α and that D^* may increase or decrease with α. The two panels plot the values of D^* and T^* that jointly maximize $\mathbb{E}[u_s^*]$ in Eqn. (19) against α, for a given set of parameters and two different functional forms for $d(D, T)$. In both panels, T^* increases with α. The indirect effect that the increase in T^* has on D^* depends on the properties of d. Since $\kappa > 1$ and $D - d > 0$ for any $D > 0$, both raising equity and issuing debt are costly for s. At $\alpha = 0$, w cannot extract any surplus from negotiations, so s chooses $T^* = 0$ and D^* that minimizes the funding cost $D + \kappa[k - d(D, 0)]$.

As α increases, s responds by choosing a larger T^*, to increase the firm's resilience t^*. In the left panel, the indirect effect on leverage is positive. This is because $D - d$ increases less with D

when T is larger, so increasing leverage becomes cheaper when T^* goes up, and D^* thus increases as well. In the right panel, the indirect effect is instead negative. In this case, $D - d$ increases less with T when D is larger. So s increases leverage to reduce the cost of choosing a larger T^*.

Model where only Leverage impacts Negotiations. Finally, we explore a model where only D impacts negotiations. To this purpose, we assume $t^* = \min\{\bar{t}, \overline{T}\}$ for $D > 0$, and $t^* = \infty$ for $D = 0$, so that t^* does not depend on s's choice of T. In this version of the model, s's equilibrium payoff $\mathbb{E}[u_s^*]$ is:

$$\mathbb{E}[u_s^*] = (1-\alpha)\left\{1 - D + \alpha\left(\delta_s - \delta_w\right)\sum_{j=1}^{t^*}\left(\delta^j - D\right)\left[(1-\alpha)\,\delta_w + \alpha\delta_s\right]^{j-1}\right\} - \kappa e, \tag{23}$$

for $t^* > 0$, and $\mathbb{E}[u_s^*] = (1-\alpha)(1-D) - \kappa e$ for $t^* = 0$.

The first term in the expression for $\mathbb{E}[u_s^*]$ in Eqn. (23) is the expected share of surplus $\mathbb{E}[y_0^*]$ that s receives in equilibrium in this version of the model. Here $\mathbb{E}[y_0^*]$ does not depend on T, since T does not affect the firm's resilience t^*. Holding fixed D, s then chooses T to minimize $D + \kappa(k - d)$.

Lemma 2. *Let (D^*, T^*) denote the value of (D, T) that maximizes $\mathbb{E}[u_s^*]$ in the model where only D impacts negotiations (Eqn. 23); D^* may increase or decrease with α, while $T^* = 0$, for any $\alpha \in [0, \frac{1}{2})$.*

Since T has no strategic value here, and d always decreases with T, s is always better off choosing $T^* = 0$ here ($\mathbb{E}[y_0^*] - \kappa(k - d(D,T))$ is always maximized at $T = 0$). Like for our baseline model, D^* may instead increase or decrease with α, depending on the parameters of the model.[3]

It is worth emphasizing that the result that T^* is always 0 when maturity has no strategic value relies on the assumption that d always decreases with T (Assumption 1). In a richer model, s may have incentives to set $T > 0$ that are unrelated to the wage negotiations (see, e.g., He and Xiong 2012). In this case, the strategic response of D to α is likely to generate indirect effects on T^*.

B Model Extensions

In this appendix, we explore the robustness of our main results to alternative assumptions. Below, we briefly discuss the setup and main insights of each extension of our baseline model. We provide

[3]Since we always have $T^* = 0$ here, the proof of Proposition 3 also proves that D^* may increase or decrease with α.

a complete analysis of each variation of the model in the remainder of the appendix.

Financial Resilience of Unions. Appendix B.1 develops an extension of the model where there is a limit to the length of strikes workers can endure: If negotiations reach time $t > t_w$, w returns to work and accepts its reservation value. w's resilience t_w is a strategic choice of the union that represents w in the negotiations, and captures the union's ability to organize and support a long walkout. Before negotiations begin, the union collects fees from w, which are then used as strike funds to increase t_w during negotiations. Since the other elements of the model stay the same, the firm's resilience (which we denote here by t_s) is the same as in our main model.

Negotiations break down when either w returns to work or the firm goes bankrupt, depending on which event occurs first. Our main result is that the share of surplus s receives in equilibrium decreases with t_w and increases with t_s. The intuition for this result is as follows. The easier it is for w to endure a long strike compared to the firm (that is, the higher t_w and the lower t_s), the harder it is for s to extract surplus from w by threatening long negotiations. So each party has an incentive to increase its resilience before entering negotiations.[4] Since t_s is the same as in the main model, our insights about the impact of the firm's debt structure on wage negotiations continue to hold here. There are two interesting implications stemming from these results.

First, the workers' resilience to negotiations represents an alternative measure of their bargaining power. We show that our qualitative results about the response of D and T to an increase in α also apply to an exogenous increase in t_w. So our empirical findings about the firms' response to changes in the collective bargaining environment can also be interpreted as a response to changes in workers' ability to organize strikes. Second, similar to firms, unions may also try to adjust their financials to mitigate the impact of hostile legislation, such as the introduction of RWLs. This second insight motivates our empirical analysis of unions' financials in Section 4.2.

Credit Market Frictions. In Appendix B.2, we consider a simple extension of the model that features bankruptcy costs and a competitive credit market. Our objective is to endogenize the

[4]This feature of the equilibrium holds here also when $\delta_s = \delta_w$, since we have an endogenous measure of w's resilience to negotiations in this version of the model.

non-strategic costs of leverage and maturity, which were captured in a reduced-form way in Section 2. We make two modifications to our main model. First, we add a competitive credit market featuring risk-neutral debtholders. The debtholders' zero-profit condition pins down the amount d raised by the firm as a function of its debt structure (D, T). Second, we introduce a stochastic component to the firm's revenue, which allows for the possibility of bankruptcy in equilibrium.[5] The wedge $D - d$ arises endogenously in this setting, since debtholders require compensation for both the bankruptcy risk and the time value of money. Our results continue to hold in this extension. An interesting new result is that, when α increases and s responds by choosing a more resilient debt structure, the firm becomes *safer*, as bankruptcy occurs with a smaller probability.

Outside Options. In Appendix B.3, we study how workers' option to leave the firm and terminate the negotiations influences their outcome. We consider an extension of the main model in which, upon receiving an offer, w can choose to accept the offer, reject it and make a counteroffer, or terminate the negotiations altogether. In the latter case, the game ends and w receives a payoff of ω. To simplify the exposition, we normalize s's outside option to 0. First, we prove that our main results carry through in this extension. Second, we show that workers' outside option limits shareholders' ability to use the firm's debt structure to influence the outcome of negotiations. Intuitively, if ω is larger, w is more eager to leave the firm when s either threatens long negotiations or pushes surplus off the negotiation table. So we expect firms to be more likely to use debt structure strategically when the labor market is looser and ω is smaller.

Debt Rollover. In Appendix B.4, we introduce debt rollover to the model: if s and w have yet to agree at time $\min\{\bar{t}, T\}$, where (D, T) is the original debt contract, s tries to obtain a loan from new debtholders to pay the existing debt and continue the negotiations. The possibility of rollover affects the surplus available to negotiate and the maximal length of negotiations. So it affects the

[5] In the main model, the firm's revenue is deterministic and s and w reach an agreement immediately, so bankruptcy never occurs on the equilibrium path. The possibility that the firm goes bankrupt if negotiations continue for too long (due to the cost of labor walkouts), however, still affects the allocation of surplus in the negotiations.

share of surplus that goes to each player in equilibrium. However, players agree immediately in equilibrium, so debt rollover never actually occurs on the equilibrium path. So when we refer to debt rollover "occurring" in the discussion below, we mean occurring off the equilibrium path.

The possibility of rollover mitigates, but does not eliminate, the firm's incentives to be resilient to the negotiation. This is because of two main reasons. First, s may be unable to raise enough funds to pay D: due to the cost of the walkout, the residual income may be too little to obtain the new loan. The firm then goes bankrupt when negotiations reach time $\min\{\bar{t}, T\}$, even if rollover is allowed. Second, even if s obtains the new loan, the payment is larger than the original obligation whenever there is a chance that the firm defaults on the new debt (like in the model in Appendix B.2). The increase in the payment reduces the surplus available in the following rounds of wage negotiations. Since w is less patient, this reduction hurts s's bargaining position, as it limits its ability to extract surplus from w. Moreover, s cannot roll over on its debt indefinitely: If negotiations continue for too long, the firm eventually goes bankrupt. So the possibility of debt rollover, even when rollover does occur off the equilibrium path, does not eliminate s's incentive to build resilience in the first place.

Debt Renegotiation. In Appendix B.5, we modify our main model to study the role of debt renegotiation – that is, the possibility that s renegotiates the terms of the debt contract when the firm is unable to fulfill the original obligation. The modeling of the debt renegotiation follows the literature on incomplete contracts (e.g., Hart and Moore (1994) and Hart and Moore (1998)).

If s and w have yet to agree at time $\min\{\bar{t}, T\}$, s offers a new contract $\{D', T'\}$ to debtholders. Debtholders act as a single agent $\mathcal{D}$, who chooses between accepting the new contract and forcing the firm to liquidate. In the latter case, the payoff to $\mathcal{D}$ is μk, where $\mu \in (0, 1)$ captures the efficiency of liquidation. If $\mathcal{D}$ accepts the new contract, s and w continue the wage negotiations. This sequence of plays continues until either s and w agree on a division of surplus or $\mathcal{D}$ forces the firm to liquidate, with potentially multiple instances of debt renegotiation along the way. Similar to the extension with rollover, renegotiation never actually occurs in equilibrium (as s and w agree immediately), even though its possibility affects the equilibrium division of surplus. So when we refer to renegotiation "occurring" in the discussion below, we mean off the equilibrium path.

The possibility of debt renegotiation adds more nuances to our results. First, perhaps not surprisingly, it weakens the link between the maximal length of wage negotiations t^* and the original debt obligation: conditional on renegotiation occurring, t^* does not depend on (D, T). Second, if the debt payment is renegotiated downward, earlier renegotiation benefits s in the negotiation with w. This creates an incentive for s to lower T so that renegotiation occurs earlier off the equilibrium path. There are, however, two important caveats to these nuances. First, conditional on renegotiation occurring, the payment is always renegotiated *upward* if $\mu k \geq D$. Second, to simplify the analysis, we do not directly model creditors' coordination problems and shareholders' reputational costs of breaching the debt contract. A large body of theoretical work (e.g., Bolton and Scharfstein 1996; Eaton and Gersovitz 1981) and empirical evidence (e.g., Carletti, Colla, Gulati, and Ongena 2021; Ivashina, Iverson, and Smith 2016; Belenzon, Chatterji, and Daley 2017) shows that both channels create frictions to debt renegotiation. If these frictions impose a sufficiently large cost on s, renegotiation never occurs both on and off the equilibrium path.

B.1 Financial Resilience of Unions

In this section, we consider an extension of our baseline model where there is a limit to the length of a strike that workers can endure, and this limit depends on the strategic choice of resilience of the union that represents the workers in the negotiations with shareholders.

We denote the union by $\mathcal{U}$ and the maximal length of strike workers can endure by t_w. We assume t_w depends on the fees (ϕ) the union collects from workers at the beginning of the game.

Assumption 3. *The maximal length of strike workers can endure t_w is an increasing and concave function of the fees ϕ collected by the union, that is, $t_w = t(\phi)$.*

Assumption 3 implies that $\mathcal{U}$ needs to collect more fees upfront if it wants to help workers endure a longer strike in the wage negotiation with shareholders. In practice, union members pay regular union dues, which are used to support strike funds (that is, funds that unions distribute to striking workers to partially substitute their regular paychecks) and other union activities.

If negotiations reach time $t > t_w$, w returns to work and accepts its reservation value 0. To distinguish t_w from the maximal length of strike the firm can afford, here we denote the latter by t_s. Like for the main model, we have $t_s = \min\{\bar{t}, T\}$ if $D > 0$, and $t_s = \infty$ if $D = 0$.

Let $\mathbb{E}[y_0^*]$ denote the expected share of surplus s receives in equilibrium for given values of (D, T) and ϕ, which pin down the values of t_s and t_w, respectively. The expected share of surplus that goes to w is then $1 - D - \mathbb{E}[y_0^*]$, and its equilibrium payoff is $\mathbb{E}[u_w^*] = 1 - D - \mathbb{E}[y_0^*] - \phi$.

To simplify the analysis, here we consider a discrete strategy space for D ($D \in \{0, D_1, D_2, \ldots, k\}$) and assume that s and $\mathcal{U}$ move sequentially in the pre-negotiations game.[6] The sequence of events is: (i) s chooses (D, T); (ii) having observed (D, T), $\mathcal{U}$ chooses ϕ; (iii) s and w negotiate.

$\mathcal{U}$ chooses ϕ to maximize $\mathbb{E}[u_w^*]$. Fixing (D, T), $\mathcal{U}$'s optimal choice of ϕ then solves:

$$\max_{\phi} 1 - D - \mathbb{E}[y_0^*] - \phi. \tag{24}$$

Let ϕ^* denote the value of ϕ that solves Program (24) for a given (D, T). s then solves:

$$\max_{(D,T)} \mathbb{E}[y_0^*] - \kappa(k - d), \tag{25}$$

where $\mathbb{E}[y_0^*]$ is evaluated at ϕ^* for any given (D, T).

An equilibrium of the game is a collection of bargaining strategies and pre-negotiation choices $\{(D, T), \phi\}$, where the latter jointly solve programs (24) and (25). Finally, since here we have endogenous measures of both w's and s's resilience to negotiations, we no longer need to assume $\delta_s > \delta_w$ (Assumption 2). We begin our analysis by characterizing how negotiations unfold for fixed values of $\{(D, T), \phi\}$. We then describe the equilibrium choices of ϕ and (D, T).

Equilibrium Negotiations. We first characterize the maximal length of negotiations on the equilibrium path (t^*) in this extension of the model. If $t_w \geq t_s$, the limit to negotiations is determined by the firm's resilience, that is, $t^* = t_s$. In this case, negotiations unfold like in the main model, so we refer to Appendix A.1 for the characterization of the equilibrium strategies and payoffs.

[6] A discrete space for D ensures that a solution to Program (25) always exists. If s and $\mathcal{U}$ move simultaneously, an equilibrium always exists if the strategy space for ϕ is bounded, that is if $\phi \leq \overline{\phi} < \infty$. However, the equilibrium may no longer be in pure strategies.

If $t_w < t_s$, the firm would survive the longest strike workers can endure, so we have $t^* = t_w$. If an agreement between s and w has yet to be reached at time t_w, at time $t_w + 1$ then workers return to work and accept the reservation value of 0, and s appropriates the residual surplus $\delta^{t_w+1} - D$. Notice that $\delta^{t_w+1} - D \geq 0$ when $t_w \leq t_s$, since t_s is such that $\delta^{t_s} - D \geq 0$ and $\delta^{t_s+1} - D < 0$. It follows that negotiations break down here when either the firm goes bankrupt or workers return to work, depending on which of these two events occur earlier. That is, $t^* = \min\{t_s, t_w\}$.

Proposition 4 describes the equilibrium properties of the wage negotiation stage.

Proposition 4. *Fix the firm's (t_s) and the union's (t_w) resiliences to negotiations, and let $t^* = \min\{t_s, t_w\}$ denote the last period before bargaining breaks down. An equilibrium of the wage negotiation subgame always exists, is unique, and has the following features:*

1. *Part 1 and Part 2 of Proposition 1 continue to hold.*

2. *The expected share of surplus s receives in equilibrium $\mathbb{E}[y_0^*]$ always decreases with t_w and it increases with t_s for any $\delta_s \geq \delta_w$.*

Note that since $\mathbb{E}[y_0^*]$ continues to increase with the firm's resilience to negotiations, the insights about the strategic use of debt structure we derive in the main model continue to hold here. In the remainder of this section, we prove and discuss the results in Proposition 4.

Since the equilibrium is the same as in the baseline model if $t_w \geq t_s$, we focus on $t_w < t_s$ in what follows. The equilibrium characterization follows the same logic as in the main model, that is, moving backward from t_w through a sequence of offers that make players indifferent between accepting or refusing. If w makes the offer at time t_w, this gives s a share of surplus $\delta_s(\delta^{t_w+1} - D)$, which is equal to the discounted value of s's continuation payoff. If s makes the offer, w receives 0 and s extracts all the surplus $\delta^{t_w} - D$, since w's continuation payoff is the reservation value 0. Since w makes an offer with probability α and s with probability $1 - \alpha$, we have:

$$v_s(t_w, t_w) = (1-\alpha)\left(\delta^{t_w} - D\right) + \alpha\delta_s(\delta^{t_w+1} - D); \;\; v_w(t_w, t_w) = \alpha\left(\delta^{t^w} - D - \delta_s(\delta^{t_w+1} - D)\right).$$

The previous round of negotiations (i.e., at time $t_w - 1$) follows the same logic; we have:

$$\begin{aligned} v_s(t_w-1,t_w) &= (1-\alpha)\left[\delta^{t_w-1} - D - \delta_w v_w(t_w,t_w)\right] + \alpha\delta_s v_s(t_w,t_w); \\ v_w(t_w-1,t_w) &= \alpha\left[\delta^{t_w-1} - D - \delta_s v_s(t_w,t_w)\right] + (1-\alpha)\delta_w v_w(t_w,t_w). \end{aligned}$$

Continuing our way backward, we obtain:

$$\begin{aligned} v_s(t_w-2,t_w) &= (1-\alpha)\left(\delta^{t_w-2} - D - \delta_w v_w(t_w-1,t_w)\right) + \alpha\delta_s v_s(t_w-1,t_w); \qquad (26)\\ v_s(t_w-3,t_w) &= (1-\alpha)\left(\delta^{t_w-3} - D - \delta_w v_w(t_w-2,t_w)\right) + \alpha\delta_s v_s(t_w-2,t_w); \\ & \dots, \end{aligned}$$

and $v_w(t_w-j,t_w) = \delta^{t_w-j} - D - v_s(t_w-j,t_w)$, for any j such that $t_w \geq j \geq 0$.

The sequence of equilibrium-path expected payoff is the same as in the main model (and in this extension when $t_w \geq t_s$), except for $v_s(t_w,t_w)$, which has the additional term $\alpha\delta_s(\delta^{t_w+1} - D)$, and $v_w(t_w,t_w)$, which has the additional term $-\alpha\delta_s(\delta^{t_w+1} - D)$. This property allows for a simple characterization of the expected share of surplus s receives in equilibrium ($\mathbb{E}[y_0^*]$); we have:

$$\mathbb{E}[y_0^*] = \begin{cases} \tilde{v}_s & \text{if } t_w \geq t_s = t^*; \\ \tilde{v}_s + \alpha[\alpha\delta_s + (1-\alpha)\delta_w]^{t_w}(\delta^{t_w+1} - D) & \text{if } t_w = t^* < t_s, \end{cases} \qquad (27)$$

where

$$\tilde{v}_s = (1-\alpha)\left\{1 - D + \alpha(\delta_s - \delta_w)\sum_{j=1}^{t^*}\left(\delta^j - D\right)\left[(1-\alpha)\delta_w + \alpha\delta_s\right]^{j-1}\right\} \qquad (28)$$

if $t^* > 0$, and $\tilde{v}_s = (1-\alpha)(1-D)$ if $t^* = 0$.

Next, we prove that $\mathbb{E}[y_0^*]$ always decreases with t_w. $\mathbb{E}[y_0^*(t_w)]$ denotes the value of $\mathbb{E}[y_0^*]$ as a function of t_w, holding t_s fixed. First, suppose t_w goes from t' to $t'+1$, with $t'+1 < t_s$ (so t^* goes from t' to $t'+1$); we have

$$\begin{aligned} \mathbb{E}[y_0^*(t_w = t'+1)] - \mathbb{E}[y_0^*(t_w = t')] = {} & (1-\alpha)\alpha(\delta_s - \delta_w)\left(\delta^{t'+1} - D\right)\left[(1-\alpha)\delta_w + \alpha\delta_s\right]^{t'} \qquad (29) \\ & + \alpha[\alpha\delta_s + (1-\alpha)\delta_w]^{t'+1}(\delta^{t'+2} - D) - \alpha[\alpha\delta_s + (1-\alpha)\delta_w]^{t'}(\delta^{t'+1} - D). \end{aligned}$$

We can rewrite the right-hand side of Eqn. (29) as:

$$\alpha[\alpha\delta_s + (1-\alpha)\delta_w]^{t'+1}(\delta^{t'+2} - D) - \alpha[\alpha\delta_s + (1-\alpha)\delta_w]^{t'}(\delta^{t'+1} - D)\left[1 - (1-\alpha)(\delta_s - \delta_w)\right]. \qquad (30)$$

Since $1-(1-\alpha)(\delta_s-\delta_w) > \alpha\delta_s+(1-\alpha)\delta_w$, the expression in Eqn. (30) is negative, which implies $\mathbb{E}[y_0^*(t_w=t'+1)]-\mathbb{E}[y_0^*(t_w=t')]<0$.

Second, suppose t_w goes from $t'<t_s$ to $t''\geq t_s$ (so t^* goes from t' to t_s); we have:

$$\begin{aligned}\mathbb{E}[y_0^*(t_w=t'')]-\mathbb{E}[y_0^*(t_w=t')] = (1-\alpha)\alpha\,(\delta_s-\delta_w)\sum_{j=t'+1}^{t_s}\left(\delta^j-D\right)[(1-\alpha)\,\delta_w+\alpha\delta_s]^{j-1}\\ -\alpha[\alpha\delta_s+(1-\alpha)\delta_w]^{t'}(\delta^{t'+1}-D).\end{aligned}\tag{31}$$

Since $\delta<1$, the right-hand side of Eqn. (31) is always smaller than the following expression:

$$\begin{aligned}\alpha[\alpha\delta_s+(1-\alpha)\delta_w]^{t'}(\delta^{t'+1}-D)\left\{(1-\alpha)(\delta_s-\delta_w)\sum_{j=0}^{\infty}[(1-\alpha)\,\delta_w+\alpha\delta_s]^j-1\right\}\\ =\alpha[\alpha\delta_s+(1-\alpha)\delta_w]^{t'}(\delta^{t'+1}-D)\left\{\frac{(1-\alpha)(\delta_s-\delta_w)}{1-(1-\alpha)\delta_w-\alpha\delta_s}-1\right\}.\end{aligned}\tag{32}$$

Since $\frac{(1-\alpha)(\delta_s-\delta_w)}{1-(1-\alpha)\delta_w-\alpha\delta_s}<1$, the expression in Eqn. (32) is negative, which implies $\mathbb{E}[y_0^*(t_w=t'')]-\mathbb{E}[y_0^*(t_w=t')]<0$. Finally, when t_w goes from $t'>t_s$ to $t''>t'$, t^* and so $\mathbb{E}[y_0^*(t_w)]$ do not change.

The better w is at enduring a long strike (i.e., the higher t_w), the lower the share of surplus s receives in the negotiations, since the threat of long negotiations is less effective at extracting surplus from w. It is worth emphasizing that this feature of the equilibrium does not rely on the assumption $\delta_s>\delta_w$, since t_w represents an endogenous measure of w's resilience to negotiations. Holding the union fee fixed, w thus benefits from a higher t_w even when $\delta_s<\delta_w$.

Finally, we prove that $\mathbb{E}[y_0^*]$ increases with t_s for any $\delta_s\geq\delta_w$. $\mathbb{E}[y_0^*(t_s)]$ denotes the value of $\mathbb{E}[y_0^*]$ as a function of t_s, now holding t_w fixed. First, suppose t_s goes from t' to $t'+1$, with $t'+1<t_w$ (so t^* goes from t' to $t'+1$). In this case, t^* is pinned down by t_s, so we have $\mathbb{E}[y_0^*]=\tilde{v}_s$, which increases with t^* if $\delta_s\geq\delta_w$, and it decreases with t^* otherwise.

Second, suppose t_s goes from $t'<t_w$ to $t''\geq t_w$ (so t^* goes from t' to t_w); we have:

$$\begin{aligned}\mathbb{E}[y_0^*(t_s=t'')]-\mathbb{E}[y_0^*(t_s=t')] = (1-\alpha)\alpha\,(\delta_s-\delta_w)\sum_{j=t'+1}^{t_w}\left(\delta^j-D\right)[(1-\alpha)\,\delta_w+\alpha\delta_s]^{j-1}\\ +\alpha[\alpha\delta_s+(1-\alpha)\delta_w]^{t'}(\delta^{t'+1}-D).\end{aligned}\tag{33}$$

The expression above is positive for any $\delta_s\geq\delta_w$, since both its terms are then positive. It is worth noticing that the expression above is positive even when $\delta_s<\delta_w$, but these two values are sufficiently close to each other, since the second term on the right-hand side of Eqn. (33) is always positive.[7] Finally, when t_s goes from $t' > t_w$ to $t'' > t'$, t^* and so $\mathbb{E}[y_0^*(t_s)]$ do not change.

Similar to the main model, shareholders extract more surplus when the firm is more resilient to strikes. When t_s increases, either longer negotiations become feasible (when t_s goes from $t'+1 < t_w$ to t') or the firm becomes able to endure a longer strike than workers (when t_s goes from $t' < t_w$ to $t'' \geq t_w$). Either case strengthens the bargaining position of s vis-à-vis w.

Shareholders' response to changes in workers' resilience. Next, we show that our qualitative results about the response of D and T to an increase in α also apply to an exogenous increase in w's resilience to negotiations. For simplicity, here we assume $\delta_s = \delta_w$.

Lemma 3. *Set $\delta_s = \delta_w$, and fix the workers' resilience to negotiations t_w, with $t_w \leq \bar{t}_w$; the following comparative statics results hold in equilibrium:*

1. *Holding the debt level D fixed, the debt maturity T that maximizes shareholders' expected payoff $\mathbb{E}[u_s^*]$ increases with t_w.*
2. *Holding T fixed, the value of D that maximizes $\mathbb{E}[u_s^*]$ may increase or decrease with t_w.*

The threshold value $\bar{t}_w$ is defined in the proof of Lemma 3.

The logic behind Lemma 3 is similar to that for Proposition 3. T increases the firm's resilience to negotiations t_s and, as a consequence, s's expected surplus from negotiations. Holding fixed D, s can then increase T to curb the effects of an increase in w's bargaining power, which is captured here by an increase in their resilience t_w.[8] Since D has an ambiguous effect on s's expected equilibrium payoff, its best response to an increase in t_w may be to increase *or* decrease D.

We prove Part 1 of Lemma 3 below. If $\delta_s = \delta_w = \delta_0$, s's expected share of surplus (Eqn. 27) simplifies to $\mathbb{E}[y_0^*] = (1-\alpha)(1-D)$ if $t_w \geq t_s$, and $\mathbb{E}[y_0^*] = (1-\alpha)(1-D) + \alpha\delta_0^{t_w}(\delta^{t_w+1} - D)$ if $t_w < t_s$, where $t_s = \min\{\bar{t}, T\}$. s chooses a value of T only if $D > 0$, so we consider $D \in (0, k]$ in what

[7] We discuss the case where δ_s is significantly smaller than δ_w at the end of Appendix B.1.

[8] If t_w becomes too large, s gives up on trying to be more resilient than w and chooses $T = 0$ to minimize the financing cost, since the interest rate $D - d$ increases with T. The condition $t_w \leq \bar{t}_w$ allows us to rule out this possibility.

follows. For a given D, s chooses T to maximize its expected total payoff $\mathbb{E}[u_s^*] = \mathbb{E}[y_0^*] - \kappa(k-d)$. Let $\mathbb{E}[y_0^*(T)]$ and $d(T)$ denote, respectively, the values of $\mathbb{E}[y_0^*]$ and d as functions of T. $d(T)$ decreases with T, and $\mathbb{E}[y_0^*(T)]$ only changes with T when T moves t_s from $t_s \leq t_w$ to $t_s > t_w$.

It follows that s chooses between (a) the lowest T such that $t_s > t_w$ and (b) $T = 0$. If $\min\{\overline{T}, \bar{t}\} < t_w + 1$ (which is equivalent to $t_w > \min\{\overline{T}, \bar{t}\} - 1$), $t_s > t_w$ is not feasible, so s chooses $T = 0$. If $t_w \leq \min\{\overline{T}, \bar{t}\} - 1$, s chooses $T = t_w + 1$ if and only if $\mathbb{E}[y_0^*(t_w+1)] - \kappa[k - d(t_w+1)] \geq \mathbb{E}[y_0^*(0)] - \kappa[k - d(0)]$, which simplifies to

$$\alpha \delta_0^{t_w}(\delta^{t_w+1} - D) + \kappa d(t_w + 1) - \kappa d(0) \geq 0. \tag{34}$$

The left-hand side of Inequality (34) always decreases with t_w, so there exists a unique value $\widehat{t}_w$ such that the inequality holds for $t_w \leq \widehat{t}_w$, and it does not hold for $t_w > \widehat{t}_w$. It follows that s chooses $T = t_w + 1$ for any $t_w \leq \bar{t}_w \equiv \min\left\{\widehat{t}_w, \min\{\bar{t}, \overline{T}\} - 1\right\}$, and 0 otherwise. This proves that s's choice of T strictly increases with t_w, for any $t_w \leq \bar{t}_w$.

Next, we prove Part 2 of Lemma 3. For a given T, s chooses D to maximize its expected total payoff $\mathbb{E}[u_s^*]$. Let $\mathbb{E}[u_s^*(D)]$, $\mathbb{E}[y_0^*(D)]$, $d(D)$, and $t_s(D)$ denote, respectively, the values of $\mathbb{E}[u_s^*]$, $\mathbb{E}[y_0^*]$, d, and t_s as functions of D. We assume $\delta^2 > k$, and $\overline{T} > 2$, so that $\min\{\overline{T}, \bar{t}\} - 1 \geq 1$ for any $D \in [0, k]$. We also assume $d(D, T') = d(D, T'')$ for any $T'' \geq T'$ and $D \in [0, k]$, so that $\widehat{t}_w \geq 2$. This implies we always have $t_w \leq \bar{t}_w$ in what follows. Finally, we set $T = 1$ so that there is only one round of negotiations if $D > 0$, and $\delta_0 = \delta$. It follows that we have $t^s(0) = \infty$ and $t^s(D > 0) = 1$.

First, consider $t_w = 0$. Since both $t^s(0)$ and $t^s(D)$ are larger than t_w, we have $\mathbb{E}[y_0^*] = (1-\alpha)(1 - D) + \alpha(\delta - D)$ for all values of D. Suppose $d(D)$ is differentiable; taking the derivative of $\mathbb{E}[u_s^*(D)]$ with respect to D then yields $-1 + \kappa \frac{\partial d}{\partial D}$. So s chooses $D = 0$ iff $-1 + \kappa \frac{\partial d}{\partial D} \leq 0$ at $D = 0$, which implies $-1 + \kappa \frac{\partial d}{\partial D} \leq 0$ for all values D by the concavity of $d(D)$.

Now consider $t_w = 1$. Since $t_s(0) > t_w = t_s(D > 0)$, we have $\mathbb{E}[y_0^*(0)] = 1 - \alpha + \alpha\delta(\delta^2 - D)$ and $\mathbb{E}[y_0^*(D > 0)] = (1-\alpha)(1-D)$. If $\kappa = 1$, $\alpha \in \left(\frac{k-d(k)}{k-\delta^3}, 1\right]$, and $k \in (\delta^3, \delta^2)$, s goes from choosing $D = 0$ to $D > 0$ when t_w goes from 0 to 1. If $\kappa \in (1, \frac{\delta^3}{k})$, $D = d(D)$, $\alpha \in \left(\frac{k}{k-\delta^3}(1-\kappa), 1\right]$, and $k \in (\delta^3, \delta^2)$, s goes instead from choosing $D > 0$ to $D = 0$ when t_w goes from 0 to 1.

Union's Choice of Resilience. We begin our analysis of the pre-negotiations stage by describing $\mathcal{U}$'s choice of ϕ, which pins down w's ability to endure a strike t_w, for given values of (D, T), which pin down the firm's resilience to negotiations t_s and the negotiation surplus $\delta^t - D$. $\mathcal{U}$ sets ϕ to maximize w's equilibrium payoff $\mathbb{E}[u_w^*] = 1 - D - \mathbb{E}[y_0^*] - \phi$, where $\mathbb{E}[y_0^*]$ is defined in Eqn. (27).

ϕ has a direct negative effect on $\mathbb{E}[u_w^*]$ but also an indirect positive effect, since $\mathbb{E}[y_0^*]$ decreases with t_w which, in turn, increases with ϕ. Let $\mathbb{E}[y_0^*(\phi)]$ denote the value of $\mathbb{E}[y_0^*]$ as a function of ϕ. It is WLOG to focus on the lowest values of ϕ that yield each given value of t_w. This is because, holding fixed t_w, $\mathbb{E}[u_w^*]$ decreases with ϕ, so w strictly prefers $\phi' < \phi''$ whenever $t(\phi') = t(\phi'')$. Since $1 - D - \mathbb{E}[y_0^*(\phi)]$ is finite for any ϕ, it is also WLOG to focus on finite values of ϕ.

We can thus restrict our attention to values $\phi \in \{\phi_1, \phi_2, \ldots, \phi_n\}$, where ϕ_j is the lowest ϕ such that $t(\phi_j) = j$, for $j \in \{1, 2, \ldots, n\}$ and $n < \infty$. It follows that a value ϕ^* that maximizes $\mathbb{E}[u_w^*]$ always exists (one can compute $\mathbb{E}[u_w^*]$ at all values $\phi \leq \phi_n$ and choose the value where $\mathbb{E}[u_w^*]$ is largest). Notice that, since ϕ is finite in equilibrium, we always have $t_w < \infty$. So the horizon of negotiations t^* is finite in this version of the model. Next, we explore how ϕ^* changes with α.

Lemma 4. *Holding the firm's debt structure (D, T) fixed, the union fee ϕ that maximizes workers' expected payoff $\mathbb{E}[u_w^*]$ may increase or decrease with their bargaining power α.*

We first prove Lemma 4 and then discuss the intuition behind this result. Let ϕ' denote $\mathcal{U}$'s choice of ϕ when w's bargaining power is $\alpha = \alpha'$. ϕ' is such that, for any $\phi \leq \phi_n$, we must have $1 - D - \mathbb{E}[y_0^*(\phi')] - \phi' \geq 1 - D - \mathbb{E}[y_0^*(\phi)] - \phi$, which simplifies to

$$\mathbb{E}[y_0^*(\phi')] - \mathbb{E}[y_0^*(\phi)] \leq \phi - \phi'. \tag{35}$$

The left-hand side of Inequality (35) is the benefit to w of paying a fee higher than ϕ' since, by increasing t_w, a higher fee reduces s's share of surplus from $\mathbb{E}[y_0^*(\phi')]$ to $\mathbb{E}[y_0^*(\phi)]$. The right-hand side of the inequality is the cost to w of paying a higher fee. For any $\phi > \phi'$, the benefit is smaller than the cost, so w always prefers ϕ' to $\phi > \phi'$. By similar logic, for $\phi < \phi'$, the cost of increasing the fee is smaller than the benefit, so w also prefers ϕ' to any $\phi < \phi'$.

Suppose $\phi' = \phi_2$, so we have $t(\phi') = 2$ (note that, for any given value of the other model parameters, one can always choose $t(\phi)$ so that ϕ_2 is optimal). For simplicity, set $\delta = 1$ and $D = 0$, which implies $t_s = \infty > t_w$. Holding fixed ϕ', the right-hand side of Inequality (35) does not depend on α. It follows that how the optimal fee ϕ^* varies with α depends on how α changes the left-hand side of the inequality. First, we prove that ϕ^* may increase with α. We have $\mathbb{E}[y_0^*(\phi_2)] - \mathbb{E}[y_0^*(\phi_3)] = \alpha(1-\delta_s)[\alpha\delta_s + (1-\alpha)\delta_w]^2$, which increases with α if $\delta_s > \frac{2\delta_w}{3}$. In this case, there always exists $t(\phi)$ such that $\phi_3 - \phi_2 > \mathbb{E}[y_0^*(\phi_2)] - \mathbb{E}[y_0^*(\phi_3)]$ at $\alpha = \alpha'$ and $\phi_3 - \phi_2 < \mathbb{E}[y_0^*(\phi_2)] - \mathbb{E}[y_0^*(\phi_3)]$ at $\alpha = \alpha'' > \alpha'$, so that w prefers ϕ_2 at α' and ϕ_3 at α''.

We next prove that ϕ^* may decrease with α. We have $\mathbb{E}[y_0^*(\phi_1)] - \mathbb{E}[y_0^*(\phi_2)] = \alpha(1-\delta_s)[\alpha\delta_s + (1-\alpha)\delta_w]$, which decreases with α if $\delta_s < \frac{\delta_w}{2}$ and $\alpha > \frac{\delta_w}{2(\delta_w - \delta_s)}$. In this case, there always exists $t(\phi)$ such that $\phi_2 - \phi_1 < \mathbb{E}[y_0^*(\phi_1)] - \mathbb{E}[y_0^*(\phi_2)]$ at $\alpha = \alpha'$ and $\phi_2 - \phi_1 > \mathbb{E}[y_0^*(\phi_1)] - \mathbb{E}[y_0^*(\phi_2)]$ at $\alpha = \alpha'' > \alpha'$, so that w prefers ϕ_2 at α' and ϕ_1 at α''.

Next, we discuss the intuition behind Lemma 4. An increase in α has two different effects on w's incentives to be resilient in the negotiation with s. On the one hand, w extracts more surplus for any value of ϕ and $t(\phi)$, which reduces w's need to invest in resilience. On the other hand, the additional surplus w extracts from being more resilient to negotiations may also increase (e.g., when α moves from 0 to a positive value), which increases w's incentives to become resilient. Depending on which of these two effects dominate, ϕ^* may increase or decrease with α.

Equilibrium. Having characterized $\mathcal{U}$'s choice of ϕ for a given (D, T), we can now solve for s's choice and characterize the unique equilibrium of the game.

Proposition 5. *An equilibrium of the game always exists. In equilibrium, the wage negotiation between s and w is as described in Proposition 4, and $\{(D, T), \phi\}$ jointly solve programs (24) and (25).*

We have shown above that ϕ^* exists and is finite for any given (D, T). Since the strategy space for (D, T) is also finite, a solution to Program (25) always exists (given ϕ^*, one can compute $\mathbb{E}[u_s^*]$ at all possible values of (D, T) and choose the value where $\mathbb{E}[u_s^*]$ is largest). It follows that a collection $\{(D, T), \phi\}$ that jointly solve programs (24) and (25) always exists, and so does an equilibrium of the game. In knife-edge cases, ϕ^* may not be single-valued, and Program (25) may admit multiple solutions. Except for these cases, the equilibrium is unique.

B.1.1 Impatient shareholders.

We conclude this section with a discussion of how the equilibrium characterization changes when shareholders are *more* impatient than workers, that is, when $\delta_s < \delta_w$. For simplicity, here we keep the maximal length of negotiations w can endure (t_w) as fixed and focus on how the firm's resilience (t_s) affects the negotiation outcomes and, as a result, its financing decisions. s's equilibrium surplus ($\mathbb{E}[y_0^*]$) is the same as before (Eqn. 27):

$$\mathbb{E}[y_0^*] = \begin{cases} \tilde{v}_s & \text{if } t_w \geq t_s = t^*; \\ \tilde{v}_s + \alpha[\alpha\delta_s + (1-\alpha)\delta_w]^{t_w}(\delta^{t_w+1} - D) & \text{if } t_w = t^* < t_s \end{cases} \tag{36}$$

where

$$\tilde{v}_s = (1-\alpha)\left\{1 - D + \alpha(\delta_s - \delta_w)\sum_{j=1}^{t^*}\left(\delta^j - D\right)[(1-\alpha)\,\delta_w + \alpha\delta_s]^{j-1}\right\} \tag{37}$$

if $t^* > 0$, and $\tilde{v}_s = (1-\alpha)(1-D)$ if $t^* = 0$.

Since t_s continues to be equal to $\min\{\bar{t}(D), T\}$, the implications for firms' financing decisions depend on how $\mathbb{E}[y_0^*]$ changes with t_s, similar to the main analysis. Since $\delta_s < \delta_w$, now $\tilde{v}_s$ decreases with the maximal length of negotiations t^*. s then is always strictly worse off at $t_s \in (0, t_w]$ than at $t_s = 0$. However, s may be still better off if it can sustain a longer strike than w, that is, if $t_s > t_w$. This may be the case when $\mathbb{E}[y_0^*](t^* = t_w)$ is larger than $\mathbb{E}[y_0^*](t^* = 0)$. After simple manipulations, $\mathbb{E}[y_0^*](t^* = t_w) > \mathbb{E}[y_0^*](t^* = 0)$ simplifies to the following inequality:

$$\frac{1}{1-\alpha}[\alpha\delta_s + (1-\alpha)\delta_w]^{t_w}(\delta^{t_w+1} - D) > (\delta_w - \delta_s)\sum_{j=1}^{t_w}\left(\delta^j - D\right)[(1-\alpha)\,\delta_w + \alpha\delta_s]^{j-1} \tag{38}$$

If Inequality (38) does *not* hold, s is always better off at $t_s = 0$. In this case, the firm's financial resilience does not help s in the negotiations. So they set $T^* = 0$ and $D^* = \arg\max_D (1-\alpha)D - \kappa(k - d(D, 0))$ in equilibrium (recall that the financing cost $d(D, T)$ decreases with T, so s would not want to choose $T > 0$ unless that increases $\mathbb{E}[y_0^*]$). If Inequality (38) holds, however, s may want to outlast w in the negotiation, that is, choose (D, T) so that $t_s > t_w$ (in particular, $t_s = t_w + 1$). The following lemma summarizes the insights described above.[9]

Lemma 5. *Set $\delta_s < \delta_w$, and fix the union's resilience to negotiations (t_w, with $t_w > 0$). Depending on the model parameters, the last period before bargaining breaks down $t^* = \min\{t_s, t_w\}$ takes one of two possible values in equilibrium: $t^* = t_s = 0$ or $t^* = t_w < t_s$. A necessary condition to have $t^* = t_w < t_s$ in equilibrium is that Inequality (38) holds.*

In the equilibrium of the model with $\delta_s \geq \delta_w$, depending on the parameters, t_s takes values over the entire interval $(0, t_w + 1]$. With $\delta_s < \delta_w$, the optimal value of t_s takes instead the form of a bang-bang solution, that is, $t_s \in \{0, t_w + 1\}$. Intuitively, shareholders may still want to *outlast* the union in the negotiations, but otherwise prefer to keep the strike as short as possible. This is because prolonged negotiations are now relatively more costly to s for any $t_s < t_w$, that is, unless the firm can wait until the strike is called off and workers accept their reservation wages.

Next, we describe how the results in Lemma 5 change our insights about the strategic use of financial resilience. The key insight from the model we test in the empirical analysis is that, controlling for the level of leverage, firms will have an incentive to increase maturity when facing more powerful workers (Part 1 of Proposition 3). In what follows, we show that this insight continues to hold when $\delta_s < \delta_w$, but the two are sufficiently close to each other.

Proposition 6. *Set $\delta_s < \delta_w$ and $\alpha \in [0, \frac{1}{2})$; holding the debt level D fixed, the debt maturity T that maximizes shareholders' expected payoff $\mathbb{E}[u_s^*]$ always increases with the workers' bargaining power α if δ_s is sufficiently close to δ_w.*

Suppose D is such that $\bar{t}(D) > t_w$, so that s may have an incentive to choose $T > 0$ to outlast w in the negotiation.[10] The maximal length of negotiations t^* is $t^* = T$ for $T \leq t_w$, and $t^* = t_w$ otherwise. Shareholders choose T to maximize their expected payoff $\mathbb{E}[u_s^*]$. As discussed above,

[9]It is easy to see that Inequality (38) may or may not hold, depending on the parameters. In the limit where δ_s approaches δ_w from the left, the inequality simplifies to $\frac{1}{1-\alpha}\delta_w^{t_w}(\delta^{t_w+1} - D) > 0$, where we must have $\delta^{t_w+1} > D$ for $\bar{t}(D)$ to be larger than t_w, so that the inequality always holds in this case. If δ_s is sufficiently smaller than δ_w, and t_w approaches infinity, the left-hand side of the inequality becomes 0, so that the inequality no longer holds.

[10]If $\bar{t}(D) \leq t_w$, even if s sets $T > t_w$, we still have $t_s = \bar{t}(D) \leq t_w = t^*$. s then always chooses $T^* = 0$ in this case.

they choose between $T = 0$ and $T = t_w + 1$. They choose the latter iff:

$$\mathbb{E}[y_0^*](t^* = t_w + 1) - \kappa(k - d(D, t_w + 1) \geq \mathbb{E}[y_0^*](t^* = 0) - \kappa(k - d(D, 0), \tag{39}$$

which simplifies to the following inequality:

$$\alpha[\alpha\delta_s + (1-\alpha)\delta_w]^{t_w}(\delta^{t_w+1} - D) + \alpha(1-\alpha)(\delta_w - \delta_s)\sum_{j=1}^{t_w}\left(\delta^j - D\right)[(1-\alpha)\,\delta_w + \alpha\delta_s]^{j-1} \tag{40}$$
$$> \kappa[d(D, 0) - d(D, t_w + 1)].$$

If δ_s is sufficiently close to δ_w, the left-hand side of Inequality (38) always increases with α.[11] Since the right-hand side of the inequality does not depend on α, the firm is then more likely to prefer $T^* = t_w + 1$ to $T^* = 0$ when α increases. So, in the model where both the firm and the union have finite resilience to negotiations, our main insights continue to hold even when shareholders are more impatient than workers ($\delta_s < \delta_w$), provided that the difference $\delta_w - \delta_s$ is not too large.

B.2 Credit Market Frictions

This section develops a simple extension of our baseline model that endogenizes the non-strategic costs of leverage and maturity, which were captured in a reduced-form way in Section 2.

We make two modifications to our baseline model. First, we introduce a stochastic component to the firm's revenue, which allows for the possibility of bankruptcy in equilibrium (i.e., even if s and w reach an agreement immediately). Let $x \in \{0, \delta^t\}$ denote the firm's revenues if an agreement is reached at time t, where $x = \delta^t$ with probability $p \in (0, 1)$. The probability distribution for x is common knowledge, but its realization is observed only after the parties reach an agreement and w begins production. The parameter p captures the likelihood that the firm's project succeeds. For simplicity, the delay in production due to negotiations reduces the firm's revenues conditional on the project succeeding, but it does not affect p. Since the firm's revenue is 0 when the project fails, the firm repays its debt only when the project succeeds, and it goes bankrupt otherwise.

[11]In the limit where δ_s approaches δ_w from the left, the left-hand side of Inequality (38) simplifies to $\alpha\delta_w^{t_w}(\delta^{t_w+1} - D)$, which always increases with α. By continuity, this expression then continues to increase with α when δ_s and δ_w are sufficiently close to each other.

Second, we add a competitive credit market featuring risk-neutral debtholders with a discount factor $\delta_c \in (0,1)$. Their breakdown condition pins down the amount d raised by the firm as a function of its debt structure (D,T). The firm's debt is non-callable, which means that it can only be paid at maturity. Therefore, when $T > 0$, even when the firm generates revenues immediately in equilibrium, debtholders will receive a premium to compensate for the delay in the payment.

Equilibrium Analysis. Like for the main model, the firm's resilience is $t^* = \min\left\{\bar{t}, T\right\}$ if $D > 0$, and $t^* = \infty$ if $D = 0$. Given t^*, the equilibrium characterization follows the same logic as in the main model, that is, moving backward from the last period before the firm goes bankrupt. Since the firm's surplus is 0 when the project fails, the two parties negotiate over the division of surplus conditional on the project succeeding, i.e., conditional on $x = \delta^t$. The party making the last offer extracts all of the remaining surplus $\delta^{t^*} - D$. The party receiving the last offer always accepts it, as this party is indifferent between the offer and the bankruptcy payoff of 0. Since w makes an offer with probability α and s with probability $1-\alpha$, and since the project succeeds with probability p, the expected equilibrium-path payoffs from agreeing at time t^* are:

$$v_s\left(t^*, t^*\right) = p\left(1-\alpha\right)\left(\delta^{t^*} - D\right); \quad v_w\left(t^*, t^*\right) = p\alpha(\delta^{t^*} - D).$$

Continuing our way backward, the previous round of negotiations follows the same logic: the party making the offer proposes a division of surplus that makes the receiving party indifferent between accepting or refusing. If s makes the offer y_{t^*-1}, this is such that $p[\delta^{t^*-1} - D - y_{t^*-1}] = \delta_w v_w(t^*, t^*)$. Similarly, w's offer would be such that $p y_{t^*-1} = \delta_s v_s(t^*, t^*)$. It follows that we have:

$$\begin{aligned}
v_s\left(t^*-1, t^*\right) &= (1-\alpha)\left\{ p[\delta^{t^*-1} - D] - \delta_w v_w\left(t^*, t^*\right)\right\} + \alpha\delta_s v_s\left(t^*, t^*\right) \\
&= (1-\alpha)p[\delta^{t^*-1} - D] - (1-\alpha)\delta_w v_w(t^*, t^*) + \alpha\delta_s v_s\left(t^*, t^*\right) \\
&= (1-\alpha)p[\delta^{t^*-1} - D] + \Delta\left(t^*\right); \\
v_w\left(t^*-1, t^*\right) &= \alpha p[\delta^{t^*-1} - D] - \Delta\left(t^*\right),
\end{aligned}$$

where $\Delta\left(t^*\right) \equiv (1-\alpha)\alpha(\delta_s - \delta_w)p[\delta^{t^*} - D]$.

Continuing the sequence until time 0, we obtain s's expected share of surplus in equilibrium:

$$\mathbb{E}[y_0^*] = p(1-\alpha)\left\{1 - D + \alpha(\delta_s - \delta_w)\sum_{j=1}^{t^*}(\delta^j - D)\left[(1-\alpha)\,\delta_w + \alpha\delta_s\right]^{j-1}\right\}, \tag{41}$$

if $t^* > 0$, and $\mathbb{E}[y_0^*] = (1-\alpha)p(1-D)$ if $t^* = 0$. w instead receives $p(1-D) - \mathbb{E}[y_0^*]$ for $t^* \geq 0$.

Even though s and w always reach an agreement at $t = 0$ in equilibrium, the firm is able to pay back D only if its project succeeds, which occurs with probability p. If the project succeeds, debtholders receive the payment D at time T, since the debt is non-callable. If the project fails, debtholders receive the liquidation value of 0. For a given debt structure (D, T), debtholders break even if $-d + p\delta_c^T D = 0$. It follows that we have $d = p\delta_c^T D$ in equilibrium.

In equilibrium, s's total expected payoff $\mathbb{E}[u_s^*]$ is then equal to $\mathbb{E}[y_0^*] - \kappa e$, where $e = k - p\delta_c^T D$. Note that the expression for $\mathbb{E}[u_s^*]$ is isomorphic to the expression for $\mathbb{E}[u_s^*]$ in the baseline model, and the two expressions correspond if we set $d = p\delta_c^T D$ and $p = 1$. Therefore, all the results we obtain in the main model carry through in this extension. An interesting implication of this version of the model is that, when α increases and s responds by switching from $D > 0$ to $D = 0$, the firm becomes *safer*, as bankruptcy no longer occurs with positive probability.

B.3 Outside options

In this section, we study how workers' option to leave the firm and terminate the negotiations influences their outcome. We consider an extension of the main model in which, upon receiving an offer, w can choose to accept the offer, reject it and make a counteroffer, or terminate the negotiations altogether. In the latter case, the game ends and w receives a payoff of ω. To simplify the exposition, we normalize s's outside option to 0.

Equilibrium Analysis. w can always receive a payoff ω by terminating the negotiations, so any agreement must leave at least ω to w. Let $\bar{t}(x)$ be such that $\delta^{\bar{t}(x)} \geq x > \delta^{\bar{t}(x)+1}$ for any $x > 0$. Let t^* denote the last round of negotiations before bargaining breaks down, which occurs when either the firm goes bankrupt or w terminates the negotiations. If s and w reach an agreement at time $\min\{\bar{t}(D), T\}$ (i.e., before the firm goes bankrupt), the firm generates a surplus $\delta^{\min\{\bar{t}(D),T\}} - D$. If

$\delta^{\min\{\bar{t}(D),T\}} - D \geq \omega$, then $\min\{\bar{t}(D), T\}$ is the firm's resilience to negotiations also here. Otherwise, w is better off terminating the negotiations and taking its outside option before time $\min\{\bar{t}(D), T\}$. In this case, the firm's resilience is $\bar{t}(\omega)$, where $\bar{t}(\omega)$ represents the maximal length of negotiations such that the firm can still pay w a wage higher than ω. So we have $t^* = \min\{\bar{t}(D), T, \bar{t}(\omega)\}$, since $\bar{t}(\omega) < \min\{\bar{t}(D), T\}$ when $\delta^{\min\{\bar{t}(D),T\}} - D < \omega$. Note that, since $\omega > 0$, t^* is always finite here.

The following proposition characterizes the equilibrium of the bargaining game.

Proposition 7. *Fix the debt structure (D, T) and let $t^* = \min\{\bar{t}(D), T, \bar{t}(\omega)\}$ denote the last period before bargaining breaks down. An equilibrium always exists, is unique, and has the following features:*

1. *An agreement y_0^* is reached immediately, that is, at time $t = 0$.*
2. *The last offer before bargaining breaks down y_{t^*} leaves the player receiving the offer indifferent between accepting y_{t^*} and its outside option (i.e., ω for w and 0 for s). For any time $t < t^*$, the equilibrium offer y_t is such that the player receiving the offer is indifferent between accepting and refusing y_t.*

For a given value of t^*, the characterization of the equilibrium follows the same logic as in the main model, with the only difference being that w must receive at least ω at each round of negotiations. Proceeding by backward induction, the last round of negotiations (time t^*) leaves the players with the following expected payoff:

$$v_s(t^*, t^*) = (1-\alpha)(\delta^{t^*} - D - \omega); \;\; v_w(t^*, t^*) = \alpha(\delta^{t^*} - D) + (1-\alpha)\omega. \tag{42}$$

In the previous round of negotiations (i.e., at time $t^* - 1$), the party making the offer proposes a division of surplus that makes the receiving party indifferent between accepting or refusing the offer. If s makes the offer y_{t^*-1}, this is such that $\delta^{t^*-1} - D - y_{t^*-1} = \max\{\delta_w v_w(t^*, t^*), \omega\}$ and, thus, $y_{t^*-1} = \delta^{t^*-1} - D - \max\{\delta_w v_w(t^*, t^*), \omega\}$. Since we have normalized s's outside option to 0, w's offer would be instead $y_{t^*-1} = \delta_s(1-\alpha)(\delta^{t^*} - D - \omega)$. It follows that we have:

$$v_s\left(t^* - 1, t^*\right) = (1-\alpha)\left(\delta^{t^*-1} - D - \max\{\delta_w v_w(t^*, t^*), \omega\}\right) + \alpha\delta_s v_s\left(t^*, t^*\right), \tag{43}$$

and $v_w\left(t^* - 1, t^*\right) = \delta^{t^*-1} - D - v_s\left(t^* - 1, t^*\right)$.

Continuing our way backward, we obtain:

$$\begin{aligned} v_s(t^*-2,t^*) &= (1-\alpha)\left(\delta^{t^*-2}-D-\max\{\delta_w v_w(t^*-1,t^*),\omega\}\right)+\alpha\delta_s v_s(t^*-1,t^*); \quad (44)\\ v_s(t^*-3,t^*) &= (1-\alpha)\left(\delta^{t^*-3}-D-\max\{\delta_w v_w(t^*-2,t^*),\omega\}\right)+\alpha\delta_s v_s(t^*-2,t^*);\\ &\ldots, \end{aligned}$$

and $v_w(t^*-j,t^*)=\delta^{t^*-j}-D-v_s(t^*-j,t^*)$, for any j such that $t^*\geq j\geq 0$.

The outside option introduces kinks in the expected payoff sequences, making it hard to derive a closed-form expression for the equilibrium payoffs. To build intuition, we study the special case $\delta_w=0$, for which we can derive closed-form expressions.

Special Case. Consider the special case when $\delta_w=0$, which implies $\max\{\delta_w v_w(t^*-j,t^*),\omega\}=\omega$ for any $t^*>j>0$. Continuing the sequence of payoffs in equations (42) to (44) until time $t=0$, we obtain a closed-form expression for s's expected share of surplus from the negotiation:

$$\mathbb{E}[y_0^*]=(1-\alpha)\left\{1-D-\omega+\alpha\delta_s\sum_{j=1}^{t^*}\left(\delta^j-D-\omega\right)[\alpha\delta_s]^{j-1}\right\}, \quad (45)$$

for $t^*>0$, and $\mathbb{E}[y_0^*]=(1-\alpha)(1-D-\omega)$ for $t^*=0$.

Since $\delta^t-D-\omega\geq 0$ for any $t\leq t^*$, all else equal, $\mathbb{E}[y_0^*]$ increases with the firm's resilience to negotiations t^*. Since $\mathbb{E}[y_0^*]$ continues to increase with the firm's resilience to negotiations, the insights about the strategic use of debt structure from the main model continue to hold here.[12] There are, however, two effects of w's outside options that are worth discussing. First, the outside option limits how much leverage the firm can take: the firm's surplus must be greater than ω in equilibrium (i.e., $1-D>\omega$), otherwise w is always better off terminating the negotiations and leaving the firm. Therefore, when ω increases, s may be forced to reduce leverage. Second, the outside option limits the maximal length of negotiations: t^* decreases with $\bar{t}(\omega)$, which decreases with ω. Intuitively, when ω is larger, w is better off terminating the negotiations earlier.

[12] The properties we derive in the special case hold more broadly, even though the expression for $\mathbb{E}[y_0^*](t^*)$ is less compact. Consider for simplicity the cases with either one or two rounds of negotiations (i.e., $t^*\in 0,1$). We can then write $\mathbb{E}[y_0^*](0)]=(1-\alpha)(1-D-\omega)$ and $\mathbb{E}[y_0^*](1)]=(1-\alpha)(1-D-\max\{\delta_w\alpha[(\delta-D)+(1-\alpha)\omega],\omega\})+\alpha\delta_s(1-\alpha)(\delta-D-\omega)$. In order for two rounds of negotiations to be feasible, we need to have $\delta-D>\omega$ and $T\geq 1$. If $\delta-D>\omega$, we have $\mathbb{E}[y_0^*](1)]>\mathbb{E}[y_0^*](0)]$.

B.4 Debt Rollover

In this section, we introduce the possibility of debt rollover into our analysis – that is, the possibility that the firm obtains a new loan to pay its existing debt and extend the horizon of negotiations.

We add the possibility of rollover to the model in Appendix B.2. Since rollover is only relevant when the firm has some debt obligation, we focus on $D > 0$ in this section.[13] Let $\bar{t}(x)$ be such that $\delta^{\bar{t}(x)} \geq x > \delta^{\bar{t}(x)+1}$ for any $x > 0$. If s and w have yet to reach an agreement at time $\min\{\bar{t}(D), T\}$, the firm is unable to repay the promised amount D at time T. In this case, we let s try to repay D to the existing debtholders by issuing a new loan contract $\{D', T'\}$ in the credit market, with D' being the payment promised to the new debtholders, and T' the maturity of the new loan. If s fails to obtain a new loan, the firm goes bankrupt and the game ends. If s succeeds in obtaining the new loan, the bargaining between s and w continues following the same protocol as in the main model. If s and w have yet to reach an agreement at time $\min\{\bar{t}(D'), T'\}$, the firm is unable to fulfill the new loan. s then tries again to obtain a new loan $\{D'', T''\}$ to pay the existing one.

The sequence of plays described above continues until either s and w agree on a division of surplus or the firm goes bankrupt, with potentially multiple instances of debt rollover along the way. The surplus available in the negotiation between s and w changes with the issuance of a new loan. For example, if the firm rolls over on its initial debt contract at the end of time t, the surplus on the bargaining table between s and w goes from $\delta^t - D$ at time t to $\delta^{t+1} - D'$ at time $t+1$. To simplify the exposition, we set $\delta_c = 1$. Finally, since the modeling of the market for the initial debt obligation does not change here, we focus on the analysis of debt rollover in this section.

Equilibrium Analysis. We begin with describing the equilibrium strategies in the sub-games where s issues a new loan to pay off an existing debt. We conjecture (and verify) that debtholders always break even in expectation and that rollover occurs at most once off the equilibrium path.

First, suppose $T < \bar{t}(D)$. In this case, the first attempt to roll over occurs if the original debt contract expires before s and w reach an agreement. The zero-profit condition for the new loan

[13] The equilibrium is the same as in the main model when $D = 0$.

is $-D + pD' = 0$, since the firm has to raise an amount D (to pay off the initial debt) and is able to repay the new loan only if the project succeeds, which occurs with probability p. Hence, s has to promise an amount $D' = \frac{D}{p}$ to the new debt-holders, so we must have $\delta^{T+1} > \frac{D}{p}$ (which is equivalent to $T < \bar{t}(\frac{D}{p})$) for the firm to be able to roll over on its initial debt. If this condition is satisfied, s issues a new debt contract $\{D' = \frac{D}{p}, T' = \bar{t}(\frac{D}{p})\}$, and bargaining continues until at most time $\bar{t}(\frac{D}{p})$: Since $\delta^{\bar{t}(\frac{D}{p})+1} < \frac{D'}{p}$, the firm is not able to roll over on its debt again if s and w have yet to reach an agreement at time $\bar{t}(\frac{D}{p})$. If we have instead $\delta^{T+1} < \frac{D}{p}$, the firm cannot roll over on the original debt, so it goes bankrupt when s and w have yet to reach an agreement at time T.

Now suppose $T > \bar{t}(D)$. If s and w have yet to reach an agreement at time $\bar{t}(D)$, the firm is unable to fulfill its original debt contract even if the debt has not expired yet (due to the cost of the walkouts). In this case, s can never rollover on its debt obligation: Since we have $\delta^{\bar{t}(D)+1} < D < \frac{D}{p}$, s cannot promise a sufficiently large payment to new debtholders to be able to rollover on the firm's original obligation. Hence, the firm is not able to roll over on its initial debt when either $T > \bar{t}(D)$ or $\delta^{T+1} < \frac{D}{p}$. Since rollover never occurs in this case in any subgame of the full game, the equilibrium is the same as in our baseline model, where debt rollover is not allowed.

Summing up, we can write the maximal length of negotiations as $t^* = \min\left\{\max\{T, \bar{t}(\frac{D}{p})\}, \bar{t}(D)\right\}$. Similar to the main model, t^* increases with T and decreases with D. If $T > \bar{t}(\frac{D}{p})$, there is no debt rollover. So the game is the same as in our baseline model, and the surplus available in the negotiation between s and w changes only when the firm goes bankrupt, as it goes to 0 then. Otherwise, the firm rolls over on its debt if s and w have yet to reach an agreement at time T, and negotiations continue at most until $\bar{t}(\frac{D}{p})$. In this last case, the surplus changes both at bankruptcy and at rollover periods: the surplus is $\delta^t - D$ for $t \le T$, $\delta^t - \frac{D}{p}$ for $T < t \le \bar{t}(\frac{D}{p})$, and 0 for $t > \bar{t}(\frac{D}{p})$.

Having described how debt rollover unfolds in equilibrium, we can now characterize the equilibrium strategies in the bargaining game between s and w.

Proposition 8. *Fix the original debt structure (D, T), with $D > 0$. An equilibrium always exists, is unique, and has the following features:*

1. *Debt rollover occurs off the equilibrium path, only once and if $T < \bar{t}(\frac{D}{p})$, and with a contract $\{D' =$*

$\frac{D}{p}, T' = \bar{t}(\frac{D}{p})\}$*. The last period before bargaining breaks down is* $t^* = \min\left\{\max\{T, \bar{t}(\frac{D}{p})\}, \bar{t}(D)\right\}$.

2. *Part 1 and Part 2 of Proposition 1 continue to hold.*

The characterization follows the same logic as in the main model, except that now the surplus available to negotiate changes when the firm issues a new loan. Let $z_j = \frac{D}{p}$ if the debt contract has already been rolled over at time j (that is, if $j > \min\{T, \bar{t}(D)\}$), and $z_j = D$ otherwise, for any $j > 0$). The last round of negotiations leaves the players with the following expected payoff:

$$v_s(t^*, t^*) = (1-\alpha)p(\delta^{t^*} - z_{t^*}); \;\; v_w(t^*, t^*) = \alpha p(\delta^{t^*} - z_{t^*}). \tag{46}$$

In the previous round of negotiations ($t^* - 1$), s's offer is $y_{t^*-1} = \delta^{t^*-1} - z_{t^*-1} - \delta_w \alpha(\delta^{t^*} - z_{t^*})$, and w's offer is $y_{t^*-1} = \delta_s(1-\alpha)(\delta^{t^*} - z_{t^*})$. It follows that we have:

$$v_s\left(t^*-1, t^*\right) = (1-\alpha)[p(\delta^{t^*-1} - z_{t^*-1}) - \delta_w v_w(t^*, t^*)] + \alpha\delta_s v_s\left(t^*, t^*\right), \tag{47}$$

and $v_w\left(t^*-1, t^*\right) = \alpha[p(\delta^{t^*-1} - z_{t^*-1}) - \delta_s v_s(t^*, t^*)] + (1-\alpha)\delta_w v_w\left(t^*, t^*\right)$.

Continuing the sequence until a given time $t^* - r$, with $r < t^*$, we have:

$$v_s\left(t^*-r, t^*\right) = p\left(1-\alpha\right)\left\{\delta^{t^*-r} - z_{t^*-r} + \alpha\left(\delta_s - \delta_w\right)\sum_{j=t^*-r+1}^{t^*}\left(\delta^j - z_j\right)\left[\left(1-\alpha\right)\delta_w + \alpha\delta_s\right]^{j-r}\right\}. \tag{48}$$

Suppose the firm needs to issue a new loan to pay off its existing debt at a given time $t^* - r - 1$. s's expected continuation payoff is $v_s\left(t^*-r, t^* > 0\right)$ as described in in Eqn. (48). Notice that $v_s\left(t^*-r, t^* > 0\right)$ decreases with z_j for any $j > 0$. It follows that s is always better off if it promises the smallest possible payment to the new debtholders.

Notice also that equilibria in which debt rollover occurs more than once are not consistent with s's optimal strategy: The surplus on the negotiating table shrinks every time the firm rolls over on a previous debt contract (e.g., s has to promise $D'' = \frac{D'}{p} > D'$ for the firm to roll over also on the second debt contract), which induces smaller values for the sequence of z_j in Eqn. (48) and, as a result, a lower $v_s\left(t^*-r, t^* > 0\right)$. Therefore, s sets the contract $\{D', T'\}$ so that there is no further rollover. Our initial conjecture that debtholders break even in expectation and that rollover occurs at most once off the equilibrium path is thus satisfied in equilibrium.

Continuing the sequence described above until time 0, we obtain s's expected share of surplus:

$$\mathbb{E}[y_0^*] = p(1-\alpha)\left\{1 - D + \alpha(\delta_s - \delta_w)\sum_{j=1}^{t^*}\left(\delta^j - z_j\right)[(1-\alpha)\delta_w + \alpha\delta_s]^{j-1}\right\}, \tag{49}$$

if $t^* > 0$, and $\mathbb{E}[y_0^*] = p(1-\alpha)(1-D)$ if $t^* = 0$. w's expected share is $p(1-D) - \mathbb{E}[y_0^*]$ for any $t^* \geq 0$.

It is worth emphasizing that the possibility of debt rollover affects the surplus available in the later rounds of negotiations and, thus, the share of surplus that goes to each player. However, players agree immediately in equilibrium, so debt rollover never actually occurs on the equilibrium path. The total surplus the players bargain over is thus the same as in the main model (that is, $1-D$), even though its distribution between s and w is different (except when $T < \bar{t}(D)$ and $\delta^T < \mu k$, in which case debt rollover does not occur off the equilibrium path either).

Next, we describe how $\mathbb{E}[y_0^*]$ changes with the original debt structure (D, T).

Lemma 6. *In equilibrium, shareholders' expected share of surplus $\mathbb{E}[y_0^*]$ increases with the original debt maturity T and decreases with the original leverage D.*

Similar to the main model, $\mathbb{E}[y_0^*]$ increases with the firm's resilience to negotiations, thus increasing with T and decreasing with D. Like for the previous extensions, our main insights about the strategic use of debt structure thus continue to hold in this version of the model.

We prove Lemma 6 below. First, we prove that $\mathbb{E}[y_0^*]$ increases with T. T affects both t^* and the rollover period. Suppose T goes from T' to $T'' > T'$. If $T'' < \bar{t}(\frac{D}{p})$, debt rollover occurs at T, and $t^* = \bar{t}(\frac{D}{p})$ at both T' and T''. Since the negotiation surplus shrinks after the rollover (z_j goes from D to $\frac{D}{p}$), and rollover occurs earlier at T', $\mathbb{E}[y_0^*]$ increases with T in this case. If $T' < \bar{t}(\frac{D}{p})$ but $T'' \geq \bar{t}(\frac{D}{p})$, we have $t^* = \bar{t}(\frac{D}{p})$ at T' and $t^* = \min\{T'', \bar{t}(D)\} > \bar{t}(\frac{D}{p})$ at T'', as rollover no longer occurs at T''. Since t^* is larger and z_j is always D at T'', $\mathbb{E}[y_0^*]$ increases with T also in this case. Finally, if $T' \geq \bar{t}(\frac{D}{p})$ rollover occurs for neither values of T. In this case, the equilibrium is the same as in our main model, where $\mathbb{E}[y_0^*]$ increases with T.

Next, we prove that $\mathbb{E}[y_0^*]$ decreases with D. Holding fixed t^* and the rollover period, an increase in D directly reduces $\mathbb{E}[y_0^*]$ by decreasing the negotiation surplus. Since the direct effect is always negative, we focus on the indirect effects in what follows. Suppose D goes from D' to

$D'' > D'$. If $T < \bar{t}(\frac{D''}{p})$, debt rollover occurs at T, and $t^* = \bar{t}(\frac{D}{p})$ at both D' and D''. Since $\bar{t}(\frac{D}{p})$ decreases with D and $\mathbb{E}[y_0^*]$ increases with t^*, $\mathbb{E}[y_0^*]$ decreases with D in this case. If $T < \bar{t}(\frac{D'}{p})$ but $T \geq \bar{t}(\frac{D''}{p})$, we have $t^* = \bar{t}(\frac{D'}{p})$ at D' and $t^* = \min\{T, \bar{t}(D'')\} < \bar{t}(\frac{D'}{p})$ at D'', as rollover no longer occurs at D''. Since t^* is larger at D', and $z_j = D$ for at least as many periods as for D'' (at D', the debt is still rolled over at T, which is never smaller than $\min\{T, \bar{t}(D'')\}$), $\mathbb{E}[y_0^*]$ decreases with D also in this case. Finally, if $T \geq \bar{t}(\frac{D'}{p})$, rollover occurs for neither values of D. So we are back to the baseline model in this case, where $\mathbb{E}[y_0^*]$ always decreases with D.

B.5 Debt Renegotiation

In this section, we modify our main model to study the role of debt renegotiation – that is, the possibility that shareholders renegotiate the terms of their debt obligation when they are unable to fulfill the original obligation. The modeling of the debt renegotiation follows the literature on incomplete contracts (e.g., Hart and Moore (1994) and Hart and Moore (1998)).

We consider a simple protocol for the renegotiation of debt contracts. Renegotiation is only relevant when the firm has some debt obligation, so we focus on $D > 0$ in this section.[14] Let $\bar{t}(x)$ be such that $\delta^{\bar{t}(x)} \geq x > \delta^{\bar{t}(x)+1}$ for any $x > 0$. If s and w have yet to agree at time $\min\{\bar{t}(D), T\}$, so that the firm is unable to pay its debt, s offers a new contract $\{D', T'\}$ to debtholders. For simplicity, we assume that debtholders coordinate and act as a single agent ($\mathcal{D}$). $\mathcal{D}$ then chooses between accepting the new contract and forcing the firm into liquidation. In the case of liquidation, $\mathcal{D}$ seizes the firm's assets and receives a payoff μk, where $\mu \in (0, 1)$ captures the efficiency of liquidation. If $\mathcal{D}$ accepts the new contract, the bargaining between s and w continues following the same protocol as in the main model. If s and w have yet to reach an agreement at time $\min\{\bar{t}(D'), T'\}$, the firm is unable to fulfill also the renegotiated contract. s then offers another contract $\{D'', T''\}$ and $\mathcal{D}$ chooses again between liquidating the firm and accepting the new contract.[15]

The sequence of plays described above continues until either s and w agree on a division

[14]The equilibrium is the same as in the main model when $D = 0$.

[15]An implicit assumption in the modeling of renegotiation is that both s's and w's human capitals are essential and inalienable for the firm's production, so $\mathcal{D}$ cannot seize control of the firm and replace either party when the firm breaches a given contract.

of surplus or $\mathcal{D}$ forces the firm into liquidation, with potentially multiple instances of debt renegotiation along the way. The surplus available in the negotiation between s and w changes with the renegotiation of debt contracts. For example, if the payment promised to $\mathcal{D}$ is renegotiated to D' at the end of time t, the surplus on the bargaining table between s and w goes from $\delta^t - D$ at time t to $\delta^{t+1} - D'$ at time $t + 1$. To simplify the exposition, we assume that $\mathcal{D}$ does not discount future payments. The remaining elements of the model are the same as in our baseline model.

Equilibrium Analysis. We begin with describing the equilibrium strategies in the debt renegotiation sub-games. We first focus on equilibria where renegotiation occurs at most once off the equilibrium path and show that such an equilibrium always exists and is unique. We then show that equilibria where renegotiation occurs more than once may also exist, but players' expected payoff and bargaining strategies in such equilibria are the same as in the one where renegotiation occurs at most once. We conjecture (and verify) that, in case of renegotiation, s offers a new contract that makes $\mathcal{D}$ indifferent between accepting the new contract and liquidating the firm.

First, consider the case where $T \leq \bar{t}(D)$, so that the first renegotiation is triggered when the debt expires before s and w agree. If $\delta^T \leq \mu k$, which is equivalent to $T \geq \bar{t}(\mu k)$, the residual surplus is not enough to convince $\mathcal{D}$ to renegotiate: s cannot promise a payment D' large enough to dissuade $\mathcal{D}$ from liquidating the firm. Therefore, if $T \in [\bar{t}(\mu k), \bar{t}(D)]$, the firm is liquidated when it breaches the original debt contract. Since renegotiation does not occur in any subgame, the equilibrium is the same as in the model where debt renegotiation is not allowed.

Now consider the case when $T \leq \bar{t}(D)$ but $\delta^T > \mu k$, and s and w have yet to reach an agreement at time T. In this case, s offers a new contract $\{D' = \mu k, T' = \bar{t}(\mu k)\}$, which makes $\mathcal{D}$ indifferent between accepting the contract and liquidating the firm. $\mathcal{D}$ accepts the new contract, and the bargaining between s and w can continue at most until time $\bar{t}(\mu k)$: Since $\delta^{\bar{t}(\mu k)+1} < \mu k$, $\mathcal{D}$ would prefer to liquidate the firm if it were to breach also the renegotiated contract. The same outcome occurs when $T > \bar{t}(D)$ and s and w have yet to reach an agreement at time $\bar{t}(D)$.

We can then write the maximal length of the wage negotiations as follows:

$$t^* = \begin{cases} T & \text{if } T \in [\bar{t}(\mu k), \bar{t}(D)]; \\ \bar{t}(\mu k) & \text{otherwise.} \end{cases} \tag{50}$$

In the first case in Eqn. (50), the surplus available in the wage negotiations is $\delta^t - D$ for $t \le T$, and 0 for $t > T$ (as the firm is liquidated if s and w have yet to agree at time T). In the second case, the surplus is $\delta^t - D$ for $t \le \min\{T, \bar{t}(D)\}$, $\delta^t - \mu k$ for $t \in (\min\{T, \bar{t}(D)\}, \bar{t}(\mu k)]$, and 0 for $t > \bar{t}(\mu k)$.

The value of t^* is uniquely pinned down in equilibrium. However, when $T \notin [\bar{t}(\mu k), \bar{t}(D)]$, there are multiple debt renegotiation paths that lead to the same equilibrium outcomes. For example, s could offer a contract $\{D' = \mu k, T' = \bar{t}(\mu k) - 1\}$, when the firm breaches the first debt contract, and then a new contract $\{D'' = \mu k, T'' = \bar{t}(\mu k)\}$, when it breaches the second one, with $\mathcal{D}$ accepting both contracts in the continuation game. However, the renegotiation of the second contract does not affect t^* or the surplus available to negotiate, so it is without loss of generality to consider the equilibria in which only the original debt contract is renegotiated off the equilibrium path.

Having described how debt is renegotiated along the equilibrium path, we can now characterize the equilibrium strategies in the bargaining game between s and w.

Proposition 9. *Fix the original debt structure (D, T), with $D > 0$. An equilibrium where renegotiation occurs at most once off the equilibrium path always exists, is unique, and has the following features:*

1. *Debt renegotiation occurs off the equilibrium path and only if $T \notin [\bar{t}(\mu k), \bar{t}(D)]$, and the renegotiated contract is $\{D' = \mu k, T' = \bar{t}(\mu k)\}$. The last period before bargaining breaks down is t^* in Eqn. (50).*

2. *Part 1 and Part 2 of Proposition 1 continue to hold.*

The characterization of the equilibrium of the bargaining stage follows the same logic as in the main model, except that now the surplus available to negotiate changes when the debt contract is renegotiated. Let $z_j = \mu k$ if the debt contract has already been renegotiated at time j (that is, if $j > \min\{T, \bar{t}(D)\}$), and $z_j = D$ otherwise, for any $j > 0$). The last round of negotiations (time t^*) leaves the players with the following expected payoff:

$$v_s(t^*, t^*) = (1 - \alpha)(\delta^{t^*} - z_{t^*}); \;\; v_w(t^*, t^*) = \alpha(\delta^{t^*} - z_{t^*}). \tag{51}$$

In the previous round of negotiations (t^*-1), s's offer is $y_{t^*-1} = \delta^{t^*-1} - z_{t^*-1} - \delta_w \alpha(\delta^{t^*} - z_{t^*})$, and w's offer is $y_{t^*-1} = \delta_s(1-\alpha)(\delta^{t^*} - z_{t^*})$. It follows that we have:

$$v_s\left(t^*-1, t^*\right) = (1-\alpha)\left(\delta^{t^*-1} - z_{t^*-1} - \delta_w \alpha(\delta^{t^*} - z_{t^*}\right) + \alpha \delta_s v_s\left(t^*, t^*\right), \tag{52}$$

and $v_w\left(t^*-1, t^*\right) = \delta^{t^*-1} - z_{t^*-1} - v_s\left(t^*-1, t^*\right)$.

Continuing the sequence until a given time t^*-r, with $r < t^*$, we have:

$$v_s\left(t^*-r, t^*>0\right) = (1-\alpha)\left\{\delta^{t^*-r} - z_{t^*-r} + \alpha\left(\delta_s - \delta_w\right) \sum_{j=t^*-r+1}^{t^*} \left(\delta^j - z_j\right)\left[(1-\alpha)\,\delta_w + \alpha\delta_s\right]^{j-r}\right\}, \tag{53}$$

and $v_w(t^*-r, t^*) = \delta^{t^*-r} - z_{t^*-r} - v_s\left(t^*-r, t^*\right)$.

Suppose the firm breaches the debt contract at time t^*-r-1, so that s has to renegotiate it with $\mathcal{D}$. s's expected continuation payoff is $v_s\left(t^*-r, t^*>0\right)$, which decreases with z_j for any $j > 0$. It follows that s is always better off if it promises the smallest possible payment to $\mathcal{D}$ (i.e., a payment μk) when it renegotiates a debt contract. So our initial conjecture that s makes $\mathcal{D}$ indifferent between accepting the new contract and liquidating the firm is always satisfied in equilibrium.

Continuing the sequence described above until time 0, we obtain s's expected share of surplus:

$$\mathbb{E}[y_0^*] = (1-\alpha)\left\{1 - D + \alpha(\delta_s - \delta_w)\sum_{j=1}^{t^*}\left(\delta^j - z_j\right)\left[(1-\alpha)\,\delta_w + \alpha\delta_s\right]^{j-1}\right\}, \tag{54}$$

if $t^* > 0$, and $\mathbb{E}[y_0^*] = (1-\alpha)(1-D)$. w's expected share of surplus is $1 - D - \mathbb{E}[y_0^*]$ for $t^* \geq 0$.

The possibility of debt renegotiation affects the surplus available to negotiate in the following rounds of negotiations and, thus, the share of surplus that goes to each player in equilibrium. However, an agreement is reached immediately in equilibrium, so the debt contract is never actually renegotiated on the equilibrium path. The surplus players bargain over is thus the same as in the main model (i.e., $1-D$), even though its distribution between s and w is different (except when $T \in [\bar{t}(\mu k), \bar{t}(D)]$, in which case debt is not renegotiated off the equilibrium path either).

Lemma 7. *In equilibrium, shareholders' expected share of surplus $\mathbb{E}[y_0^*]$ may increase or decrease with both the original debt maturity T and leverage D.*

The comparative statics in Lemma 7 differ from those we obtain in the baseline model, since $\mathbb{E}[y_0^*]$ may now decrease with T and increase with D, which was never the case in the main model. Below, we first briefly discuss the intuition behind the results and then proceed to formally prove the lemma. A more detailed discussion of the results is at the end of this section.

If $\delta^T > D > \mu k$, the debt contract is renegotiated when the bargaining continues beyond time T (since $\delta^T > D$ implies $\min\{T, \bar{t}(D)\} = T$). Through the renegotiation, s obtains a reduction in the payment promised to $\mathcal{D}$ (since $D > \mu k$), which increases the surplus available in the continuation of the bargaining game between s and w. Since w is more impatient than s, s benefits relatively more from the increase in future surplus. When T is smaller, debt is renegotiated earlier, and there are thus more rounds of negotiations with relatively more surplus. So $\mathbb{E}[y_0^*]$ decreases with T in this case. By a similar logic, when $D < \mu k$, and D increases slightly so that $\bar{t}(D)$ goes down and debt is renegotiated earlier, $\mathbb{E}[y_0^*]$ may increase with D.

If $\min\{\mu k, \delta^T\} \geq D$, we recover the result that $\mathbb{E}[y_0^*]$ always increases with T and decreases with D. If $\mu k > \delta^T \geq D$, $\mathcal{D}$ prefers to liquidate the firm when it breaches the debt contract, so there is no renegotiation off the equilibrium path either and we are back to our main model. If $\delta^T > \mu k \geq D$, if the firm breaches the contract, $\mathcal{D}$ agrees to extend the debt maturity but also requires a larger payment (since $\mu k \geq D$). When T is smaller, debt is renegotiated earlier, and there are thus more rounds of negotiations with relatively less surplus. It follows that $\mathbb{E}[y_0^*]$ increases with T and decreases with D, as the negotiation surplus always decreases with D in this case.

We prove Lemma 7 below. Let $\mathbb{E}[y_0^*(T)]$ denote the value of $\mathbb{E}[y_0^*]$ as a function of T. Suppose T goes from $T' = 1$ to $T'' = 2$, and δ, D, and μk are such that $\bar{t}(\mu k) = \bar{t}(D) = 3$. Since $T < \bar{t}(\mu k)$, renegotiation occurs at time T and $t^* = 3$ at both T' and T''. We can then write $\mathbb{E}[y_0^*(2)] - \mathbb{E}[y_0^*(1)] = -(1-\alpha)\alpha(\delta_s - \delta_w)[(1-\alpha)\delta_w + \alpha\delta_s](D - \mu k)$. $\mathbb{E}[y_0^*(2)] - \mathbb{E}[y_0^*(1)]$ is then positive if $\mu k > D$, and negative otherwise, which proves that $\mathbb{E}[y_0^*]$ may increase or decrease with T. Next, we prove that $\mathbb{E}[y_0^*]$ may increase or decrease with D. Let $\mathbb{E}[y_0^*(D)]$ denote the value of $\mathbb{E}[y_0^*]$ as a function of D. Suppose D goes from D' to $D'' > D'$, where $D' = \delta^2$, and $D'' \in (\delta^2, \delta)$. For simplicity, set also $\delta_s = 1$, $\delta_w = 0$, $\mu k = \delta^3$, and $T > 3$. In this example, we have $t^* = 3$, and renegotiation occurring at time $\bar{t}(D') = 2$ at D', and at time $\bar{t}(D'') = 1$ at D''. We can then write $\mathbb{E}[y_0^*(D'')] - \mathbb{E}[y_0^*(D')] = (1-\alpha^3)\delta^2 - (1-\alpha^2)D'' - (1-\alpha)\alpha^2\mu k$. At $\alpha = \frac{1}{2}$, $\mathbb{E}[y_0^*(D'')] - \mathbb{E}[y_0^*(D')]$ is positive for $D'' \in (\delta^2, \frac{1}{6}\delta(7\delta - \delta^2))$, and negative for $D'' \in (\frac{1}{6}\delta(7\delta - \delta^2), \delta)$.

Discussion of Results. The possibility of debt renegotiation adds more nuances to how the firm's debt structure influences its negotiations with labor. First, renegotiation weakens the link between the maximal length of wage negotiations t^* and the original debt obligation: conditional on renegotiation occurring off the equilibrium path, t^* no longer depends on (D, T). Second, if the debt payment is renegotiated downward, the surplus available in the rounds of bargaining that follow the debt renegotiation increases. Since w is less patient, the increase in surplus improves s's bargaining position, as it would be less costly for s to haggle until renegotiation occurs. This creates an incentive for s to lower maturity, so renegotiation occurs earlier off the equilibrium path.

There are, however, a number of caveats to these nuances. First, when renegotiation is triggered by the expiration of the original maturity ($T \le \bar{t}(D)$), the debt payment is renegotiated *upward* if $D \le \mu k$. It is worth noticing that, if the debt contract is generally not enforceable (that is, even when the profits are sufficient to pay D, like in Hart and Moore 1994), $D > \mu k$ is not "renegotiation-proof" and so not feasible in equilibrium: $\mathcal{D}$ anticipates that any $D > \mu k$ would be renegotiated down to $D' = \mu k$ also on the equilibrium path. So s is restricted to choose $D \le \mu k$ in this case.

Second, if $D > \mu k$ and debt renegotiation occurs off the equilibrium path, the maximal length of wage negotiations $\bar{t}(\mu k)$ may be relatively short. So s may still be better off choosing (D, T) such that renegotiation never occurs also off the equilibrium path. Finally, to simplify the analysis, we have abstracted from coordination problems among creditors and shareholders' reputational concerns with breaching the original debt contract (see Appendix B for references to some of the literature on these issues). A simple way to include these frictions in our model is to assume that renegotiating the original debt contract imposes a private cost c on s. A sufficient condition for debt renegotiation to never occur both on and off the equilibrium path would be $c \ge \delta^{\min\{\bar{t}(D),T\}+1} - \mu k$.[16]

[16]The surplus s receives in the continuation of the wage negotiations following debt renegotiation cannot be higher than $\delta^{\min\{\bar{t}(D),T\}+1} - \mu k$. So if $\delta^{\min\{\bar{t}(D),T\}+1} - \mu k - c \le 0$, s is always better off not renegotiating the original contract.

C Data Appendix

C.1 List of data sources

C.1.1 Compustat

The Compustat Annual updates dataset contains balance sheet and income statement information for firms. The dataset covers the period from 1950 to 2020. Our sample includes all publicly traded US firms, excluding those in the financial sector (SIC code 60) and utilities (SIC code 49). In Section 4.1, we employ the headquarters location information in Compustat to match it with the adoption of RWLs across different US states. Following the approach of Fortin, Lemieux, and Lloyd (2023), the sample period for this analysis is from 2007 to 2019, excluding states that had already adopted these laws before 2007.

C.1.2 Strikes data

The data, available on the US Bureau of Labor Statistics website, includes information on work stoppages (strikes) of US companies. The sample consists of labor strikes involving more than 1,000 workers and covers the period from 1993 to 2019. To link this dataset with financial information, we matched it with the Compustat quarterly dataset using company names. This allowed us to obtain financial data for the firms whose workers were involved in a strike. The financial information was used to create Figure 1.

C.1.3 Union elections

This dataset contains information on union certifications of establishments within US firms. The data is collected from two different sources: data from 1977 to 1999 is provided by Holmes (2006), and data from 2000 to 2020 is hand-collected from the National Labor Relations Board (NLRB). We matched this dataset with Compustat using the company names. Through a string-matching procedure and manual checks, we identified 1,247 unique firms with union elections. This data is used to estimate our difference-in-differences model on a sample of unionized firms to plot Figure 4 and our classification of high and low unionization industries in Section 4.1.2.

C.1.4 Labor organizations: membership and financial data

This dataset contains information on the balance sheets and income statements of US labor organizations. The data is maintained by the US Department of Labor. Labor organizations that fall under the Labor Management Reporting and Disclosure Act (LMRDA), the Civil Service Reform Act (CSRA), or the Foreign Service Act (FSA) are required to submit a financial report, either Form LM-2, LM-3, or LM-4, to the Office of Labor-Management Standards (OLMS) of the US Department of Labor each year. These laws apply to labor organizations representing employees in private industry, the US Postal Service, and most federal government employees. Labor organizations representing state, county, or municipal government employees are not covered by these laws and are not obligated to file.

The filing requirements for labor organizations depend on their total annual receipts. The term "total annual receipts" refers to all the financial receipts the labor organization receives during its fiscal year, regardless of the source. Labor organizations with total annual receipts of \$250,000 or more are required to file Form LM-2, those with total annual receipts of \$10,000 or more but less than \$250,000 must file Form LM-3, and labor organizations with total annual receipts of less than \$10,000 are required to file Form LM-4. In our sample, we include all labor organizations that filed Forms LM-2 and LM-3. The data spans from 2000 to 2022, but the specific time period used for each table depends on the test and is specified accordingly. Table 2 presents summary statistics for all relevant variables.

Variable Label	Description
	Panel A: Main dependent variables
LT debt ratio(>5Y)	The ratio between debt with maturity longer than three years (Compustat variables dltt - dd2 - dd3 - dd4 - dd5) over the total value of assets (Compustat variable *at*).
Book leverage	Ratio between the total book value of debt (Compustat variables dltt + dlc) over the total value of assets.
Resilience	
(Intensive Margin)	Debt at different maturity intervals (under 1 year, 2 years, 3 years, 4 years, and above 5 years) divided by assets. We use midpoint maturity for each interval except for debt with maturity greater than 5 years, for which we use the average of years to maturity for debt with remaining maturity longer than 5 years (10.26 years according to Badoer and James, 2016).
	Panel B: Firm-level controls
Total asset	Total value of assets (Compustat variable at).
Total debt	Total value of debt outstanding (Compustat dltt plus dlc).
Size	Natural logarithm of the sales.
Cash	Ratio between cash and short term investment (Compustat variable che) and the total value of assets.
Profitability (ROA)	The ratio of earnings before interest, taxes, depreciation and amortization (Compustat variable *ebitda*) scaled by the total value of assets.
Market-to-book (M/B)	Ratio of market value of assets (Compustat variables at plus csho times prcc_f-ceq) over the total value of assets.

(Continued)

Variable Label	Description
Collateral (Cltr)	Ratio between the sum of inventories (Compustat variable *invt*) and property, plant and equipment (Compustat variable *ppent*) over the total value of assets.
Inventory	Ratio between the value a firm's total inventory (Compustat variable *invt*) and sales (Compustat variable *sale*).
Tangibility	Ratio between tangible assets measured by property, plant and equipment (Compustat item ppent) and total assets.
	Panel C: Labor organization membership and financials
Receipts	Total value of union receipts. Statement B of the LM-2 (item 49) and LM-3 (item 44) forms from the Labor Organization Annual Report. Mandatory filings for labor organizations with more than $10,000 in total annual receipts.
Assets	Total value of a union assets. Statement A of the LM-2 and LM-3 forms.
Leverage	Ratio between the total book value of liabilities and the total value of assets.
Cash	Total value of cash holding. Statement A of the LM-2 and LM-3 forms.
Members	Number of union members at the end of the reporting period. Schedule 13 of LM-2 form and item 19 of LM-3 form.
Fees	The total value of dues and agency fees. Statement B of the LM-2 (item 36) and LM-3 (item 38) forms.
Strike funds	An indicator variable equal to one if a union has used funds to support strike activities, and zero otherwise. Statement B of the LM-2 (item 57) and LM-3 (item 50) forms.

Table IA1. (Summary statistics – Compustat-Capital IQ merged dataset) The table contains summary statistics for the merged Compustat-Capital IQ capital structure dataset. There are 8,308 unique firms for 51,443 firm-year observations. The sample period is from 2007 to 2019.

	Mean	Std. Dev.	Min	Median	Max
Commercial paper	0.008	0.043	0.000	0.000	1.000
Revolving debt	0.298	0.354	0.000	0.127	1.000
Term loans	0.264	0.340	0.000	0.070	1.000
Bonds and notes	0.313	0.356	0.000	0.142	1.000
Capital lease	0.071	0.216	0.000	0.000	1.000
Hybrid securities	0.000	0.006	0.000	0.000	0.570
Other borrowings	0.045	0.145	0.000	0.000	1.000

Table IA2. (Summary statistics – CDS dataset) This table reports summary statistics for the Credit Default Swap (CDS) dataset matched with Compustat. We follow the approach of Fortin, Lemieux, and Lloyd (2023) and analyze data from 2007 to 2019, excluding states that implemented RWLs laws before 2007. The sample comprises 210 unique firms and 1,899 firm-year observations with no missing data for 5-year CDS spread data. Financial variables are winsorized at 1% tails. Refer to the Variable List and Description table for more details about variables' definition and computation.

	Mean	Std. Dev.	Min	Median	Max
Par-spread 1Y	0.014	0.097	0.000	0.003	2.632
Par-spread 5Y	0.021	0.063	0.001	0.009	1.615
Par-spread 10Y	0.024	0.055	0.001	0.012	1.468
Par-spread 30Y	0.024	0.045	0.002	0.014	1.129
Recovery rate	0.387	0.036	0.094	0.400	0.577
Leverage	0.314	0.168	0.000	0.289	0.874
Cash	0.124	0.114	0.001	0.090	0.952
LT debt ratio(>5Y)	0.130	0.098	0.000	0.111	0.708
Market-to-book	1.866	0.874	0.566	1.628	9.432
Profitability (ROA)	0.141	0.098	-2.194	0.137	0.431
Collateral	0.326	0.193	0.008	0.302	0.897

Table IA3. (List of states adopting RWLs) This table reports the years in which US states adopted RWLs. Given Compustat data availability, every change that happened before 1950 will not be captured by our difference-in-differences model. Data can be found at https://www.ncsl.org/research/labor-and-employment/right-to-work-laws-and-bills.aspx

State	*Year RWLs*	*Introduction*	*State*	*Year RWLs*	*Introduction*
Alabama	1953		Nebraska	1946	
Alaska	No		Nevada	1951	
Arizona	1946		New Hampshire	No	
Arkansas	1947		New Jersey	No	
California	No		New Mexico	No	
Colorado	No		New York	No	
Connecticut	No		North Carolina	1947	
Delaware	No		North Dakota	1947	
District of Columbia	No		Ohio	No	
Florida	1944		Oklahoma	2001	
Georgia	1947		Oregon	No	
Hawaii	No		Pennsylvania	No	
Idaho	1985		Rhode Island	No	
Illinois	No		South Carolina	1954	
Indiana	2012		South Dakota	1946	
Iowa	1947		Tennessee	1947	
Kansas	1958		Texas	1947	
Kentucky	2017		Utah	1955	
Louisiana	1976		Vermont	No	
Maine	No		Virginia	1947	
Maryland	No		Washington	No	
Massachusetts	No		West Virginia	2016	
Michigan	2012, Rpld.: 2023		Wisconsin	2015	
Minnesota	No		Wyoming	1963	
Mississippi	1954				
Missouri	No				
Montana	No				

D Proxying for Heterogeneity in Shareholders' Discount Factors

In our theoretical framework in Section 2, we assumed workers are more impatient than shareholders ($\delta_s > \delta_w$), an assumption we then relaxed in Appendix B.1 to when workers and shareholders have equal discount factors ($\delta_s \geq \delta_w$), and then further relaxed to when $\delta_s < \delta_w$ but both discount factors are sufficiently close ($\delta_s \gtrapprox \delta_w$). In this section, we provide empirical analysis where we proxy for heterogeneity in shareholders' discount factors and show that as shareholders' discount factors increase, so does the magnitude of our findings.

Shareholder Impatience. We proxy for the degree of impatience of shareholders by measuring the concentration of shares within a firm using an HHI index. The rationale behind this proxy is that, when any negative impacts of strikes are distributed across more shareholders, any one shareholder will be less affected, and shareholders as a group will be able to withstand a strike for longer. We classify a firm with high share HHI as having (relatively) impatient shareholders. Conversely, a low HHI index, indicating dispersed shares, would proxy for patient shareholders.

Recall that for the resilience motive, our model predictions should hold if $\delta_s \gtrapprox \delta_w$, but are ambiguous if $\delta_s << \delta_w$. That would induce a bias towards zero to our estimates of the debt maturity response to the passage of RWLs where shareholders are more impatient. Appendix Table IA4 tests this by presenting results by shareholder impatience splits. The maturity response intensifies for more patient shareholders, consistent with our model and its extensions.

Regarding leverage, if the leverage response to RWLs is driven by the traditional strategic leverage motive, we should expect this response to be (a) independent of the impatience levels if neither group cares about resilience, otherwise (b) larger (i.e., more negative) where shareholders are more impatient, since impatient shareholders should be less concerned about the negative effect of leverage on the firm's resilience. Appendix Table IA4 shows instead that the leverage response intensifies where shareholders are more patient. This finding is inconsistent with changes in leverage arising *exclusively* from strategic motives, but it is consistent with a leverage response that accommodates changes in debt maturity due to resilience motives (e.g., the firm changes debt maturity because of the resilience concern, and then adjusts leverage in response to the lower cost of debt implied by the new maturity structure).

CEO Impatience. Another dimension of impatience is that of management. We repeat the exercise above by instead using a measure of CEO impatience. We proxy for CEO impatience by measuring the fraction of their total compensation that is performance-based. The rationale is that CEOs with a higher proportion of performance-based compensation are more negatively impacted by workers' strikes, as these strikes directly affect firm performance. Therefore, a strike should impose larger costs on CEOs with more performance-based compensation, who should then have a relatively lower discount factor (less patient) in the negotiations with labor. In Appendix Table IA5, we show that, for patient CEOs, the magnitude of our results becomes significantly larger. For impatient CEOs, just as before, the results are instead weaker. This again is incompatible when strategic leverage motives are the exclusive channel of response to the passage of RWLs, but it is entirely consistent with resilience motives.

E Additional Robustness

E.1 Margins of Response – Robustness

Figure IA3 provides evidence on alternative margins of response to increase financial resilience following changes in RWLs. Inventory and cash are not the main margins of response following the passage of RWLs.

E.2 Substitution Across Sources of Debt

A potential confounder for our results is that firms may substitute bank loans with public debt when facing more powerful employees: Since the latter is harder to renegotiate with creditors, it may be more effective in pushing surplus off the negotiation table with workers (Qiu 2016). Given that public debt tends to have longer maturity, our results may be driven by this substitution rather than the firms' interest in financial resilience. To test for this alternative mechanism, we use data on firms' debt structure to separate different sources of financing. Results in Table IA6 show that firms do not adjust the relative weights of their sources of debt (including the fractions of bank and public debt), which suggests that this alternative mechanism is not at play in our sample.

E.3 Effect of RWLs on Firms' Credit Ratings and Credit Default Swaps Spreads

Another potential mechanism is that following the passage of RWLs, lenders might regard corporate debt more or less risky in firms that are covered by RWLs. This would then be reflected in the firms' credit ratings, their bond prices, or the spreads in credit default swaps. We presented results showing that bond prices do not change in Figure 7. In Table IA7, we also show that credit ratings remain unchanged as well, showing that credit rating agencies do not evaluate the creditworthiness of the firm differently following passage RWLs. As is the case with bond prices, we also show in Table IA8 that CDS spreads do not meaningfully change either, showing that the market does not consider the passage RWLs as improving the creditworthiness of corporate debt.

E.4 Effect of RWLs on Firms' Cumulative Abnormal Returns (CARs)

Consistent with the lack of response stemming from credit markets documented above, we show that cumulative abnormal stock returns (CARs) for firms newly exposed to RWLs do not change (Table IA9). This is consistent with prior evidence (Lee and Mas 2012) showing no short-term response and a slow long-term response to unionization events in equity markets.

E.5 Lack of Heterogeneous Response to RWLs Conditional on High Fixed Costs

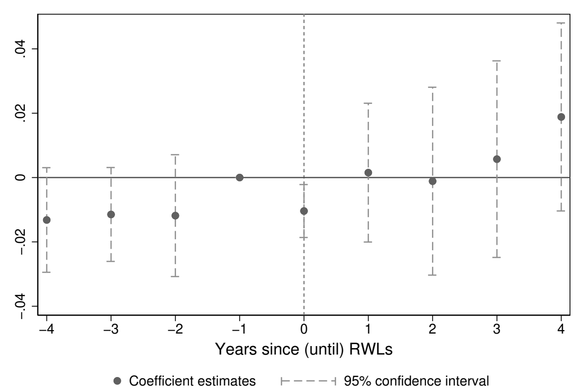
Here we test for whether the connection between financial leverage/debt maturity and RWLs is driven by substitution between operational and financial leverage. Simintzi et al. (2015) argue for this trade-off using cross-country variation in employment protection.

We test for this by evaluating whether there exists a heterogeneous response to the passage of RWLs in firms that have high fixed costs. Following the literature (e.g., Gorodnichenko and Weber, 2016), we measure fixed costs by using Compustat variables: selling, general and administrative expenditures (Compustat item XSGA), advertising (Compustat item XAD), and research and development expenses (Compustat item XRD). We then divide these by sales. Results are shown in Table IA10. High fixed costs firms do not respond differently to the passage of RWLs.

F Tables and Figures

Figure IA3. (Parallel trends DiD framework – Cash and Inventory) The figure plots the dynamic effect of RWLs on cash and inventory variables, following the estimation procedure in Sun and Abraham (2021). We centered the adoption of the Right-work-law at date $t-1$ and estimated a model with indicators for each year relative to the year before the adoption date. We follow the approach of Fortin, Lemieux, and Lloyd (2023) and analyze data from the period between 2007 and 2019, excluding states that implemented RWLs laws before 2007. The regressions include industry-by-year and firm fixed effects. Standard errors are clustered at the state level.

(a) Cash



(b) Inventory (finished goods)

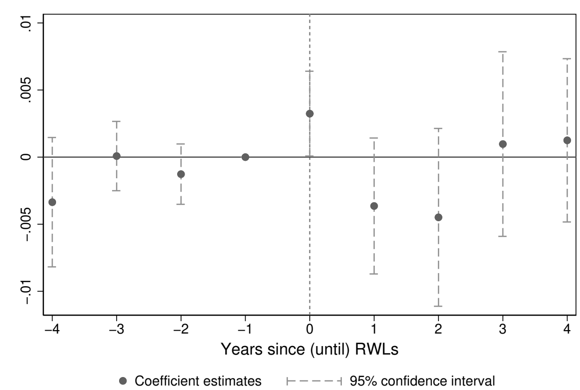


Table IA4. (DiD results and shareholders patience) This table presents the results of a Difference-in-Differences (DiD) analysis, using sub-samples of firms categorized based on a proxy that captures the patience level of their shareholders. Shareholder patience is measured by the Herfindahl-Hirschman Index (HHI) of ownership concentration. A higher HHI (indicating more concentrated ownership) captures less patient shareholders, while a lower HHI (indicating more dispersed ownership) suggests more patient shareholders. We define *impatient shareholders* as those in the top 25% of the HHI distribution and *patient shareholders* as those in the bottom 25%. We follow the approach of Fortin, Lemieux, and Lloyd (2023) and analyze data from 2007 to 2019, excluding states that implemented RWLs laws before 2007. Some specifications include financial controls such as Size, Profitability (ROA), Collateral, and Market-to-book ratio. Refer to the Variable List and Description table for more details about variables' definition and computation. Standard errors in parenthesis are robust and clustered at the firm level. ∗∗∗, ∗∗, and ∗ indicate significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Patient Shareholders						Impatient Shareholders					
	LT debt ratio(>5Y)		Book leverage		Resilience Intensive Margin		LT debt ratio(>5Y)		Book leverage		Resilience Intensive Margin	
Unconditional												
RWL	-0.038***	-0.038***	-0.048**	-0.047**	-0.427***	-0.417***	0.006	0.010	0.014	0.004	0.093	0.147
	(0.013)	(0.013)	(0.019)	(0.018)	(0.135)	(0.131)	(0.017)	(0.020)	(0.021)	(0.016)	(0.154)	(0.193)
Theory												
RWL	-0.016**	-0.016**	-0.029**	-0.027*	-0.142**	-0.132**	0.003	0.009	0.010	-0.002	0.050	0.134
	(0.007)	(0.007)	(0.014)	(0.014)	(0.052)	(0.052)	(0.019)	(0.022)	(0.026)	(0.023)	(0.179)	(0.213)
Firm controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Obs.	3,616	3,342	3,616	3,342	3,616	3,342	3,692	2,648	3,692	2,648	3,692	2,648
Cluster	27	27	27	27	27	27	26	24	26	24	26	24

Table IA5. (DiD results and CEO patience) This table presents the results of the Difference-in-Differences (DiD) analysis, using sub-samples of firms categorized by a proxy that captures the patience level of their CEOs. We define *patient* CEOs those with the ratio of performance-based components to total compensation within the bottom 25% of the sample distribution. Conversely, a CEO is deemed *impatient* if this ratio falls within the top 25% of the distribution. We follow the approach of Fortin, Lemieux, and Lloyd (2023) and analyze data from 2007 to 2019, excluding states that implemented RWLs laws before 2007. Some specifications include financial controls such as Size, Profitability (ROA), Collateral, and Market-to-book ratio. Refer to the Variable List and Description table for more details about variables' definition and computation. All regressions include two-digit SIC industry-by-year and firm fixed effects, with standard errors clustered at the state level. ∗∗∗, ∗∗, and ∗ indicate significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	Patient CEOs						Impatient CEOs					
	LT debt ratio(>5Y)		Book leverage		Resilience Intensive Margin		LT debt ratio(>5Y)		Book leverage		Resilience Intensive Margin	
Unconditional												
RWL	-0.023*	-0.039*	-0.049*	-0.060	-0.346*	-0.483*	-0.012	-0.002	-0.022	-0.007	-0.069	0.046
	(0.013)	(0.019)	(0.027)	(0.037)	(0.193)	(0.252)	(0.024)	(0.019)	(0.029)	(0.019)	(0.249)	(0.176)
Theory												
RWL	-0.005	-0.016**	-0.033	-0.031	-0.120	-0.192**	-0.004	0.001	-0.017	-0.007	0.028	0.078
	(0.006)	(0.007)	(0.020)	(0.024)	(0.077)	(0.087)	(0.015)	(0.013)	(0.018)	(0.013)	(0.126)	(0.100)
Firm controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Obs.	3,156	2,631	3,156	2,631	3,156	2,631	3,468	2,918	3,468	2,918	3,468	2,918
Cluster	19	19	19	19	19	19	24	24	24	24	24	24

Table IA6. (Debt structure – Several sources of debt) This table presents results obtained from estimating the difference-in-differences model, as depicted in Eqn. (4), where the dependent variables are calculated as the fractions of various debt types relative to the total outstanding debt of the firm. We follow the approach of Fortin, Lemieux, and Lloyd (2023) and analyze data from 2007 to 2019, excluding states that implemented RWLs laws before 2007. Specifications include financial controls such as Size, Profitability (ROA), Collateral, and Market-to-book ratio. All regressions include two-digit SIC industry-by-year and firm fixed effects, with robust standard errors in parenthesis clustered at the state level. $***$, $**$, and $*$ indicate significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dep var.: Fraction of the following debt types						
	Commercial paper	Revolving debt	Term loans	Bonds and notes	Capital lease	Hybrid securities	Other borrowings
RWL	0.003	-0.031	-0.009	0.033	0.006	-0.000	-0.002
	(0.003)	(0.035)	(0.020)	(0.037)	(0.008)	(0.000)	(0.012)
Firm controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	19,574	19,574	19,574	19,574	19,574	19,574	19,574
Cluster	28	28	28	28	28	28	28

Table IA7. (DiD: Effects of RWLs on credit ratings) This table presents the results obtained from estimating the DiD model, as shown in Eqn. (4), with firms' credit ratings as the outcome variable. In columns (1) and (2), credit ratings are expressed as ratios between an integer number assigned to a specific credit rating and the total number of possible ratings. Specifically, we code D as 1/22 (representing the lowest rating) and AAA as 22/22 (representing the highest rating). Therefore, this measure ranges between 0.04545 and 1. In columns (3) and (4), credit ratings are defined on a scale where AAA is assigned a value of 1 (representing the highest rating), and D is assigned a value of 22 (representing the lowest rating). We follow the approach of Fortin, Lemieux, and Lloyd (2023) and analyze data from 2007 to 2019, excluding states that implemented RWLs laws before 2007. If indicated, the specification includes the following financial controls: Size, Profitability (ROA), Collateral, and Market-to-book ratio. Refer to the Variable List and Description table for more details about variables' definition and computation. All regressions include two-digit SIC industry-by-year and firm fixed effects, with robust standard errors clustered at the state level. $***$, $**$, and $*$ indicate significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)
	Credit Ratings		Credit Ratings (Ranking)	
RWL	0.014	0.012	-0.304	-0.270
	(0.014)	(0.013)	(0.313)	(0.287)
Firm controls	No	Yes	No	Yes
Obs.	6,896	6,313	6,896	6,313
Cluster	26	26	26	26

Table IA8. (DiD RWLs: Credit Default Swaps) The table presents the results of the difference-in-differences estimation using Eqn. (4) with differences in CDS spreads as the outcome variables. Columns (1) and (2) show the difference between the five-year CDS spread and the one-year CDS spread. Columns (3) and (4) display the difference between the ten-year CDS spread and the five-year CDS spread. Similarly, columns (5) and (6) present the difference between the twenty-year CDS spread and the ten-year CDS spread, while columns (7) and (8) show the difference between the thirty-year CDS spread and the twenty-year CDS spread. Lastly, columns (9) and (10) provide the results for the recovery rate. We follow the approach of Fortin, Lemieux, and Lloyd (2023) and analyze data from 2007 to 2019, excluding states that implemented RWLs laws before 2007. In this sample, we find qualitatively similar effects of RWLs on firm debt maturity (with a point estimate of −0.023) and leverage (with a point estimate of −0.031) compared to our main estimates in Table 3. If indicated, the specification includes the following financial controls: Size, Profitability (ROA), Collateral, and Market-to-book ratio. Refer to the Variable List and Description table for more details about variables' definition and computation. All regressions include two-digit SIC industry-by-year and firm fixed effects, with robust standard errors clustered at the state level. $***$, $**$, and $*$ indicate significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Spread 5Y minus 1Y		Spread 10Y minus 5Y		Spread 20Y minus 10Y		Spread 30Y minus 20Y		Recovery rate	
RWL	0.003	0.004	0.001	0.001	0.002***	0.002***	0.001*	0.000**	0.003	0.003
	(0.003)	(0.003)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)	(0.000)	(0.003)	(0.003)
Firm controls	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Obs.	1,740	1,706	1,779	1,743	1,585	1,565	1,550	1,533	1,850	1,810
Cluster	20	20	20	20	20	20	20	20	20	20

Table IA9. (Cumulative Abnormal Stock Returns) The table presents estimates of cumulative abnormal returns following the implementation of RWLs. The dependent variable measures the cumulative abnormal return for each firm during specific event windows. In Panel A, the event window spans 5 business days before and 5 business days after the passage of RWLs. In Panel B, the event window extends to 20 business days before and 20 business days after the passage of RWLs. We follow the approach of Fortin, Lemieux, and Lloyd (2023) and analyze data from 2007 to 2019, excluding states that implemented RWLs laws before 2007. Standard errors, shown in parentheses, are robust and clustered at the state level. $***$, $**$, and $*$ indicate significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)
	Panel A. Time window: [-5 +5] days to/from RWL	
	Abn. returns CAPM	Abn. returns 3-Factors
RWL	-0.001	-0.001
	(0.001)	(0.001)
Obs.	1,530	1,530
Cluster	5	5
	Panel B. Time window: [-20 +20] days to/from RWL	
	Abn. returns CAPM	Abn. returns 3-Factors
RWL	0.001	0.001
	(0.001)	(0.001)
Obs.	6,125	6,125
Cluster	5	5

Table IA10. (Debt structure response to RWLs – Fixed costs) This table presents results obtained from the difference-in-differences estimation, as shown in Eqn. (4), by introducing treatment heterogeneity based on the magnitude of fixed costs before the implementation of RWLs. We measure fixed costs by using Compustat variables, namely selling, general, and administrative expenditures (XSGA), advertising (XAD), and research and development expenses (XRD), divided by sales (Gorodnichenko and Weber, 2016). The table includes results for measures of maturity (LT debt ratio(>5Y)), leverage (Book leverage), and resilience (Resilience Intensive Margin). We follow the approach of Fortin, Lemieux, and Lloyd (2023) and analyze data from 2007 to 2019, excluding states that implemented RWLs laws before 2007. If indicated, the specification includes the following financial controls: Size, Profitability (ROA), Collateral, and Market-to-book ratio. Refer to the Variable List and Description table for more details about variables' definition and computation. All regressions include two-digit SIC industry-by-year and firm fixed effects, with standard errors clustered at the state level. $***$, $**$, and $*$ indicate significance at the 1%, 5%, and 10% level, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
	High fixed costs firms		Other firms		All firms (triple-diff)	
A. RWL on Maturity						
RWL	-0.026**	-0.028**	-0.035***	-0.037***	-0.035***	-0.039***
	(0.010)	(0.010)	(0.008)	(0.010)	(0.007)	(0.009)
RWL × High fixed costs					0.013	0.016
					(0.010)	(0.012)
B. RWL on Leverage						
RWL	-0.078***	-0.072***	-0.055***	-0.057***	-0.057***	-0.061***
	(0.016)	(0.014)	(0.019)	(0.020)	(0.017)	(0.018)
RWL × High fixed costs					-0.001	0.007
					(0.020)	(0.019)
C. RWL on Resilience Intensive Margin						
RWL	-0.365***	-0.370***	-0.411***	-0.439***	-0.409***	-0.453***
	(0.113)	(0.112)	(0.101)	(0.120)	(0.087)	(0.103)
RWL × High fixed costs					0.123	0.170
					(0.115)	(0.122)
Firm controls	No	Yes	No	Yes	No	Yes
Obs.	1,530	1,450	3,209	3,021	4,798	4,522
Cluster	18	18	25	25	25	25