Corporate Leverage and Employees' Rights in Bankruptcy

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Abstract

The seniority of employees' claims in the liquidation of insolvent firms and their rights in firm restructuring vary greatly across countries. These rights of employees are predicted to have different effects on corporate leverage depending on whether firms use debt strategically in wage negotiations or are credit-constrained. We test these predictions on a panel of 13,809 companies in 28 countries, using novel, questionnaire-based measures of employees' rights in bankruptcy. We find that increases in the value of firms' real estate or profits are associated with larger increases in leverage by companies whose employees have strong seniority in liquidation and weaker rights in restructuring, consistently with the strategic use of leverage, not with credit rationing.

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Most research on corporate capital structure assumes that the two main liabilities of firms are debt and equity. In fact, the liabilities of firms to their employees are typically of comparable magnitude. Between 1992 and 2005, wages amounted to 34% of the total assets of U.S. bankrupt firms reported in the UCLA-Lopucki Bankruptcy Research Database (Table 1 in Graham, Kim, Li and Qiu, 2015). Firms' pension claims are also sizeable: in 2005 the off-balance-sheet pension liabilities for S&P 500 firms stood at $1.25 trillion in 2005, and one fourth of the companies in the Compustat database between 1991 and 2003 had defined benefit pension plans, which once consolidated with their financial debt raised their leverage by about one third (Shidvasani and Stefanescu, 2010). A similar figure is found for other countries, where consolidating off-balance sheet pension plans typically raises leverage by 32%, and for some firms up to 70%, as in some countries defined benefit pension plans are more sizeable than in the US (Bartram, 2016).

While the recent literature has increasingly recognized that such a sizeable stakeholder as employees can make a difference to corporate leverage decisions, it has overlooked that these decisions can be affected by the balance of power between workers and creditors in bankruptcy proceedings. In this paper we show, both theoretically and empirically, that the workers' impact on leverage depends crucially on the protection that bankruptcy law gives to the employees' claims versus those of creditors, and specifically by their relative seniority in firm liquidation and by the balance of their rights in firm restructuring.

An important strand of the research on the impact of employees on firms' leverage decision is predicated on the idea that debt is used strategically to counteract employees' wage demands. While in models of strategic leverage employees are typically assumed to be junior stakeholders in bankruptcy, in reality the balance between their rights and those of creditors varies greatly from country to country. This is illustrated by Figure 1, which displays the seniority of employees' claims, separately for unpaid salaries, severance pay and pension contributions in 29 countries. Each bar indicates the ranking of these claims relative to those of competing claimants, i.e. secured creditors, the bankruptcy trustee for administrative expenses, post-petition creditors, tax authorities, and unsecured creditors. A higher value indicates higher seniority: for instance, employees' seniority is much higher in Argentina, Belgium, Brazil (before the 2005 bankruptcy reform), France, Hungary, India, Mexico and Singapore than in Australia, Denmark, Finland, Germany,

Slovakia, Turkey and the US.[1] In particular, in some countries (like France) employees are senior to most other claimants, whereas in others (like Germany) their claims are the most junior ones. Moreover, aside from seniority, in some countries government insurance schemes protects employees' claims on bankrupt employers, either fully or partly, as will be seen below.

[Insert Figure 1]

These wide differences in the legal protection afforded to employees relative to creditors may be expected to affect the financial leverage chosen by firms. Indeed, using a simple model, we show that the stronger the legal protection of employees in bankruptcy, the greater their aggressiveness in bargaining over wages and pension benefits, which in turn affects leverage differently depending on whether firms have unused debt capacity or are collateral-constrained in their choice of leverage.

If firms have unused debt capacity, they may adjust their leverage in response to the legal protection afforded to their employees, as predicted by strategic debt models: in jurisdictions where employees enjoy stronger protection in the liquidation of insolvent firms, employers will respond by higher leverage, so as to reduce the surplus on the bargaining table in wage and pension negotiations. By the same token, when firms' surplus tends to grow (for instance due to appreciation of their real estate or to high profits), they will increase leverage relatively more if their employees have stronger legal protection in bankruptcy, so as to prevent a surge in their wage demands. The response is similar to that predicted in response to greater workers' bargaining power, for instance due to union-friendly legislation: taking on more debt to moderate employees' wage demands (Baldwin, 1983; Bronars and Deere, 1991; Perotti and Spier, 1993; Matsa, 2010, among others). Of course, this response will be mitigated by bankruptcy costs, and indeed may be reversed if these are sufficiently high: if bankruptcy is very costly, firms may want to accommodate workers' demands and thus choose low leverage if their employees enjoy strong legal protection in case of bankruptcy.

If firms are collateral-constrained, instead, they cannot use leverage strategically vis-à-vis their employees. Hence, insofar as strong employee protection in bankruptcy contributes to wage pressure, the resulting increase in labor costs eats into the future cash flows that could otherwise be pledged to creditors, shrinking the firms' debt capacity and

[1] We defer a more detailed description of the construction of this measure of employees and of the relevant sources to Section 2 below.

therefore their leverage. The effect would be akin to the effect on leverage stemming from legal protection of employees against unemployment according to Simintzi, Vig and Volpin (2015): the resulting increase in the firms' wage bill (i.e. in their operating leverage) would crowd out their financial leverage. In this case, also the prediction regarding the sensitivity of leverage to changes in the firm's surplus switches sign: the stronger is employees' protection, the more muted will be the response of leverage to an increase in the firm's cash flow and in the value of its assets. Intuitively, if employees are expected to have a strong legal position in bankruptcy, a larger fraction of any increase in the value of corporate assets or in cash flow will go to employees in case of bankruptcy, and a smaller one to creditors. Anticipating that their claims will take a back seat in liquidation, creditors will be strict in providing additional credit even when the firm's assets appreciate or its prospects brighten. Hence, employees' rights in bankruptcy will attenuate the sensitivity of leverage to changes in asset values or expected cash flow.

The above predictions allow a sharp test of the strategic debt model against the collateral constraint model: while both predict leverage to increase in response to higher cash flows and collateral values, according to the strategic debt model employees' rights in bankruptcy can amplify this response, whereas they should mitigate it in a setting with binding credit constraints.

However, the standing of employees in the liquidation of insolvent firms captures only one aspect of their legal protection in case of bankruptcy: often distressed firms are restructured instead of being liquidated. If workers and creditors can renegotiate their respective claims to avoid the company's liquidation, the workers' rights in the renegotiation process become relevant, and in the strategic debt model these rights turn out to have the opposite effect compared to seniority: the stronger are employees' rights in debt renegotiation, the smaller the fraction of the firm's continuation payoff accruing to creditors in case of insolvency, and therefore the greater their loss from insolvency; anticipating this, shareholders will pick lower leverage. So while the strength of employees' seniority rights in firm liquidation may call for more leverage, the strength of their rights in case of debt renegotiation calls for less leverage. This yields yet another testable prediction about relating firm leverage to employees' rights in bankruptcy.

A key requirement to test these hypotheses is the availability of reliable and consistent measures of employees' rights in bankruptcy. Since major changes in the bankruptcy code in a given country are rare, the only way to identify the effect of the different balance of

power between workers and creditors is to use a large set of countries with cross-sectional variation in legal rights. To this effect, we collect novel data about workers' legal rights during liquidation and reorganization in 29 countries by way of a questionnaire (reproduced in Appendix B and discussed in Section 2) sent to law firms in each country participating in the Lex Mundi project as well as to other legal experts.[2] Specifically, we collect data on the seniority of employees' unpaid salaries, severance pay and contributions to pension benefit plans relative to other types of creditors, when the firm enters liquidation, as well as on employees' rights during reorganization, namely whether employees' claims arising from collective agreements can be impaired and whether their consent to the restructuring plan should be sought. Importantly, these rights differ from those attributed to employees by legislation on dismissals outside of bankruptcy and widely used in other studies, notably the Employment Protection Legislation (EPL).

We use these novel legal indicators jointly with firm-level data from Worldscope and Osiris (for non-U.S. firms) and Compustat databases (for U.S. firms) over the period 1988-2013 to test the widely different predictions arising from the strategic debt model and from the credit-rationing model of firm leverage described above. Specifically, we study whether differences in employees' protection in the liquidation of insolvent firms and in debt renegotiation are associated with a different response by firms to changes in the value of their assets or in their profitability, and use the sign of these differences in firms' responses to gauge which of the two models – if any – is consistent with the data.

Testing the two models' contrasting predictions requires identifying an exogenous source of variation in the firms' surplus: we rely on changes in real estate prices and in commodity prices as two different sources of such variation. First, we analyze the response of corporate debt to the changes in the value of firm's real estate assets associated with changes in national and regional real estate prices. Real estate assets are important in firms' balance sheets: 59% of U.S. firms report some real estate holdings (Cheney et al., 2012). In our international sample we find that this figure rises to 71%, underscoring the worldwide importance of real estate valuations for firms. A change in the national or regional real estate values is a plausibly exogenous shock to individual firms, and we exploit its impact on the value of the real estate owned by a firm to test whether the subsequent response of its debt accords with the predictions of the strategic leverage model or those of the credit rationing model. More precisely, we carry out a

[2] For two more countries, we find partial information about employees' rights in other public sources.

difference-in-difference estimation comparing the leverage response of firms incorporated in countries with different workers' rights in bankruptcy, following a valuation shock to their real estate assets using both national and regional real estate price changes, and exploit such differential response as testing ground for the two models.

Second, we focus on another source of variation of corporate leverage, namely, the change in profitability stemming from changes in the price of the commodities used in production and/or produced by firms, to condition on a plausibly exogenous source of variation in profits. This strategy is reminiscent of that used by Bertrand and Mullainathan (2001). Clearly, the profitability of firms in different sectors is likely to respond quite differently to changes in the prices of the same commodity, due to their revenue and cost structure: for instance, an increase in the oil price reduces profitability more in industries that rely more on oil as input (e.g., airlines) than others (e.g., software companies), and increases the profitability of oil-producing companies and possibly coal and gas producers. We adopt an instrumental variables (IV) estimation, where in the first stage we estimate the response of each firm's profits to different commodity price changes, allowing its coefficients to reflect its cost and revenue structure; in the second stage, we estimate the response of the firm's leverage to profitability – and to its interactions with our measures of employees' rights in bankruptcy – using commodity prices as instruments. Going back to the example of an increase in oil prices, the objective is to know whether the resulting profit surge in oil industry induces oil companies to increase leverage more in countries where employees have greater seniority in liquidation and have fewer rights in restructuring, compared to other countries. Similar to the diff-in-diff strategy based on real estate price changes, this approach compares the leverage response of two firms exposed to a change in profitability triggered by the same commodity price change, but located in countries with different levels of workers' rights.

Our main empirical results are as follows. First, in countries where workers have higher seniority or are more protected by government insurance in bankruptcy, firms increase leverage more in response to an increase in their real estate valuations or in their profitability, compared to firms whose employees are less protected in case of liquidation. Second, the opposite result holds for cross-country differences in employees' rights in case of firm restructuring: in this case, the firms employing the better protected employees increase leverage less – or even decrease it – in response to an appreciation of their real estate holdings or a rise in profits. Thirdly, in countries where workers have higher

bargaining power due to more generous employment protection legislation, firms increase leverage more in response to an increase in their real estate valuations or in their profitability. All three results are consistent with the predictions of the strategic debt model, while the first and the third run counter to those of the credit-constraint model.

In all the specifications, we control for the firm-level variables that existing literature has found to influence leverage decisions (namely, firm size, profitability, asset tangibility and market-to-book to proxy for growth opportunities). Our specifications include firm fixed effects to absorb time-invariant unobserved heterogeneity at the firm level, and country-time or industry-country-time fixed effects to control for time-varying country and industry variables that might create spurious correlation in our regressions, by driving both real estate prices or firm profitability and the leverage chosen by firms.

We further extend our analysis and check its robustness in three main directions. First, we take into account that, in jurisdictions where workers' rights in bankruptcy are strongly protected, firms may increase funding from junior creditors by conferring them time-seniority via the issuance of short-maturity debt. If the maturity of such debt is shorter than the horizon of the typical wage contract, junior debtholders will have *de facto* seniority. Hence, in countries where workers' rights in bankruptcy are strongly protected, short-term debt to be more responsive to increases in the firm's surplus than long-term debt. The evidence is consistent with this hypothesis.

Second, the strategic value of debt is likely to be more relevant in firms belonging to industries where growth options are less important than existing assets: such firms should be more inclined to raise their indebtedness to gain bargaining power with their employees, being less concerned that high indebtedness may jeopardize their continuation value. In these mature industries, workers are also more likely to have low reservation wages, which increases the strategic gains that debt can afford in bargaining with workers. We use a high ratio of tangible assets to total assets to identify these industries, and find that the predictions from the strategic debt model hold more strongly for firms in industries with a higher fraction of tangible assets.

Third, we explicitly take into account the role of credit constraints. Recall that, according to the strategic debt model, the seniority of employees' claims in firm liquidation may call for greater issuance of debt. However, the ability of a firm to issue more debt depends on its access to finance: in the presence of moral hazard or limited

enforceability, a firm's ability to issue more debt is constrained by its limited collateral. While the strategic use of debt and the presence of credit constraints are at odds with each other, it is possible that each of them may be relevant for different sets of firms in our sample: financially unconstrained firms and constrained ones, respectively. To allow for this possibility, we estimate a switching regression model to jointly estimate the leverage choices of firms and their likelihood of being constrained, and find that results are broadly consistent with the predictions of the strategic debt model for firms likely to be financially unconstrained, and not for those for which financial constraints are likely to be binding.

The overall contribution of our paper is to highlight the importance of the balance between workers and creditor rights in the choice of corporate leverage – an element missing so far both from the literature that views leverage as driven by strategic motives and from contributions that take it to be dictated by credit constraints. The findings of most empirical papers based on U.S. firm-level data are consistent with the strategic use of debt: more leveraged U.S. firms pay lower wages and fund their pension plans less generously, controlling for performance (Hanka, 1998); U.S. airlines in distress obtain wage concessions from workers with underfunded pension plans (Benmelech, Bergman and Enriquez, 2010); and unions are more likely to strike and "win" in wage negotiations if firm debt has decreased in previous years (Myers and Saretto, 2015). Moreover, for the U.S. there is evidence that when workers are protected by more favorable unemployment insurance or are more unionized, firms choose higher leverage to counter-balance their employees' bargaining power: Agrawal and Matsa (2011) document that increases in state unemployment insurance benefit entitlements are associated with significant increases in firm leverage; similarly, Matsa (2010) finds that in the U.S. collective bargaining coverage and pro-union changes in state labor laws increase firm leverage – a result reported also by Cronqvist, Heyman, Nilsson, Svaleryd and Vlachos (2009) for Sweden. Consistently, U.S. firms facing greater threat of unionization have higher leverage (Bronars and Deere, 1991), while those rated as "employee-friendly" keep their leverage low (Bae, Kang and Wang, 2011).

These results have been challenged by Chemmanur, Cheng, and Zhang (2013), who report evidence of a positive relation between wages and leverage in the U.S., and explain this finding by appealing to the idea that risk-averse employees require higher wages from more levered employers as compensation for greater bankruptcy risk, an idea formalized by Berk, Stanton and Zechner (2010). Moreover, using firm-level data from 21 countries,

Simintzi, Vig and Volpin (2015) find that greater employment protection (which should increase the bargaining power of employees) is associated with lower company leverage. This is consistent with corporate leverage being determined by credit constraints rather than strategic concerns: indeed Simintzi et al. (2015) argue that if workers have greater bargaining power, their higher wages reduce their employer's debt capacity.

Instead, our cross-country results are consistent with the predictions of the strategic debt model, and also with the view that firms increase corporate leverage when their employees have better insurance against unemployment risk, as in Agrawal and Matsa (2011). The difference with the findings by Simintzi et al. (2015) may be due to the fact that our study takes into account that the balance of power between workers and other creditors in bankruptcy varies greatly and subtly across countries. Moreover, our empirical strategy differs from theirs as it centers on how the response of leverage to collateral prices and profits differs across firms whose employees have different legal protection in bankruptcy, whereas they study the relationship between leverage and country measures of workers' bargaining power.

The rest of the paper is as follows. Section 1 presents the two models, whose different predictions guide our subsequent empirical analysis—the strategic debt model and a model where firms are credit-constrained. Section 2 maps the key predictions offered by these models into testable hypotheses and lays out our empirical strategy. Section 3 describes the data. Section 4 presents our empirical results. Section 5 concludes.

1. Theory

As stated in the introduction, existing work on corporate leverage neglects the role of employee protection in bankruptcy, that is, the extent to which their wage and pension claims are protected by (i) seniority in liquidation procedures, (ii) rights in corporate restructuring, and (iii) government-provided insurance schemes.

To guide the empirical analysis, this section presents two simple models that produce largely different predictions about the impact of these forms of employee protection on firm's optimal leverage. Sections 1.1, 1.2 and 1.3 present a model of strategic debt choice, where the firm can use leverage to improve its bargaining position vis-à-vis their employees. In Section 1.4 these predictions are contrasted with those obtaining if firms' leverage is instead determined by a binding rationing constraint.

1.1 Strategic Debt Model

Our strategic leverage model is based on the idea, common to several papers in this literature, that firms can use leverage to push money off the bargaining table and thereby reduce the wages paid to their employees. But the model takes also into account that leverage raises the likelihood of insolvency, which deprives the firm of its future profits and induces its employees to require a wage premium to compensate them for the cost of unemployment spells. These costs tend to act as counterweights to the strategic gains from debt, generating an optimal leverage level.

Section 1.1 lays out the setting of the model. Section 1.2 characterizes the equilibrium leverage under the assumption that the firm is liquidated in bankruptcy and workers' claims are protected by their seniority in liquidation. Section 1.3 repeats the analysis assuming that the firm is restructured, and workers' claims are renegotiated in the process.

1.1 Setting

Consider a firm that bargains with its employees to determine the wage *W* and therefore the split of its surplus (after deducting non-labor costs) between shareholders and workers. Management runs the firm in the shareholders' interest, setting its wage policy and leverage so as to maximize the firm's value *V*, which is determined by risk-neutral investors. The firm has initial assets (property, plants and equipment) whose market value is $A \geq 0$. With no loss of generality, the number of workers hired by the firm is standardized to 1 and the risk-free interest rate to 0.

By combining its assets with labor, the firm generates a random revenue $\tilde{R}$ (net of non-labor costs), which is uniformly distributed on the support $\left[0, \overline{R}\right]$. The firm is viable, in the sense that its expected revenue exceeds labor costs if workers are paid their reservation wage W_0 and the firm incurs no bankruptcy risk: $\overline{R}/2 - W_0 > 0$. But, for low realizations of its revenue $\tilde{R}$, the firm may be insolvent: this occurs if the sum of its assets *A* and revenue $\tilde{R}$ – hereafter denoted by $\tilde{X}$ for brevity – falls short of its debt *D* and contractual wage obligations *W*, i.e. $\tilde{X} < D + W$.

Employees care not only about their expected income but about the risk of becoming unemployed due the firm's bankruptcy: their utility *U* is their expected wage income minus the expected loss from unemployment, arising from the destruction of their firm-

specific human capital and the hardship due to unpaid wages and pension income. This loss, that we denote by *L*, can be mitigated by public insurance mechanisms: in several countries the government supports the employees of bankrupt firms, by repaying part or all of their claims directly, and taking their place in the liquidation procedure; moreover, unemployment insurance can play a further mitigating role.

To capture its mitigating influence, public insurance is assumed to absorb a fraction γ of the loss *L*, reflecting for instance the fraction of the salary or pension claims that the government guarantees in bankruptcy: hence, the loss that employees suffer due to unemployment in bankruptcy states is $(1-\gamma)L$.[3] The loss L of firm-sepcific human capital is assumed to be larger in firms with greater resources, as these tend to pay higher wages, as will be seen below. Formally, $L = L(A, \bar{R})$, with $\partial L / \partial A > 0$ and $\partial L / \partial \bar{R} > 0$. Employees can avoid the risk of this loss by taking a safe job paying wage W_0, which determines their reservation utility. As we shall see, the loss $(1-\gamma)L$ moderates the union's wage demand: to leave some scope for union wage pressure and therefore for the strategic use of leverage, this loss is assumed not to exceed the expected value of the firm's resources, i.e. $(1-\gamma)L < A + \bar{R}/2$. This condition guarantees that the wage demanded by the union exceeds the reservation wage W_0, thus generating quasi-rents.

Before bargaining with workers, shareholders issue debt with face value and pledged repayment *D* and pay to themselves the sum raised by debt issuance, via a debt-for-equity swap. As shown in Figure 2, the time line of the model consists of three stages.

[Insert Figure 2]

At $t = 1$, the firm issues debt with face value *D*. Its equity is correspondingly reduced.

At $t = 2$, the firm bargains with workers over the wage *W* via the random proposer model of Binmore (1987): the workers' union and the firm make take-it-or-leave-it offers with frequency α and $1-\alpha$, respectively. Hence, the wage *W* is set at the union's preferred level W_u with frequency α and at the firm's preferred level W_f with frequency $1-\alpha$, where α can be thought of as the union's bargaining power.

[3] All the results would in fact be qualitatively unchanged if the government were assumed to pay workers a fraction γ of their contractual salary in insolvency states, and workers bear the entire employment loss *L* in such states. The assumption made in the text that the government absorbs a fraction γ of the unemployment loss *L* captures the same insights in a simpler way.

At $t = 3$, the firm generates the cash flow $\tilde{R}$, which determines whether it is solvent or insolvent. If the firm is solvent, i.e. repays creditors and employees, it continues to operate and captures growth opportunities yielding a continuation payoff *C*, which is increasing in the firm's size, as measured by value of its assets *A* and maximal revenue $\overline{R}$: $\partial C / \partial A > 0$, $\partial C / \partial \overline{R} > 0$. If instead the firm is insolvent, it can be either liquidated or restructured. If the firm is liquidated, its net worth $A + \tilde{R}$ is shared between creditors and workers according to the seniority rules set by the law, and its continuation value *C* is lost. This loss is avoided if creditors and employees accept to reduce their claims so that the firm can keep running as a going concern. To achieve such restructuring of the firm's liabilities, creditors and employees bargain over the split of firm's continuation value, their seniority rights in liquidation defining their respective outside options. In the following sections, we will derive the equilibrium wage and leverage first under the assumption that bankruptcy leads to liquidation, and then that it results in restructuring.

Hence, the split of the realized firm's cash flow among the claimants depends not only on the terms of the debt contract signed by the firm and its creditors at $t = 1$ and of the labor contract agreed at by the firm and its employees at $t = 2$, but also on whether at $t = 3$ the firm is solvent or not, and – in case of insolvency – on the seniority rights of creditors and workers. To capture the relative seniority of workers, we assume that in bankruptcy $1 - \theta$ of the firm's debt *D* is senior to the workers' claim *W*, and the remaining fraction θ of debt *D* is junior to this claim. Hence, the parameter $\theta \in [0,1]$ can be seen the seniority protection afforded by the legal system to the employees of a defaulted company, and therefore determines the balance between workers' and creditors' rights if the firm is liquidated. In the extreme, when $\theta = 0$ workers are junior to all creditors, while when $\theta = 1$ they are the most senior claimants. As we shall see in Section 3, there are large cross-country differences in workers' seniority in bankruptcy.

Even if the agreed wage is a constant *W*, the worker's actual income $\tilde{Y}$ is stochastic, as in insolvency states (where $A + \tilde{R} < D + W$) it depends on the value of the firm's assets and revenue $A + \tilde{R}$. Specifically, the realization of $\tilde{X}$ determines one of four possible outcomes, which are illustrated in Figure 3:

(i) *default on senior debt*: if $\tilde{X}$ falls short even of senior debt's face value $(1 - \theta)D$, the firm default on all creditors and on workers, whose payoff is zero in this region;

(ii) *default only on workers and junior debt*: if $\tilde{X}$ covers the senior debt $(1-\theta)W$ but not the entire workers' claim, i.e. $\tilde{X} \in [(1-\theta)D, (1-\theta)D + W)$, the payment to workers is $\tilde{Y} = \tilde{X} - (1-\theta)D$ and that to junior creditors is zero;

(iii) *default only on junior debt*: if $\tilde{X}$ covers both senior debt and the workers' claim W, but not all of junior debt θD, i.e. $\tilde{X} \in [(1-\theta)D + W, W + D)$, workers receive W and junior creditors receive $\tilde{X} - (1-\theta)D - W$;

(iv) *no default***:** if $\tilde{X}$ covers both the workers' entire claim W and the face value of all debt D, i.e. $\tilde{X} \in [W + D, A + \bar{R}]$, all three groups (senior creditors, workers and junior creditors) are repaid in full.

[Insert Figure 3]

The wage W set by bargaining at $t = 2$ differs depending on whether the union or the firm sets it. If the union makes the take-or-leave-it offer and sets the wage W_u, the income $\tilde{Y}_u$ that employees will receive is a random variable that takes different values over the four regions (i)-(iv). The union sets the wage so as to maximize the workers' utility, i.e. their expected income minus their expected loss from unemployment, net of the fraction γ absorbed by public insurance schemes:

$$U = E(\tilde{Y}_u) - \text{prob}(bankruptcy \,|\, W = W_u)(1-\gamma)L \,. \qquad (1)$$

If instead the firm makes the take-or-leave-it offer, it will set the wage schedule $W_f(\tilde{X})$ so as to maximize its expected profits. Hence, this wage schedule must (i) induce employees to work at the least cost, i.e. meet their participation constraint with equality:

$$\mathrm{E}\left[W_f(\tilde{X})\right] - \text{prob}(bankruptcy \,|\, W = W_f)(1-\gamma)L = W_0 \,, \qquad (2)$$

and (ii) minimize the likelihood of bankruptcy, as in this case bankruptcy costs are not offset by any gains in wage bargaining, as the firm already has all the bargaining power.

1.2 Equilibrium under liquidation in bankruptcy

In this section, we derive the wages and leverage that obtain in equilibrium under the assumption that the firm is liquidated (rather than restructured) in insolvency states. The

model is solved by backward induction, first deriving the wages set at stage 2, and then the value-maximizing debt level chosen by shareholders at stage 1.

When the union sets the wage (which happens with frequency α), it will choose the wage W_u that maximizes the workers' payoff U in (1), namely:

$$W_u^* = A + \bar{R} - (1-\theta)D - (1-\gamma)L > W_0. \tag{3}$$

as shown in Appendix A.1. Hence, the wage set by the union exceeds its reservation level, and is increasing in the value of the firm's assets A and in its maximum revenue $\bar{R}$ (as well as its expected value $\bar{R}/2$). Intuitively, when the firm has valuable assets or abundant revenue, employees know that it has substantial expected surplus after paying down its debt, and thus can accommodate large wage demands. By the same token, such wage demands are moderated by the debt D issued by the firm at $t=1$. But this strategic value of leverage is diminished by the workers' seniority θ, and vanishes altogether in the limiting case in which the workers' claim is entirely senior to the firm's debt ($\theta=1$). Wage demands are also mitigated by the loss L borne by workers when the firm goes bankrupt, and encouraged by the public insurance coverage γ. When the agreed wage is W_u^* also the expected value of employees' income $\tilde{Y}_u$ is increasing in their seniority θ and public insurance coverage γ, and decreasing in the firm's debt D:

$$\mathrm{E}(\tilde{Y}_u \,|\, W = W_u^*) = \frac{\left[A + \bar{R} - (1-\theta)D\right]^2 - (1-\gamma)^2 L^2}{2\bar{R}}, \tag{4}$$

When instead the firm sets the wage (which happens with frequency $1-\alpha$), as explained above it will choose a wage schedule $W_f(\tilde{X})$ that (i) just meets the workers' participation constraint, i.e. equation (2), and (ii) minimizes bankruptcy costs. Once these conditions are met, the form of the wage schedule $W_f(\tilde{X})$ is irrelevant. To minimize the likelihood of bankruptcy, the firm will set the wage at zero in states in which it cannot repay its debt D entirely and increasing in $\tilde{X}$ in solvency states, for instance a fraction of its revenue $\tilde{R}$ for $\tilde{R} \geq D - A$, picked so as to just meet the employees' participation constraint (2). Then, the firm would never default on its employees, because it promises to pay them only in solvency states.[4] Hence, when the firm is given all the bargaining power

[4] The results would be qualitatively unchanged (at the cost of additional complexity) if the firm were to pledge a constant wage to its workers, in which case it may default on them. But in this case its shareholders would bear the costs associated with bankruptcy more often, without any countervailing labor cost savings.

in wage-setting, it effectively indexes their compensation to its performance. With such a wage schedule, workers' expected income is

$$\mathrm{E}\left[W_f(\tilde{X})\right] = W_0 + \frac{D-A}{\bar{R}}(1-\gamma)L\,, \tag{5}$$

where $(D-A)/\bar{R}$ is the probability of bankruptcy when the firm sets the wage.[5]

Employees' expected income is given by the sum of expressions (4) and (5), respectively weighted by the probabilities α and $1-\alpha$:

$$\mathrm{E}(\tilde{Y}) = \alpha\frac{\left[A+\bar{R}-(1-\theta)D\right]^2-(1-\gamma)^2L^2}{2\bar{R}} + (1-\alpha)\left[W_0+\frac{D-A}{\bar{R}}(1-\gamma)L\right]. \tag{6}$$

Thus corporate debt *D* has two opposite effects on average employee compensation: a negative effect via wage bargaining (in the first term), and a positive one via the premium required to offset the loss *L* that workers suffer in bankruptcy (in the second term).

From the firm's standpoint, expression (6) measures its expected labor costs, which contribute negatively to its value. The firm's value at $t=1$, *V*, is the sum of the value of its assets, its expected cash flow and its expected continuation payoff *minus* its expected labor costs $\mathrm{E}(\tilde{Y})$ from (6) (see Appendix A.2):

$$V = A + \underbrace{\frac{\bar{R}}{2}}_{\mathrm{E}(\tilde{R})} + \underbrace{\left[1-\frac{(1-\alpha)(D-A)+\alpha(\bar{R}+\theta D-(1-\gamma)L)}{\bar{R}}\right]}_{1-\mathrm{prob}(\textit{bankruptcy})}C - \mathrm{E}(\tilde{Y})\,. \tag{7}$$

The first-order condition of expression (7) with respect to *D* yields the value-maximizing debt level:

$$\hat{D}_l = \frac{A+\bar{R}}{1-\theta} - \frac{1-\alpha(1-\theta)}{\alpha(1-\theta)^2}C - \frac{1-\alpha}{\alpha(1-\theta)^2}(1-\gamma)L\,, \tag{8}$$

where the subscript *l* is a mnemonic for "liquidation" in insolvency states. Hence the optimal level of debt balances the benefit of lower wages arising from its strategic use in bargaining (the first term) with the costs due to higher likelihood of bankruptcy, consisting of the forgone continuation payoff *C* (the second term) and the loss *L* for

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Moreover, since in this case bankruptcy would occur more often, workers would have to be paid a higher expected income to compensate them for their greater expected unemployment costs.

[5] We focus on the more interesting case where $D > A$, which is a necessary condition for a potential default by the firm. In the opposite case where $D < A$, the expected wage that would meet employees' participation constraint would simply be W_0.

employees (the third term). The optimality condition (8) is valid only if $\theta < 1$, i.e. not all of the employees' claims are senior to other debt, as only in this case leverage has a strategic value: if all of employees' claims must be paid before other claimants in liquidation ($\theta = 1$), the firm would choose zero leverage, because in this simple model its strategic value is its only benefit. Of course leverage would still be positive if it had other advantages: for instance, the model can easily incorporate tax shield concerns, which would increase debt compared to (8). So this prediction is to be read as saying only that if $\theta = 1$ the firm will not issue debt for strategic reasons.

Equation (8) can be used to predict how the optimal level of debt responds to changes in employees' bargaining power and in their rights in case of firm liquidation:

Proposition 1 (Optimal Debt under Liquidation). *If employees' claims are not senior to all other debt ($\theta < 1$), then the optimal debt level is increasing in employees' bargaining power α and in the government insurance coverage γ, and it can be either increasing or decreasing in employees' seniority θ.*

This proposition is proved in Appendix A (and so are all subsequent propositions). But the intuition behind it is straightforward. Firm's value maximization calls for high leverage in situations where unions are strong, so as to mitigate their wage demands, and where employees are well protected from unemployment risk, either via public insurance in case of bankruptcy (high γ) or via unemployment insurance. The first prediction is in line with the literature on strategic debt, the second with Agrawal and Matsa (2011).

The effect of employees' seniority θ is more subtle: as their seniority tends to reduce the strategic value of debt, an increase in θ requires greater leverage in order to achieve the same deterrence of workers' demands. But this increases the likelihood of bankruptcy, because for any given level of debt creditors will compete with a larger claim by workers: hence, beyond a critical level of the bankruptcy cost the firm will react to stronger seniority rights of workers by scaling down leverage.

The above analysis neglects that debt cannot be so high as to induce the union to set a wage below the level yielding the reservation utility to workers. Hence, D cannot exceed the level $\bar{D}_l$ that just meets the participation constraint:

$$\mathrm{E}(\tilde{Y}_u \left| W = W_u^* \right.) - \mathrm{prob}(\textit{bankruptcy} \left| W = W_u^* \right.)(1-\gamma)L \geq W_0 \,. \qquad (9)$$

Jointly with expression (3), the constraint (9) implicitly defines the maximal debt $\bar{D}_l$:

$$\frac{\left[A+\bar{R}-(1-\theta)\bar{D}_l\right]^2-\left[(1-\gamma)L\right]^2}{2\bar{R}}-\frac{\bar{R}+\theta\bar{D}_l-(1-\gamma)L}{\bar{R}}(1-\gamma)L=W_0\,. \qquad (10)$$

Hence, condition (8) determines the firm's optimal debt only if the participation constraint (9) is slack. If instead $\hat{D}_l$ violates the constraint (9), debt is set at the lower level $\bar{D}$, which satisfies this constraint with equality. This can happen in particular if the reservation wage W_0 is high, for instance due to keen competition for workers. It is therefore worth characterizing the optimal leverage in this case:

Proposition 2 (Optimal Debt under Liquidation with Binding Participation Constraint). *If the workers' participation constraint is binding, the optimal debt level is invariant to employees' bargaining power α, increasing in the government insurance coverage γ and employees' seniority θ, and decreasing in the reservation wage* W_0.

So in this case leverage is not only increasing in the government's insurance γ, as in Proposition 1, but also unambiguously increasing in employee seniority θ, because seniority tends to raise employees' expected income, and therefore calls for more leverage to compress their expected income down to its reservation level. Another difference with Proposition 1 is that in this case debt does not respond to workers' bargaining power, because workers are already at their reservation utility level, and by the same token is decreasing in their reservation wage, and thus in competition for labor by firms.

The two previous propositions focus on the comparative statics of the *level* of debt to model parameters. Our empirical tests will instead focus on how the model parameters affect the *sensitivity* of debt to changes in the firm's asset value and expected revenue, as this allows us to exploit not only country-level variation in variables such as employees' seniority in liquidation but also firm-level variation in asset value and profitability. Thus, the predictions of the following proposition are central to our tests:

Proposition 3 (Optimal Debt Response to Changes in Surplus under Liquidation). *The sensitivity of the firm's optimal debt level* $\hat{D}_l$ *to the value of its assets A and to its expected revenue* $\bar{R}/2$ *is*

(i) increasing in employees' bargaining power α and public insurance coverage γ;

(ii) increasing in employees' seniority θ if the implied increase in bankruptcy costs is below a critical threshold, and decreasing in employees' seniority θ otherwise.

The rationale of the results under point (i) is that, when a firm's assets appreciate or its profits are expected to increase, its shareholders want to increase leverage *more* if unions are powerful than if they are weak, and if the firm's employees are better protected against losses from unemployment in case of firm bankruptcy. To understand the result under point (ii), consider first a firm experiencing a transitory increase in the value of assets (or expected profits), which no impact on its continuation payoff: such a firm will respond by increasing leverage *more* if its employees have strong seniority rights than if they are weakly protected, since in the first case it fears larger wage demands. Next, consider a firm experiencing a persistent increase in the value of its assets (or profits): this firm will be more wary of raising its indebtedness in response to this shock if its employees have stronger seniority rights, for fear of compromising its – now brighter – growth opportunities. In fact, if these future prospects have improved sufficiently, it will want to respond by lowering its indebtedness, to offset the bankruptcy risk created by aggressive wage demands of employees well protected by their seniority.

1.3 Debt Renegotiation in Bankruptcy

So far, bankruptcy has been assumed to take the form of a liquidation procedure that allows creditors and employees to recover what they can of their claims according to their seniority. This assumption is reasonable if corporate debt is hard to renegotiate, for instance because creditors are dispersed. If instead creditors are concentrated (e.g. a small number of banks) and thus can coordinate, they will have the incentive to renegotiate their debt with workers to reduce their claims to the firm's actual value and keep it operating as a going concern, preserving its continuation value *C*, otherwise lost under liquidation.

In this case, in the last stage of the model's timeline shown in Figure 2, occurring at $t = 3$, renegotiation replaces liquidation, i.e. the lowest branch is the relevant one in case of insolvency: after the firm's revenue $\tilde{R}$ is realized, creditors and workers bargain about the split of the firm's continuation payoff *C*. Their respective outside options are the payoffs that they could obtain if the firm were liquidated. Like wage bargaining between the firm and workers at $t = 2$, also debt renegotiation between creditors and workers at $t = 3$ is formalized via the random proposer model, with workers and creditors making

take-or-leave-it offers with frequencies β and $1-\beta$, respectively. Hence, the parameter β captures the bargaining power of workers vis-à-vis creditors at the debt renegotiation stage, which may differ from their bargaining power α in wage negotiations, because it does not depend only on union power but also on the extent to which workers are protected by the law in a corporate restructuring. Moreover, if the reorganization can mitigate employment losses compared to its liquidation, employees may be softer in debt renegotiation than in wage bargaining, i.e. $\beta < \alpha$.[6]

Thus, at the debt renegotiation stage workers expect to get an additional quasi-rent βC and creditors an additional expected payment $(1-\beta)C$ compared to the case of firm liquidation. The anticipation of these renegotiation payoffs in case of insolvency affects both the wage chosen by workers at $t=2$ and the choice of leverage by shareholders at $t=1$, as shown in Appendix A. The contractual wage set by the union to maximize workers' utility now is

$$W_u^* = A + \overline{R} - (1-\theta)D - (1-\gamma)L + \beta C, \tag{11}$$

where the presence of the last term is the only difference from the corresponding expression (2) obtained under the assumption of firm liquidation: as now employees anticipate to receive a fraction β of the continuation payoff in insolvency states, they are more aggressive in their wage demands. Indeed, we assume $\beta < (1-\gamma)L/C$, to avoid W_u^* being so high as to make the firm insolvent even with zero leverage. Symmetrically, as workers are expected to obtain this windfall in insolvency, when the firm sets wages it will offers a lower expected compensation than in the case of liquidation (expression (5)):

$$\mathrm{E}\left[W_f(\tilde{X})\right] = W_0 + \frac{D-A}{\overline{R}}\left[(1-\gamma)L - \beta C\right]. \tag{12}$$

So on the whole the bargaining power β of employees in debt renegotiation has an ambiguous effect on their expected compensation: its sign depends on their bargaining power α in wage negotiations, being positive if the union is strong and negative otherwise.

[6] In principle, the surplus that creditors and employees bargain upon at the renegotiation stage should include not only the firm's continuation payoff *C* but also the money equivalent of the reduction of the employment loss implied by firm reorganization relative to its liquidation. But this unemployment loss mitigation seems hard to monetize, being not only an intrinsically illiquid "asset", but also potentially offset by the withdrawal of public insurance schemes: if the firm is reorganized rather than liquidated, the government can save expenses to support its employees. Hence, reorganization may generate fewer job losses than liquidation, but by the same token also less government support, possibly leaving *L* unaffected.

Via its effect on labor costs, the parameter β affects the firm's value V and so its optimal leverage. But these are affected by β also via a more direct channel: renegotiation preserves the continuation payoff C in insolvency and lets creditors appropriate a fraction $1-\beta$ of it, hence adding $(1-\beta)C$ to the firm's value V. The greater is employees' bargaining power β in renegotiation, the more of this addition to V is "lost" to employees.

Through this channel, the parameter β also lowers optimal leverage: the larger is the portion of the continuation payoff eventually grabbed by employees rather than creditors, the more shareholders will worry about bankruptcy. For instance, if $\beta = 0$, creditors grab the whole continuation payoff, taking full benefit of the firm's restructuring; at the other extreme, with $\beta = 1$ none of the continuation payoff goes to creditors, who are as penalized as under liquidation. In the latter case shareholders (who initially extract the creditor's fraction of the continuation payoff) will worry more about bankruptcy than in the former. Hence, if $\beta = 1$ they will want the firm to be less indebted than if $\beta = 0$.

This negative effect of parameter β on firm indebtedness turns out to prevail over its ambiguous effect via the average employee compensation, as shown by the following expression for the firm's optimal debt (see Appendix A for its derivation):

$$\hat{D}_r = \frac{A+\bar{R}}{1-\theta} - \frac{\theta}{(1-\theta)^2}\beta C - \frac{1-\alpha}{\alpha(1-\theta)^2}(1-\gamma)L\,, \qquad (13)$$

where the subscript r stands for "renegotiation". The difference between the optimal debt under renegotiation $\hat{D}_r$, and its analogue (8) under liquidation $\hat{D}_l$ lies in the second term, which captures the response of debt to the firm's continuation value: the greater the bargaining power that employees have in renegotiation, the lower the debt level that the firm chooses initially. The comparative statics of $\hat{D}_r$ with respect to other parameters are qualitatively similar to those of $\hat{D}_l$.

Also when the debt of insolvent firms is renegotiated, their debt cannot be so large as to violate the employees' participation constraint. In this case, the relevant upper bound on $\hat{D}_r$ is the value $\bar{D}_r$ that solves an equation similar to (10), as shown in Appendix A. So, as in Section 1.2, optimal debt is the smaller of two levels: in this case, $\hat{D}_r$ and $\bar{D}_r$.

The comparative statics of debt with respect to the model's parameters is summarized by the following:

Proposition 4 (Optimal Debt under Renegotiation)

(i) Optimal debt is decreasing in employee rights in renegotiation, β, if the workers' participation constraint is slack, and increasing if this constraint is binding.

(ii) The responses of optimal debt to the employees' bargaining power in wage negotiations (α), seniority rights (θ) and public insurance coverage (γ) have the same sign as under liquidation.

It may appear surprising that optimal leverage is increasing in workers' bargaining power β in debt renegotiation (when their participation constraint is slack). The intuitive reason for this result is that if workers grab more of the continuation payoff in insolvency states they reduce the claim that creditors have on this continuation payoff, and thus the wealth that shareholders can extract via debt issuance: hence a higher β makes bankruptcy more harmful to financial claimholders, and calls for lower debt $\hat{D}_r$ to reduce its likelihood. This explains why the parameters α and β have opposite effects on debt issuance, even though both of them refer to the bargaining power of workers: their power in wage negotiations, α, calls for greater debt issuance as a strategic device, while workers' power vis-à-vis creditors at the renegotiation stage, β, induces less debt issuance. The prediction is that corporate debt should be larger where workers have stronger bargaining power and lower where they have stronger legal protection in the restructuring of insolvent firms.

If debt is so high as to make employees' participation constraint binding, then this prediction is overturned: intuitively, in this case an increase in the fraction β of the continuation payoff accruing to employees tends to increase their expected payoff, creating scope for the firm to bring it down to its reservation level via a larger debt $\bar{D}_r$.

Also in the case of debt renegotiation, the predictions regarding the *level* of the optimal debt $\hat{D}_r$ extend to the *sensitivity* of debt to changes in the firm's asset value and expected revenue. Since the firm's continuation payoff is assumed to be increasing in the size of the firm's assets *A* and maximal revenue $\bar{R}$, an increase in the value of the firm's resources calls for a reduction in firm leverage if employees capture a comparatively large fraction β of this continuation payoff in debt renegotiation:

Proposition 5 (Optimal Debt Response to Changes in Surplus under Renegotiation).

(i) The sensitivity of the firm's optimal debt $\hat{D}_r$ *to the value of its assets A and to its expected revenue* $\bar{R}/2$ *is decreasing in employees' bargaining power in renegotiation,* β*.*

(ii) Its comparative statics with respect to employees' bargaining power in wage negotiations (α*), seniority rights (*θ*) and public insurance coverage (*γ*) have the same sign as under liquidation (see Proposition 3).*

1.4 Model with Credit Constraints and No Strategic Leverage

It is useful to compare the predictions of the strategic leverage model presented so far with those arising from a model where corporate debt is determined by a binding credit constraint, so that it cannot be chosen strategically by the firm to improve its bargaining position vis-à-vis its employees. Such an alternative model can be obtained by making only two changes to the structure of the model presented above.

The first change is a reversal of the timing of debt issuance and wage bargaining stage: suppose that in the timeline of the model the firm chooses its debt level after the wage bargaining stage, rather than before it, as in the timeline of Figure 2. Hence the firm can no longer precommit to the debt level to raise its bargaining power in wage negotiations, since when it chooses its debt at $t = 2$ the wage has already been set. Conversely, in bargaining with the firm at $t = 1$, workers set their wage demands in anticipation of the debt to be issued by the firm at $t = 2$.

The second change is to introduce credit rationing in the model: assume that at the debt issuance stage the firm can undertake a profitable and scalable investment whose future cash flow cannot be pledged to the firm's creditors due to moral hazard or non-contractibility reasons, in contrast to the firm's existing assets *A* and their revenue $\tilde{R}$.[7] By the same token, the firm's continuation payoff *C* cannot be pledged to creditors.

Hence, the amount of investment that the firm can undertake is determined by its debt capacity, i.e. by the collateral *A* and revenue $\tilde{R}$ that it can pledge to its creditors. The funding that the firm can raise at $t = 2$ equals the market value that creditors place on its

[7] The analysis could be easily extended to the case where the cash flow generated by the new investment or the firm's continuation payoff *C* can be partly pledged to the firm's creditors.

debt under our assumptions of risk neutrality and no discounting. As shown in Appendix A.6, the market value of the firm's debt is

$$V_D = \frac{D^2 - A^2}{2\bar{R}} + D\frac{\bar{R} + A - D}{\bar{R}} - \alpha\theta D\frac{W_u}{\bar{R}}. \tag{14}$$

The sum of the first two terms in expression (14) is the market value of debt if creditors were entirely senior to workers, i.e. $\theta = 0$: specifically, the first term is the expected value of the payoff that in this scenario would accrue to creditors in insolvency states, and the second term its expected value in solvency states. The last term instead captures the reduction in the market value of debt stemming from workers' seniority rights θ and their bargaining power α in wage setting: intuitively, both parameters tend to raise labor costs and, insofar as workers are senior to creditors, these costs reduce the payoff the firm can pledge to creditors in bankruptcy states. As shown in Appendix A.6, the firm's debt trades at a discount relative to its book value (i.e., $V_D < D$) for two reasons: its default risk due to incomplete collateralization ($D > A$) and the erosion of the creditors' claim due to the combination of the employees' bargaining power ($\alpha > 0$) and seniority rights ($\theta > 0$).

When issuing debt at $t = 2$, the firm will fully exploit its debt capacity, i.e. will set the face value D of debt at the level $D_{\max}$ that maximizes V_D in expression (14):

$$D_{\max} = \bar{R} + A - \alpha\theta W_u. \tag{15}$$

This expression shows that the firm's debt is increasing in the maximal amount of resources that it can pledge to creditors ($\bar{R} + A$) and decreasing in the wage set by the union W_u at $t = 1$, to an extent that depends both on workers' bargaining power α and seniority θ: the operating leverage due to labor costs tends to crowd out financial leverage, with both α and θ determining the strength of the crowding out.

Expression (15) still contains a variable to be determined, namely the contractual wage W_u. The union sets it taking into account that that at $t = 2$ the firm will issue debt $D_{\max}$, so that W_u is obtained by combining expressions (3) and (15):

$$W_u^* = A + \bar{R} - (1-\theta)D_{\max} - (1-\gamma)L = \frac{\theta(A + \bar{R}) - (1-\gamma)L}{1 - \alpha\theta(1-\theta)}. \tag{16}$$

It is easy to see that the wage W_u^* chosen by the union is increasing in the workers' bargaining power α, seniority θ and public insurance coverage γ.[8] The wage is also increasing in the maximum value of the firm's surplus ($A+\bar{R}$) if the rise in the loss from unemployment associated with a larger firm size is small enough ($\theta > (1-\gamma)\partial L / \partial A$).

Substituting the optimal wage (16) back into expression (15) yields the (book value of) debt chosen by the firm at $t=1$:

$$D_{\max} = \frac{(1-\alpha\theta)(A+\bar{R}) + \alpha\theta(1-\gamma)L}{1-\alpha\theta(1-\theta)}, \qquad (15')$$

so that the firm's debt has the following comparative statics properties:

Proposition 6 (Optimal Debt with Binding Credit Constraint).

(i) If the firm is subject to a binding credit constraint, its optimal debt is decreasing in the workers' bargaining power α, public insurance coverage γ and seniority θ.

(ii) The sensitivity of debt to the value of the firm's assets A and expected revenue $\bar{R}/2$ *is also decreasing in α, γ and θ if the equilibrium wage is increasing in A and* $\bar{R}/2$.

The predictions of Proposition 6 are in striking contrast with those of Propositions 1, 2 and 3 regarding the model with strategic leverage. First, workers' seniority, bargaining power and public insurance coverage reduce the firm's optimal debt instead of increasing it: intuitively, they reduce the firm's debt capacity rather than prompting it to lever up in order to counteract workers' aggressiveness in wage bargaining. In the words of Simintzi, Vig and Volpin (2015), in this model "operating leverage reduces financial leverage". Second, and more importantly for our empirical tests, workers' seniority, bargaining power and and public insurance mitigate the positive response of the firm's leverage to increases in collateral values and expected revenue. In contrast, in the strategic debt model greater seniority may amplify this response, and both bargaining power and and public insurance are predicted to do so.

[8] A sufficient condition for it to be increasing in θ is $W_u^* > 0$, which in turn is a necessary condition for the workers' participation constraint to be satisfied.

2. Empirical Strategy

As illustrated in Section 1, the strategic debt model and the credit rationing model yield widely different predictions about the impact of employees' rights in bankruptcy on firm leverage and on its response to increases in the value of the firm's assets and profitability. This section describes our empirical strategy to take these predictions to the data. Our methodology is best illustrated by the baseline specification that we use to investigate how firm's leverage decisions are affected by workers' rights in bankruptcy when the value of its assets or its profitability changes in our sample:

$$D_{ijt} = \left(\lambda_0 + \lambda_1\theta_c + \lambda_2\beta_c + \lambda_3\alpha_c + +\lambda_4\gamma_c\right)\cdot S_{ijt-1} + \delta' X_{ijt-1} + \phi' X_{ct} + \mu_i + \mu_t + \varepsilon_{ijt}, \quad (17)$$

where the subscripts *i*, *j*, *c* and *t* index firms, industries, countries and years respectively, D_{ijt} is the (debt or market) leverage of firm i in industry *j* in year *t*, θ_c measures employees' seniority rights in firm liquidation in country *c*, β_c their rights in debt renegotiation in country *c*, α_c their bargaining power in wage negotiations (as proxied by union density of employment protection legislation) in country *c*, γ_c the presence of government insurance for employees' claims in bankruptcy; S_{ijt-1} is a variable capturing the "surplus" of firm *i* in year $t-1$, i.e. the value of its assets or profits; X_{ijt-1} is a vector of company-specific variables measured in year $t-1$: firm size (log of total assets), asset tangibility (ratio of plant, property and equipment to total assets), profitability (return on total assets), growth opportunities (market-to book ratio), and capital investment (capex ratio scaled by lagged total assets); and X_{ct} is a vector of country characteristics measured in year *t* (unemployment rate, GNP growth rate, inflation rate and, in some specifications, creditor rights). Finally, μ_i is a firm fixed effect, μ_t is a year effect, and ε_{ijt} is the error term. Some specifications include industry-time fixed effects, country-year fixed effects or country-industry-year effects.

The coefficient λ_0 measures the response of leverage to a change to the firm *i*'s asset value or cash flow. The coefficients λ_1, λ_2, λ_3 and λ_4 respectively measure how this response of leverage is affected by employees' seniority rights in liquidation, their rights in the renegotiation process, their bargaining power in wage negotiations, and the presence of a government insurance scheme protecting the employees of bankrupt firms.

Recall that the strategic debt model predicts that non-persistent changes in the value of the firm's assets or in its profitability should be associated with higher leverage ($\lambda_1 > 0$) for a firm whose employees enjoy high seniority than for an identical firm facing the same shock but located in a country with low workers' seniority. The coefficient can switch sign ($\lambda_1 < 0$) only for persistent changes in the value of assets or profitability. In contrast, the credit rationing model unambiguously predicts $\lambda_1 < 0$, since stronger employee seniority rights tend to reduce the extent to which a change in the value of the firm's collateral or profits expands the firm's debt capacity, and therefore its leverage.

Moreover, the strategic debt model predicts that a change in asset value or profits should lead a firm whose employees have strong rights in debt renegotiation to decrease leverage (or at least increase it less) compared to a firm whose employees have weaker rights in reorganization ($\lambda_2 < 0$).

Finally, if firms use debt strategically, they should raise debt more in response to an increase in the value of their assets or profits if they face stronger unions than if they do not ($\lambda_3 \geq 0$), and if the claims of their employees are protected by government insurance in case of firm bankruptcy ($\lambda_4 > 0$). Instead, the credit rationing model produces again opposite predictions in both cases ($\lambda_3 < 0$ and $\lambda_4 < 0$).

We use two different identification strategies: the first is based on the response of the firm's leverage to a change in the value of the firm's assets, triggered by an exogenous change in country-level or region-level real estate prices; the second is instead based on its response to exogenous shifts in profitability, arising from fluctuations in commodity prices that the firm uses as inputs in production or sells as outputs.

In the first identification strategy, we interact the asset value (namely, the market value of the firm's real estate assets) with measures of workers' rights in bankruptcy and reorganization and with measures of union power and employment protection, which we use to capture workers' bargaining power. The latter, being based on country-level characteristics, are largely time invariant (the exception being EPL, used to measure employment protection, which changes over time) and does not vary across firms in the same country. Changes in the value of firms' real estate vary over time, as well as across firms in the same country, since firms typically have different amounts of real estate

assets. In other words, the power of our identification strategy comes from these shocks' differential effect across firms depending on the country-level legal protection of workers.

The first task is to measure the market value of real estate assets owned by each firm since the balance sheet books these assets at their historical cost. Real estate assets are largely made up of two main components: land and buildings. One important difference between these two components is their depreciation: existing literature argues that depreciation is very important for buildings, but significantly less so for land, which tends to appreciate, not depreciate, over time. Hence we use two different methods (Chaney et al., 2012, and Cvijanovic, 2015) to effect the real estate's market valuation.

Our first measure uses only the land component of real estate assets as in Cvijanovic (2015). Importantly, we do not want in our measure to include the increase (i.e. new acquisition) of the physical stock of land through our sample period. As argued above, depreciation is not a significant issue for land, and therefore in computing our first measure we disregard any accumulated depreciation reported by the firm. We check the robustness of the results using a variant of this measure where we use the net historical cost value of land after depreciation. We thus use the (historical cost) valuation of land of each firm for the year in which it appears for the *first time* in our dataset.[9] We then use the real estate price index to inflate the original value of land held by each firm and get its market valuation. We measure the value of a firm's real estate as the market value of land scaled by the lagged valuation of the firm's property, plant and equipment (PPE). For our analysis, we use alternatively two different real estate price indices: first, we use country-level residential real estate values for the country where the firm is incorporated; second, we use commercial real estate values in the geographical region in each country. While the country-level indices are available for all 28 countries, we have regional real estate values for 20 countries in our sample.

Our second measure is based on both land and buildings and follows the methodology used by Chaney et al. (2012). Because this measure contains the building component, for which depreciation is an important item, we first need to adjust the valuation of buildings for their accumulated depreciation. Thus the first step is to compute the accumulated depreciation of buildings to the historic cost of buildings, in order to measure the proportion of the original value of the building claimed as depreciation. As Chaney et al.

[9] Thus, for older firms and that have been in our dataset from the beginning, this year is 1989. For relatively younger firms, which enter later in our sample, it is their IPO year.

(2012), we assume a depreciable life of 40 years (and we then check the robustness of results by varying this from 30 to 50 years), and compute its average for the buildings for each firm. We use the (historical cost) valuation of land and buildings of each firm for the year in which it appears for the *first time* in our dataset[10] and then inflate the original value of land using the residential real estate price index in the country (or region) where the firm is incorporated, so as to obtain its market value. We infer the market value of a firm's real estate assets for each year in the sample period by inflating the historical cost with the country-level (or region-level) real estate price index. Also in this case, we measure the value of a firm's real estate is the market value of land and buildings scaled by the lagged value of PPE.

Our alternative identification strategy relies on estimating the response of firm's leverage to changes in profitability. Since we require the shock to be exogenous, we cannot use profitability measures such as the return on assets (ROA) because this is likely to be affected by leverage, as shown by the literature. Instead, we focus on changes in commodity prices as an exogenous source of variation in firm-level profitability. As in Bertrand and Muillanathan (2001), the movement of commodity prices can be seen as exogenous from the point of view of the single firm but has a first-order impact on firm profitability. We use a two-stage procedure to instrument for the firm's Return on Assets (ROA). In the first-stage firm-level profitability is instrumented with the price indices for crude oil, gold, silver, platinum and copper, allowing the coefficients of each of these price indices to take different coefficients in each firm, to take into account that the different cost structure and output composition can generate different firm-level exposures to each of these commodity indices. In the second stage we investigate how firm-level leverage responds to these exogenous shocks to predicted profitability.

[10] Thus, similar to what we do in our first measure, for older firms and that have been in our dataset from the beginning, this will be year 1989. For relatively younger firms, that enter later in our sample, this will be their IPO year. However, in the case of this second method there is an additional layer of complexity. For certain countries there is no data for accumulated depreciation after a particular year. For example, in the case of the United States there is no data on accumulated depreciation of building after 1993. Thus, when using this second measure we will lose all companies that went public after the last year for which accumulated depreciation is available, resulting in a smaller sample.

3. Data

To implement the empirical methodology described in the previous section, we collect data on employees' rights in bankruptcy around the world, merge them with firm-level data for the same countries and with data for other country-level variables, and test whether the response of corporate leverage fits more closely the predictions of the strategic leverage model or those of the credit rationing model.

The variables used in the estimation are defined in Appendix C, and are measured by drawing a variety of sources. Accounting and financial data for firms outside the U.S. are drawn from Worldscope and Osiris and for U.S. firms from Compustat. We collect data for firms incorporated and listed in 28 countries[11] in the period 1988-2013, with two screens: we do not include financial institutions and utilities, as well as firms with less than 9 years of data. The data are winsorized below the 1st percentile and above the 99th percentile. This leaves us with 13,809 firms and 221,835 firm-year observations. Table 1 shows the descriptive statistics of our sample.

[Insert Table 1]

Country-level data on workers' employment protection and other country-level variables come from various sources, mostly from the OECD and Bank for International Settlements datasets. Our analysis also relies on less standard data on real estate prices and commodity prices and on novel measures of employees' legal protection in bankruptcy: the next two subsections describe their sources, definitions and the way they are used in the empirical analysis.

3.1 Real estate values and commodity prices

To implement our first identification strategy, which relies on the response of leverage to changes in real estate values, we draw real estate prices data from two sources. First, we draw country-level residential real estate price indices from the Banks for International Settlements database. While this database covers all the countries in our sample, it is at a high level of geographic aggregation, and provides no data for commercial real estate, which is likely to be more relevant for the real estate holdings of firms.

[11] While we collect data on workers' rights in bankruptcy proceedings for 29 countries, our specifications will be estimated on 28 countries since we for one country (Hong Kong) data on Employment Protection Legislation is missing.

To address these concerns, we resort to the Property Market Analysis (PMA) database, which contains commercial real estate price indices at the city and regional levels. This second database contains a comprehensive cross-section of international property markets for a number of cities in the largest global markets for institution-grade commercial real estate such as the US, Japan, China, Germany, and the UK. For each covered country, the PMA data provides commercial real estate indices for three market segments: (i) office space, (ii) retail, and (iii) logistics. We use the data for office space since it has the longest span of years, covering our entire sample period 1988-2013. However, the PMA database covers only 18 of our sample countries, which reduces the size of our sample. Another feature is that the number of cities for which data are available changes across countries. For example, while we have real estate data for two cities in Italy (Rome and Milan), we have data for 4 cities in Australia (Sydney, Melbourne, Brisbane and Perth), and 7 cities in Germany (Frankfurt, Berlin, Cologne, Dusseldorf, Hamburg, Munich and Stuttgart). So these data require matching firms to the relevant commercial real estate market. To this purpose, for countries where we have price indices for several cities we match each firm with the nearest city for which we have commercial real estate data: first, we calculate the distance between the city of the firm's headquarters and the nearest city in the same country for which we have data (calculating the shortest distance based on websites such as https://www.distancecalculator.net). Instead, for countries where commercial real estate price data are available only for one city, all companies in the country are matched with that single city. This is the case, for example, of Swedish companies (which are matched with data for Stockholm) and Irish ones (matched with Dublin).

Our second identification strategy, which relies on the response of corporate leverage to exogenous changes to profitability, requires commodity prices in the first-stage regression: we draw crude oil, gold, silver, platinum and copper prices from Bloomberg.

3.2 Worker Protection in Bankruptcy around the World

To measure the legal rights of employees in bankruptcy procedures, we construct a completely novel dataset, mostly obtained from detailed questionnaires sent to law firms belonging to the Lex Mundi project and to expert legal scholars. The text of the questionnaire is shown in Appendix B. We received one questionnaire per country. Table

2 shows the most important rights of employees in bankruptcy in each country for which we have data, based on the replies to the questionnaire.

[Insert Table 2]

The first issue on which the questionnaires provide information is the seniority of (i) employees' unpaid salaries and wages, (ii) severance pay and (iii) employers' contributions to pension plans vis-à-vis the claims of other creditors in the liquidation of an insolvent company. The questionnaires consider five types of creditors potentially competing with these three claims by employees: (a) creditors with lien on property (e.g., real estate mortgage), (b) administrative expenses incurred by the trustee, (c) post-petition credit, (d) income and other taxes due to local or central government, and (e) unsecured creditors. So altogether each of the three types of employees' claims sits in an 8-dimensional seniority ranking, where some claims may have the same seniority, i.e., may be "tied". Absent ties, these claims are ranked on a scale from 8 for the most senior to 1 for the most junior one; in case of ties, we apply the average-rank method proposed by Kendall (1945), i.e. assign to all the tied claims the average of their ranks.

Hence the questionnaires enable us to establish the seniority of each of the three types of workers' claims (unpaid salaries and wages, severance pay, and employers' contributions to pension plans). However, in most of our regressions we shall base the measure of employee seniority – the empirical counterpart of the parameter θ in our model – on one of them only, namely employers' contributions to pension plans, as the magnitude of this claim is likely to exceed that of unpaid wages or severance pay. Anyway, the ranks of all three claims of employees are very closely correlated, as will be seen below. Moreover, we check the robustness of our results using also the seniority of unpaid wages and severance pay, as well as the average seniority of all three claims.

Column 1 of Table 2 shows the rank of employers' contributions to employee pension benefit plans. Assuming no ties, this claim has rank 8 in countries where it has the highest seniority, 7 when it comes second by seniority, and so on. In case of ties with other claims, it gets the average rank: for instance, if all three of the above-listed employees' claims (salaries and wages, severance pay and employers' pension contributions) are ranked as the most senior, then each of them has rank $(8+7+6)/3=7.$ There are very significant cross-country differences in the rank of employees' claims: they have the highest priority in Brazil (prior to the 2005 bankruptcy reform) and France, where

employees have the highest seniority in the liquidation of an insolvent company (the rank of their claims is 7), before any other creditor of the company. The seniority of employees is much lower in other countries: for instance, in Ireland, Spain and United States they are ranked last (the rank of their pension claims being 1.5). Employee seniority in other countries lies between these two extremes: it is low in countries such as Japan, Germany, Sweden, and Denmark, and rather high in countries such as Norway, Czech Republic, India and Mexico. While the seniority of employees' claims is important, it is not the only relevant dimension: another one is whether workers' unpaid wages are capped at a maximum amount payable or not. Also here there are considerable cross-country differences, although for the sake of brevity we do not report these data.

Even if employees have low seniority, the government can effectively secure their claims (wholly or partly) by creating an insurance fund to cover their claims. Thus, in countries where workers rank amongst the most junior creditors in case of liquidation, a government-mandated insurance fund can attenuate the cost to workers by covering at least part of the unpaid salaries, pension contributions and/or severance pay. Again, it should be noted that any payment made out by this government fund can be capped at a certain level. Thus countries fall in one of three groups: (i) those without any government insurance fund, (ii) those with government insurance capped at some level, and (iii) those with government insurance that is not capped at any level. We assign value 0, 1 and 2 to the countries in each of these three groups, respectively, to measure the coverage of government-supplied insurance in bankruptcy, i.e. parameter γ in the model. Column 2 of Table 2 shows these values for the countries in the sample, with reference to the insurance of pension contributions. Most countries provide such insurance, but the amount covered varies significantly across countries, and is not systematically correlated with employee seniority. For example, in Brazil and in Greece there is no government-mandated insurance, in Italy and Sweden insurance provision is capped, and in Germany it is uncapped, even though in all five countries pension contributions have the same seniority (for Brazil, after its reform). Conversely, in Spain, Japan, Turkey, Australia and Mexico, whose governments do not insure unpaid pension contributions, the seniority of such contributions is 1.5, 2, 4, 4.5 and 6, respectively.

Our questionnaire also provides information about legal rights of workers in firm restructuring procedures, and specifically about whether the reorganization plan can impair employees' rights arising from collective agreements and whether their consent is

necessary to carry out the plan. Notice that there is no necessary correlation between these two dimensions: the law may prescribe for instance that even a restructuring plan that does not infringe collective agreements may require the consent of workers. Column 3 of Table 2 shows a measure of workers' rights in reorganization – the empirical counterpart of the parameter β in our model – obtained by ranking the relevant replies from 1 (highest impairment, hence lowest protection of workers' rights in restructuring) to 6 (lowest impairment, hence strongest protection of workers' rights). Figure 5 shows precisely how the relevant replies from our questionnaire are hierarchically mapped into these values: we start with the reply to the question whether collective bargaining agreements can be modified by the reorganization plan; then consider whether the reorganization plan itself be proposed to employees' representatives (e.g. unions) for approval, and finally consider whether, absent the employees' approval, the reorganization plan can still be carried out if authorized by court (possibly in a modified version).

The results show significant cross-country heterogeneity: in countries such as France and the United States, both with a value of 2, and Germany and Australia, both with a value of 1, previous collective bargaining agreements can be modified relatively easily, while in countries such as Canada and Finland (both with a value of 6), as well as Austria, Denmark, Norway and Turkey (with a value of 4) modifying the collective bargaining agreements and/or having the reorganization plan of an insolvent firm approved is quite difficult. One important dimension to note is the significant cross-country heterogeneity within group of countries that broadly share the same type of legal system (i.e. either common or civil law). For example, there are significant differences among common law countries: in Canada and the U.K. (where our measure equals 6 and 5 respectively), the law gives strong rights to employees in the reorganization of insolvent firms, while this is not the case in the U.S. and Australia (where the measure equals 2 and 1, respectively).

Employees aside, the implementation of a restructuring plan obviously rest primarily on the consent of a sufficiently large fraction of creditors: depending on the fraction of creditors required to agree to the plan, bankruptcy law can make restructuring easier or harder to undertake, and therefore more or less likely. Our questionnaire provides information also on the minimum fraction of creditors required to agree on the reorganization plan in each country. Insofar as this fraction affects the probability that creditors will agree on a restructuring plan rather than liquidating the firm, it also affects the relevance of employees' rights in restructuring: for instance, if firm restructuring

requires creditor unanimity, which is very unlikely to occur, employees' rights in restructuring become almost irrelevant; conversely, if restructuring does not even require the consent of the majority of creditors, and therefore is more likely, employees' rights in restructuring can be quite important.

To take this into account, we devise an alternative measure of workers' rights in reorganization (i.e. the parameter β in the model) by interacting the measure described above and shown in Column 3 of Table 2 with a proxy of the likelihood of restructuring based on the minimum fraction of creditors required to approve a restructuring plan. This interacted variable is meant to provide a probability-weighted measure of employees' rights in reorganization: for brevity, we refer to it as their "effective rights in reorganization". Specifically, we consider four possible thresholds regarding the required fraction of consenting creditors: (i) creditor unanimity, (i) qualified majority, (iii) simple majority, and (iv) no requirement. Since the likelihood of restructuring should be inversely related to the strictness of the threshold, we approximate it with the following values: (i) 0.25 when the law requires creditor unanimity, (ii) 0.50 when the law requires a qualified majority, (iii) 0.75 when it requires simple majority, and (iv) 1 when no majority is required. Employees' effective rights in reorganization are then measured by applying these weights to the variable shown in Column 3. Thus, for example, while this variable has the same value of 4 in Austria, Italy, Japan, Sweden and Switzerland, its effective value differs across these countries, since in Austria and Switzerland reorganization requires a qualified majority (0.5), in Italy and Japan a simple majority (0.75) and in Sweden there is no requirement (1). Therefore, workers' effective rights in reorganization are measured to be 2 in the case of Austria and Switzerland, 3 in the case of Italy and Japan, and 4 in the case of Sweden.

The other data in Table 2 provide information on other country-level labor market characteristics and measures of creditor rights used in our empirical methodology. Two important labor market variables that we use as alternative measures of workers' bargaining power are union density and the Employment Protection Legislation (EPL). Union density measures the level on unionization in each country, while the EPL indicator is a time-varying variable that ranges between 0 and 6, with 6 indicating the highest level of protection to workers. It measures the difficulty with which individual and collective dismissal can be made in each country. It has three distinct components: Regular Contracts (for workers with regular contracts), Temporary Contracts (for workers with

fixed-term, temporary contracts), and Collective Dismissals (regulations applying to collective dismissals).

Table 3 shows the correlations between the different dimensions of workers' rights in bankruptcy and between them and country-level characteristics. We start by showing the correlation between the seniority ranking of workers' three separate claims, i.e. (i) unpaid salaries and wages, (ii) severance pay and (iii) employers' contributions to pension plans. As expected, the seniority levels of these three claims are highly correlated. Workers' seniority in liquidation is negatively correlated with the existence of a government insurance fund and with workers' rights in reorganization. Although these correlations are not statistically significant, they suggest that these dimensions of workers' legal rights in bankruptcy tend to be substitutes rather than complements: where workers have higher seniority, they are less likely to be protected by government insurance and have fewer rights in firm reorganization.

[Insert Table 3]

Workers' seniority is instead positively correlated with employment protection legislation (EPL), suggesting that the two tend to complement each other. However, their correlation is low (always lower than 30%, being highest when we consider the seniority of employers' pension contributions, and never reaching the 5% significance level), which indicates that important dimensions of workers' rights are not captured by the EPL indicator used by previous studies on corporate leverage. Workers' seniority instead correlates negatively with union density: unions tend to be stronger in countries where employees have low seniority. Finally, employees have lower seniority in countries where creditors' rights are stronger (and creditors' have an automatic stay on assets), whereas the measure of workers' rights in reorganization is positively correlated with creditors' rights. But also these correlations are not statistically significant, implying that our new measures may play a role that is independent of existing measures of creditors' rights.

4. Empirical Results

To investigate how firm capital structure is affected by workers' rights in bankruptcy we estimate variants of the regression described by specification (14), the key coefficients of interest being λ_1 and λ_2, namely those of the interaction between our measures of

employee protection in bankruptcy and the variables capturing changes to the firm's asset value or profitability: recall that the strategic debt model predicts λ_1 to be either positive or negative and λ_2 to be negative, while the credit constraint model predicts both coefficients to be negative. Also the parameter of the interaction with employees' bargaining power (λ_3) and that of the interaction with government insurance (λ_4) help to discriminate between the two models, as they are both predicted to be positive by the strategic debt model, and negative by the credit rationing model.

4.1 Regressions Based on Real Estate Valuations

We start from the results obtained from the identification strategy that relies on the value of firms' real estate holdings. The first set of results is shown in Table 4 where, depending on the specification, we use industry-year, firm-level, country-level, country-industry and country-year fixed effects.

[Insert Table 4]

Our objective is to test whether, ceteris paribus, a change in the value of their existing assets lead firms incorporated in countries that grant employees stronger rights in bankruptcy to change their leverage *differently* from firms incorporated in countries where employees have weaker rights. Hence, our identification strategy is based on a difference-in-difference estimation that compares the leverage reaction of two otherwise identical firms, but incorporated in countries with different levels of workers' rights in bankruptcy, following a change in the valuation of their real estate holdings.

The first row of Table 4 shows that the coefficient estimate of the interaction between the real estate assets' value and workers seniority (λ_1) is positive, as predicted by the strategic debt model, and highly significant. Whether we include industry-year fixed effects (Column 1), country-industry and year effects (Column 2), firm and year effects (Column 3), firm and country-year effects (Column 4) or firm and country-industry-year effects (Column 5), we always find that, faced with an increase in the valuation of their real estate holdings, a firm incorporated in a country where workers have high seniority in liquidation increases leverage more than an identical firm incorporated in a country where workers rank low. The effect is economically significant as well: a shift from a situation where employees have the lowest seniority (a rank equal to 0.5) to one where they have

the highest seniority (a rank of 6) is associated with an increase in leverage of about 39% of its standard deviation.

This finding contrasts with predictions of the credit rationing or collateral constraint model of Section 2: according to that model, an increase in firm's real estate values should also impact firms' financial capacity and thus their indebtedness, but the response of leverage to real estate values should be weaker, not stronger, for firms incorporated in countries where workers have higher seniority in bankruptcy and/or have greater bargaining power. In contrast, we find that the interaction of real estate value with both of these variables has a positive coefficient.

The result in the second row of Table 4 shows that the coefficient estimate of the interaction of real estate assets' valuation and workers' wage bargaining power (λ_2) is positive, as predicted by the model, and significant at the 5 percent confidence level in every specification we use except in the last column (where we include country-industry-year fixed effects) where it is significant at the 10 percent level.

The third row shows the coefficient estimate of the interaction between the valuation of real estate holdings and workers' rights during reorganization (λ_3): this coefficient is negative, as predicted by the strategic debt model, and is significant at the 5 percent confidence level in the specifications of Columns 1-4.

Finally, the fourth row of the table displays the coefficient of the interaction between the insurance provided by government to employees of firms in bankruptcy liquidation and real estate valuation (λ_4): also this coefficient is estimated to be positive, in agreement with the prediction of the strategic leverage model, and is significantly different from zero in the specifications of Columns 1-3.

It is important to note that these results, largely consistent with the strategic leverage model of Section 1, are obtained controlling for various channels that may influence the leverage decision. Every specification controls for the traditional firm-level time variant variables that the literature has found to influence leverage decisions (namely, firm size, profitability, asset tangibility and market-to-book to proxy for growth opportunities), while time-invariant firm characteristics are absorbed by the firm fixed effects.

Finally, an important concern in our analysis is the impact that country characteristics may have on the outcome: some country-level characteristics and macroeconomic factors may be driving both real estate prices and firms' financing choices, in this case leverage.

The most likely reason is a demand channel: a positive aggregate demand shock is likely to fuel an increase in real estate prices, while at the same time generating a rise in economic activity to which firms may respond by increasing investment. If this increase in investment is financed through borrowing, then we should find an impact on leverage due to omitted variables that also drive changes in real estate prices.

For this concern to affect our estimates of the coefficients of our interaction variables, the omitted variables would also have to correlate with workers' rights and drive the differential impact that the real estate price increase has on firm's leverage in countries where workers' rights differ. In any event, we address the potential problems arising from omitted country characteristics by including country-level controls in our specifications.

First, the specifications of Columns 1-3 in Table 4 control for the unemployment rate and for GDP growth, to absorb any effects that country-level macroeconomic activity may have on both real estate prices and leverage decisions. In Column 2, we also control for country- and industry-level time-invariant unobserved heterogeneity by including country-industry fixed effects.

Second, since the spurious correlation between real estate valuations and firm leverage may be driven by time-varying country-level variables other than unemployment and GDP growth, we estimate a specification with country-year effects in Column 4, and one with country-industry-year effects in Column 5.

Even in the specifications most saturated by fixed effects, the three key predictions of the strategic debt model continue to hold: the coefficient of the interaction of real estate assets' valuation with employee seniority is estimated to be positive and statistically significant at the 5 percent level, that of the interaction with workers' wage bargaining power is positive and significant at the 10 percent level, and that with workers' rights during reorganization is negative, though not precisely estimated.

In Table 5 the above identification strategy is replicated using the finer measure of the value of firms' real estate holdings based the city or regional commercial real estate data drawn from the PMA database. These data allows us to get a more accurate measure of the impact of changes in real estate prices on the firm's market value because they refer to commercial rather than residential real estate, and enable us to evaluate firms' real estate holdings using the real estate index for the same geographical region where the firm is incorporated. However, reliance on PMA data reduces the number of countries in the

estimation from 28 to 20, due to data availability. The results are shown in Table 5 where, depending on the specification, we also include region-level fixed effects in combination with other fixed effects.

[Insert Table 5]

The predictions of the strategic debt model are confirmed using these regional data on commercial real estate indices. Especially noteworthy are the results shown in Columns 3-5 where, beside firm fixed effects, the specifications also include region-year effects (Column 3), region-industry-year effects (Column 4), and region-country-industry-year effects (Column 5). Insofar as they control not only for country-level but also for region-specific effects, these results confirm the robustness of our results.

Finally, we check whether our results hold also using our second measure of the market valuation of firms' real estate: instead of land assets only, we use land and building assets, which we can compute for a subsample of firms due to data limitations. In general, the results get stronger using this second measure. We also split the sample in small and large firms (using country median values of market capitalization), as larger firms may own real estate assets outside their country of incorporation: this may introduce a bias since we use the real estate price index in their country of incorporation to measure the market value of their assets. We find that the results still hold for both groups of firms, but are stronger for smaller firms.

4.2 Regressions Based on Commodity-Price-Driven Changes in Profits

We next turn to the analysis based on the exogenous shocks to firm-level profitability using several commodity indices – that should be exogenous to firm-level performance - to instrument changes in profitability. This strategy is reminiscent of that used by Bertrand and Mullainathan (2001). Similarly to the first diff-in-diff strategy, this one compares the leverage response of two otherwise identical firms whose employees have different rights in case of bankruptcy, following an exogenous shock to their profitability arising from the pattern of commodity prices. The results are shown in Table 6.

[Insert Table 6]

The results found in Tables 4 and 5 are confirmed in Table 6, where we use specifications with the same fixed effects used in Table 4. Also in this case, the predictions made by the strategic leverage model are broadly borne out: the coefficients of

the interactions of profitability with workers seniority and with workers' bargaining power are both positive and statistically significant. The effects are also economically significant: for instance, a shift from a situation where employees have the lowest seniority (a rank equal to 0.5) to one where they have the highest seniority (a rank of 6) is associated with an increase in leverage of about 48% of its standard deviation.

In the following two subsections, we explore two further issues, both of which are arguably related to the theoretical analysis of Section 1. The first is whether the leverage response documented so far occurs mainly via changes in short-term or long-term corporate debt. The second is whether its response differs appreciably between industries with a fraction of tangible assets and those that rely more on intangibles.

4.2.1 Role of Debt Maturity

If corporate leverage is affected by strategic concerns vis-à-vis employees, as shown by the evidence discussed so far, firms should be expected to respond to workers' rights in bankruptcy more by using short-term rather than long-term debt. This is for two reasons.

First, short-term debt may be more effective in moderating the wage demands of employees with high seniority in liquidation: not only the firm's inability to meet short-term debt repayment makes financial distress more of a threat, but a short-maturity claim effectively allows creditors to "circumvent" the workers' seniority rights in the firm's liquidation. In a way, it gives seniority in time even though they are junior in the eventual bankruptcy liquidation procedure. This result would naturally emerge from the model of Section 1 if at $t=1$ the firm could issue some debt $D \leq A$ maturing *before* the realization of its revenue $\tilde{R}$ at $t=3$. Besides being safe, such debt would be effectively senior than workers' claims, even if these were entirely protected by seniority in the event of firm liquidation, i.e. if $\theta=1$. So a short maturity reopens the door to a strategic use of debt even when workers are perfectly protected by seniority in liquidation (recall that if $\theta=1$ debt loses all bite in the model of Section 1.1).

Second, short-term debt is more suited than long-term debt to take a temporary increase in the firm's surplus off the bargaining table, without at the same time weakening the firm's long-term growth prospects (its continuation payoff *C*). Recall that, according to our strategic debt model, when employees have high seniority, leverage is more likely

to increase in response to temporary increases in the firm's resources rather than those that also raise its long-term profitability.

Therefore, in Table 7 we re-estimate the same specifications shown in Columns 4 and 5 of Table 6, separately for short- and long-term corporate debt, respectively defined as debt with maturity not exceeding 1 year and above 1 year. The results shown in Columns 1 and 2, where the dependent variable is short-term debt, are statistically and economically stronger than those shown in Columns 3 and 4 when using long-term debt, confirming the conjecture that firms use short-term debt more aggressively to respond to workers' rights in bankruptcy.

[Insert Table 7]

4.2.2 Role of Asset Tangibility

The predictions of the strategic debt model can be expected to apply more closely to industries with a high fraction of tangible assets than to firms with a high intensity of intangibles such as R&D. Also in this case, the rationale is twofold.

First, the model rests on the premise that employees can earn quasi-rents, i.e. have low reservation wage W_0 compared to firms' average revenue $\overline{R}$: it is by reducing these quasi-rents that debt issuance can increase the surplus accruing to shareholders. While the assumption of a low reservation wage may apply to low-skill labor, it is less likely to be appropriate for firms whose workforce is dominated by skilled and sought-after employees, such as software engineers or biotech researchers.

Second, future growth opportunities are typically more important in firms with high intensity of intangibles than in firms in more mature industries. In terms of the model of Section 1, the continuation payoff C is less important for the latter, which therefore by Propositions 1 and 2 should be more likely to choose high leverage if their employees have high seniority.

Hence, we divide firms in two groups: those with high levels of tangible assets (as a fraction of PPE) and those with low levels of tangible assets, and repeat the estimation separately for the two groups. The results are shown in Table 8, where Columns 1 and 2 show the results for the first group, and Columns 3 and 4 those for the second group. We

use country-year, and firm fixed effects in Columns 1 and 3, and country-industry-year, and firm fixed effects in Columns 2 and 4.

[Insert Table 8]

The results in Columns 1 and 2 for firms with high asset tangibility are statistically and economically stronger than those shown in Columns 3 and 4 for firms in low asset tangibility, in agreement with the arguments offered above. Incidentally, in estimates that we do not report for brevity, we also split the sample between firms in industries with high labor intensity and those with low labor intensity, and find that results are stronger in the former, which is again consistent with them being stronger in mature industries.

4.2.3 Role of Financial Constraints

As highlighted in Section 1, the strategic debt model and the credit rationing model yield widely different predictions about the impact of employees' rights in bankruptcy on leverage. However each of the two models may apply to different firms in our sample, respectively unconstrained and constrained ones. Identifying financially constrained firm is notoriously problematic because many of the approaches used so far by the literature, based on specific firm characteristics, fail to model jointly the factors that affect firms' access to external finance and often rely on time-invariant firm characteristics (such as ownership), thus not allow firms to move from the financially constrained regime to unconstrained one, and vice versa.

To solve this problem we estimate an endogenous switching regression model with unknown sample separation, following Hu and Schiantarelli (1998), Almeida and Campello (2007) and Huang, Pagano and Panizza (2016). The specification assumes that at each point in time a firm is in one of the two possible financial regimes, and the probability of being in one or the other is endogenously determined by a selection function. This probability depends on several variables identified by past studies as possible determinants of access to external finance: firm-level characteristics such as age, (log of) total assets, asset tangibility, dividend payments, presence of a bond rating and distance to default; and country-level variables such as stock market capitalization and private credit scaled by GDP, meant to proxy financial development.

Hence, the switching regression methodology entails the joint maximum-likelihood estimation of the parameters of three equations: one for the leverage of unconstrained

firms, another for the leverage of constrained ones, and the selection function determining the likelihood that each firm-year observation is in either one of the two regimes. Hence, this approach allows our specification in (17) to have different coefficients for firms that are likely to be financially constrained and those that are not. The two regimes are not observable but their likelihood is endogenously determined by the system of equations.

Note that this specification cannot be combined with our specification that uses the exogenous shock to profitability because the system of equations cannot handle the use of the IV methodology. We thus apply the switching regression method to the approach based on real estate prices, using country-level residential real estate indices. Moreover, since estimation of our switching regression model does not converge when including firm fixed effects, in Table 9 we present only results for regressions that include either year and industry effects or country-industry-year fixed effects.

[Insert Table 9]

The first two columns of Table 9 present estimates for financially unconstrained firms: Column 1 refers to the specification with industry and year fixed effects and Column 2 to that with country-industry-year effects. The last two columns of the table report instead the estimates for financially constrained firms, again first with industry and year fixed effects in Column 3, and with country-industry-year effects in Column 4.

The estimates corroborate the importance of access to financial markets for firms to be able to use debt strategically in wage bargaining. The results in the first row show that the coefficient estimate of the interaction between the real estate assets' value and employees' seniority is positive and highly significant only for firms that are not financially constrained. Firms that are financially constrained do not exhibit the same behavior: the coefficient estimate of the interaction between the real estate assets' value and workers seniority is negative, although it lacks statistical significance.

Another important result relates to the coefficient estimate of the interaction of real estate assets' valuation and employees' wage bargaining power: also this parameter estimate differs remarkably between financially unconstrained and constrained firms, being strong – both economically and statistically – for the former, and not significant for the latter.

4.3 Further Robustness Checks

Beside the extensions described so far, we perform various other robustness checks. First, as all the previous results rely on a definition of employees' seniority that is based on the seniority of their employers' unpaid pension contributions, we check whether the estimates are robust to measuring it with the average seniority of the three claims of employees: pension contributions, wages, and severance pay. The results are similar to those obtained so far, as shown by Table D1 in Appendix D. They are also robust to measuring employees' seniority with the seniority of wages or severance pay alone.

Second, we repeat the estimation with our measure of effective employees' protection in reorganization, as described in Section 2: the results, shown in Table D2 in Appendix D, are qualitatively unchanged. Finally, we check that the results are not sensitive to change the definition of the dependent variable from book leverage to market leverage.

5. Conclusions

Several papers find evidence in support of the hypothesis that firms use leverage to "take surplus off the bargaining table" in wage negotiations, so that greater workers' bargaining power induces employers to take on more debt so as to moderate their wage demands. But the existing literature neglects that the strategic value of debt in wage bargaining depends on the seniority of employees' claims relative to other creditors in the liquidation of insolvent firms, as well as on employees' rights in the renegotiation of their employer's debt. This is potentially important because the balance between the rights of workers and those of other creditors in bankruptcy varies greatly across countries.

In this paper, we show theoretically and empirically that this balance affects the strategic value of debt, and thus the predictions about the response of firm leverage to changes in the value of its assets and expected revenue. In a simple model of strategic leverage, we show that the rights of employees in liquidation and reorganization procedures can have opposite effects on the response of a firm's leverage to changes in the value of its assets and cash flow. However, firms' ability to use debt strategically in wage bargaining hinges on them being financially unconstrained: when firms face a binding collateral constraint, the response of their leverage to both workers' seniority and to their bargaining power should switch sign compared to the strategic debt model, which provides a sharp way to test this model against an alternative one.

To test the two models' predictions, we collect novel data about workers' legal rights during liquidation and reorganization by way of a questionnaire sent to law firms in each country participating in the Lex Mundi project. These rights turn out to differ from those attributed to employees by legislation on dismissals outside of bankruptcy and used in other studies. We find that, as predicted by the strategic leverage model, upon experiencing a positive shock to their real estate valuations or profitability, firms increase their leverage more if their workers have stronger seniority rights and greater bargaining power in wage negotiations, as well as weaker rights in firm reorganization. Moreover, when we distinguish between financially constrained and unconstrained firms, the predictions of the strategic debt model are strongly supported by the evidence only for unconstrained firms. Also consistently with this model, its predictions find stronger empirical support for short-term debt and for firms belonging to industries with a low fraction of intangibles to total assets.

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Appendix A

A.1. Derivation of the optimal wage set by the union

When the contractual wage is set by the union, i.e. $W = W_u$, the expected value of the workers' income $\tilde{Y}_u$ is

$$\mathrm{E}(\tilde{Y}_u) = \int_{(1-\theta)D}^{W_u+(1-\theta)D} \left[\tilde{X} - (1-\theta)D\right] f(\tilde{X})d\tilde{X} + \int_{W_u+(1-\theta)D}^{A+\bar{R}} W_u\, f(\tilde{X})d\tilde{X} = \frac{\left[A+\bar{R}-(1-\theta)D\right]W_u}{\bar{R}} - \frac{W_u^2}{2\bar{R}}.$$

As this expression is increasing and concave in W_u, it is maximized by setting W_u equal to W_u^* in (3), which is obtained from the first-order condition. Combining the assumption that the firm is viable ($A+\bar{R}/2 > W_0$) with the upper bound on the losses from unemployment ($A+\bar{R}/2 > (1-\gamma)L$), it is immediate that $W_u^* > W_0$. Substituting W_u^* from (3) in the previous expression for the expected income of workers yields (4).

A.2. Derivation of the probability of bankruptcy

The firm defaults if $\tilde{X} < D + W$, where the wage $W = W_u^*$ if set by the union and $W = W_f(\tilde{X})$ if set by the firm. Since $W_f(\tilde{X}) = 0$ for $\tilde{X} \le D$, its default probability is

$$\Pr(\tilde{X} < D+W) = (1-\alpha)\int_A^D f(\tilde{X})d\tilde{X} + \alpha \int_A^{D+W_u^*} f(\tilde{X})d\tilde{X} = \frac{(1-\alpha)(D-A) - \alpha(\bar{R}+\theta D-(1-\gamma)L)}{\bar{R}}.$$

Using this expression in the firm's expected continuation payoff $\left[1-\Pr(\tilde{X} < D+W)\right]\cdot C$, one obtains expression (7) for the value of the firm, *V*.

A.3. Proofs of Propositions 1, 2 and 3

Proof of Proposition 1. First, the fact that optimal debt is positive only if $\theta < 1$ is immediate from expression (7) for the firm's value *V*: with $\theta = 1$, expected labor income $\mathrm{E}(\tilde{Y})$ no longer depends on *D*, while the expected continuation value $\left[1-\Pr(\tilde{X} < D+W)\right]C$ is increasing in *D*. Hence, it is optimal to set *D* equal to zero.

If instead $\theta < 1$, the optimal debt $\hat{D}_l$ is given by (8), which is increasing in employees' bargaining power α and in public insurance coverage γ:

$$\frac{\partial \hat{D}_l}{\partial \alpha} = \frac{C + (1-\gamma)L}{\alpha^2 (1-\theta)^2} > 0, \qquad \frac{\partial \hat{D}_l}{\partial \gamma} = \frac{1-\alpha}{\alpha (1-\theta)^2} L > 0,$$

while its derivative with respect to the worker's seniority θ is

$$\frac{\partial \hat{D}_l}{\partial \theta} = \frac{A + \bar{R}}{(1-\theta)^2} - \frac{\left[2 - \alpha(1-\theta)\right]}{\alpha (1-\theta)^3} C - \frac{2(1-\alpha)(1-\gamma)}{\alpha (1-\theta)^3} L,$$

whose sign depends on the size of the continuation payoff *C* and loss from unemployment *L*: it is positive for sufficiently small values of *C* and *L*, and negative otherwise. ■

Proof of Proposition 2. The comparative statics of $\bar{D}_l$ are obtained by applying the implicit function theorem to expression (10):

$$\frac{\partial \bar{D}_l}{\partial \alpha} = 0, \quad \frac{\partial \bar{D}_l}{\partial \gamma} = \frac{W_u^* + \bar{D}_l - A}{\Delta_l} L > 0, \quad \frac{\partial \bar{D}_l}{\partial \theta} = \frac{W_u^* \bar{D}_l}{\Delta_l} > 0, \quad \frac{\partial \bar{D}_l}{\partial W_0} = -\frac{\bar{R}}{\Delta_l} < 0,$$

where $\Delta_l \equiv (1-\theta) W_u^* + (1-\gamma) L$ for brevity, W_u^* is defined by (3) evaluated at $D = \bar{D}_l$, and $\bar{D}_l > A$ is a necessary condition for default to be a positive-probability event. ■

Proof of Proposition 3. The effect of α, γ and θ on the response of $\hat{D}_l$ to a change in *A* is obtained from the relevant cross-derivatives, starting from the derivatives in the proof of Proposition 2:

$$\frac{\partial^2 \hat{D}_l}{\partial A \partial \alpha} = 2 \frac{\partial^2 \hat{D}_l}{\partial \bar{R} \partial \alpha} = \frac{1 - \theta(1-\alpha)}{\alpha (1-\theta)^2} \frac{\partial C}{\partial A} + \frac{1-\gamma}{\alpha^2 (1-\theta)^2} \frac{\partial L}{\partial A} > 0,$$

$$\frac{\partial^2 \hat{D}_l}{\partial A \partial \gamma} = 2 \frac{\partial^2 \hat{D}_l}{\partial \bar{R} \partial \gamma} = \frac{1-\alpha}{\alpha (1-\theta)^2} \frac{\partial L}{\partial A} > 0,$$

recalling that $\partial C / \partial A > 0$ and $\partial L / \partial A > 0$ by assumption, and

$$\frac{\partial^2 \hat{D}_l}{\partial A \partial \theta} = 2 \frac{\partial^2 \hat{D}_l}{\partial \bar{R} \partial \theta} = \frac{1}{(1-\theta)^2} \left[1 - \frac{2 - \alpha(1-\theta)}{\alpha (1-\theta)} \frac{\partial C}{\partial A} - \frac{2(1-\alpha)(1-\gamma)}{\alpha (1-\theta)} \frac{\partial L}{\partial A} \right],$$

which is positive if $\partial C / \partial A$ and $\partial L / \partial A$ are sufficiently small, and negative otherwise. The corresponding cross-derivatives with respect to $\bar{R}$ are obtained simply replacing $\partial C / \partial \bar{R}$ to $\partial C / \partial A$ and $\partial L / \partial \bar{R}$ to $\partial L / \partial A$ in the previous expressions. ■

A.4. Derivations and proofs for the case of renegotiation in bankruptcy (Section 1.3)

This section provides the derivations of the results in Section 1.3, including the proofs of Propositions 5 and 6. When workers expect that, in case of default by the firm, they will obtain a fraction β of the continuation payoff at the debt renegotiation stage, their objective function U when the union sets the wage W_u is redefined as follows:

$$\begin{aligned} U &= E(\tilde{Y}_u) + \text{prob}(\textit{bankruptcy} \,|\, W = W_u)\left[\beta C - (1-\gamma)L\right] \\ &= \frac{A + \bar{R} - (1-\theta)D}{\bar{R}} W_u - \frac{W_u^2}{2\bar{R}} + \frac{D + W_u - A}{\bar{R}}\left[\beta C - (1-\gamma)L\right]. \end{aligned} \tag{A1}$$

The first-order condition of expression (A1) with respect to W_u yields the union's optimal wage W_u^* in equation (11). Substituting (11) in (A1), one obtains the expected labor income of employees when the union sets the optimal wage W_u^*:

$$\mathrm{E}(\tilde{Y}_u \,|\, W = W_u^*) = \frac{\left[A + \bar{R} - (1-\theta)D\right]^2 - \left[\beta C - (1-\gamma)^2 L^2\right]}{2\bar{R}}. \tag{A2}$$

Hence, the expected labor income of employees is the weighted average of expressions (A2) and (12), respectively weighted by α and $1-\alpha$:

$$\begin{aligned} \mathrm{E}(\tilde{Y}) = \alpha &\frac{\left[A + \bar{R} - (1-\theta)D\right]^2 - \left[\beta C - (1-\gamma)L\right]^2}{2\bar{R}} \\ &+ (1-\alpha)\left[W_0 + \frac{D - A}{\bar{R}}\left[(1-\gamma)L - \beta C\right]\right]. \end{aligned} \tag{A3}$$

To obtain the value of the firm, one has to compute the expected continuation payoff accruing to shareholders and creditors. Using the notation $p \equiv \text{prob}(\textit{bankruptcy})$ for brevity, the firm's value includes the continuation payoff C in case of solvency, which occurs with probability $1-p$, and the expected fraction $(1-\beta)C$ in case of insolvency, which occurs with probability p. In the latter contingency, $(1-\beta)C$ is expected to accrue to creditors by negotiating with employees, but shareholders will extract it ex ante via debt issuance. Hence, the continuation payoff C to be included in the value of the firm

must be weighted by the probability $(1-p)+p(1-\beta)=1-p\beta$, rather than by $1-p$ as in expression (7). Moreover, the probability of bankruptcy must take into account that the wage set by the union is now given by expression (11) rather than by expression (3):

$$\Pr(\tilde{X} < D+W) = \frac{(1-\alpha)(D-A)-\alpha(\bar{R}+\theta D+\beta C-(1-\gamma)L)}{\bar{R}}. \qquad \text{(A4)}$$

Accordingly, the expression for the value of the firm becomes:

$$V = A + \underbrace{\frac{\bar{R}}{2}}_{\mathrm{E}(\tilde{R})} + \underbrace{\left[1-\beta\frac{(1-\alpha)(D-A)+\alpha(\bar{R}+\theta D+\beta C-(1-\gamma)L)}{\bar{R}}\right]}_{1-\beta\cdot\mathrm{prob}(bankruptcy)} C - \mathrm{E}(\tilde{Y}), \qquad \text{(A5)}$$

where $\mathrm{E}(\tilde{Y})$ is given by (A3). The first-order condition of expression (A5) with respect to *D* yields the value-maximizing debt under renegotiation in bankruptcy, i.e. expression (13) for $\hat{D}_r$ in the text.

To identify the maximum debt $\bar{D}_r$ level consistent with workers' participation constraint, one must find the maximal value of *D* that satisfies the condition:

$$\mathrm{E}(\tilde{Y}_u \,|\, W = W_u^*) + \mathrm{prob}(bankruptcy \,|\, W = W_u^*)\left[\beta C-(1-\gamma)L\right] = W_0.$$

Using (A2) and noting that $\mathrm{prob}(bankruptcy \,|\, W = W_u^*) = \left[\bar{R}+\theta D+\beta C-(1-\gamma)L\right]/\bar{R}$, this condition can be rewritten as follows:

$$\frac{\left[A+\bar{R}-(1-\theta)\bar{D}_r\right]^2-\left[\beta C-(1-\gamma)L\right]^2}{2\bar{R}} - \frac{\bar{R}+\theta\bar{D}_r+\beta C-(1-\gamma)L}{\bar{R}}\left[\beta C-(1-\gamma)L\right] = W_0, \qquad \text{(A6)}$$

which is the renegotiation analogue of equation (10) obtained for the case of liquidation. Using these results, one can now prove Proposition 4.

Proof of Proposition 4. Consider first the case where the employees' participation constraint is slack, so that optimal debt is given by expression (13) for $\hat{D}_r$ in the text. Assuming $\theta<1$, the comparative statics of $\hat{D}_r$ with respect to β, α, γ and θ are:

$$\frac{\partial\hat{D}_r}{\partial\beta} = -\frac{\theta}{(1-\theta)^2}C > 0, \qquad \frac{\partial\hat{D}_r}{\partial\alpha} = \frac{(1-\gamma)L}{\alpha^2(1-\theta)^2} > 0, \qquad \frac{\partial\hat{D}_r}{\partial\gamma} = \frac{1-\alpha}{\alpha(1-\theta)^2}L > 0,$$

and

$$\frac{\partial \hat{D}_r}{\partial \theta} = \frac{A + \bar{R}}{(1-\theta)^2} - \frac{\left[2 - \alpha(1-\theta)\right]}{\alpha(1-\theta)^3} C - \frac{2(1-\alpha)(1-\gamma)}{\alpha(1-\theta)^3} L,$$

which is positive for sufficiently small values of C and L, and negative otherwise.

If the workers' participation constraint is binding, so that debt is $\bar{D}_r$, comparative statics are obtained by applying the implicit function theorem to expression (A6) above:

$$\frac{\partial \bar{D}_r}{\partial \beta} = \frac{W_u^* + \bar{D}_r - A}{\Delta_r} C > 0, \qquad \frac{\partial \bar{D}_r}{\partial \alpha} = 0, \qquad \frac{\partial \bar{D}_r}{\partial \gamma} = \frac{W_u^* + \bar{D}_r - A}{\Delta_r} L > 0,$$

$$\frac{\partial \bar{D}_l}{\partial \theta} = \frac{W_u^* \bar{D}_l}{\Delta_r} > 0, \qquad \frac{\partial \bar{D}_l}{\partial W_0} = -\frac{\bar{R}}{\Delta_r} < 0,$$

where $\Delta_r \equiv (1-\theta)W_u^* + (1-\gamma)L - \beta C > 0$ (by the assumption $\beta < (1-\gamma)L/C$), W_u^* is defined by (11) evaluated at $D = \bar{D}_r$, and $\bar{D}_r > A$ is a necessary condition for default to be a positive-probability event. ■

Proof of Proposition 4. The effect of β, α, γ and θ on the response of $\hat{D}_r$ to a change in A is obtained from the relevant cross-derivatives, starting from the derivatives in the proof of Proposition 3:

$$\frac{\partial^2 \hat{D}_r}{\partial A \partial \beta} = -\frac{\theta}{(1-\theta)^2} \frac{\partial C}{\partial A} > 0, \quad \frac{\partial^2 \hat{D}_r}{\partial A \partial \alpha} = \frac{(1-\gamma)}{\alpha^2 (1-\theta)^2} \frac{\partial L}{\partial A} > 0, \quad \frac{\partial^2 \hat{D}_r}{\partial A \partial \gamma} = \frac{1-\alpha}{\alpha(1-\theta)^2} \frac{\partial L}{\partial A} > 0,$$

recalling that $\partial C / \partial A > 0$ and $\partial L / \partial A > 0$ by assumption, and

$$\frac{\partial^2 \hat{D}_r}{\partial A \partial \theta} = \frac{1}{(1-\theta)^2} \left[1 - \frac{1+\theta}{\alpha(1-\theta)} \frac{\partial C}{\partial A} - \frac{2(1-\alpha)(1-\gamma)}{\alpha(1-\theta)} \frac{\partial L}{\partial A} \right],$$

which is positive if $\partial C / \partial A$ and $\partial L / \partial A$ are sufficiently small, and negative otherwise. The corresponding cross-derivatives with respect to $\bar{R}$ are obtained simply replacing $\partial C / \partial \bar{R}$ to $\partial C / \partial A$ and $\partial L / \partial \bar{R}$ to $\partial L / \partial A$ in the previous expressions. ■

A.6. Derivations and proofs for the model with credit constraints (Section 1.4)

Expression (14) for the market value of debt is obtained as follows:

$$V_D = \alpha\left[\int_A^{(1-\theta)D} \tilde{X} f(\tilde{X})d\tilde{X} + (1-\theta)D\int_{(1-\theta)D}^{\bar{R}+A} f(\tilde{X})d\tilde{X}\right] + \alpha\left[\int_{(1-\theta)D+W_u}^{D+W_u} \left(\tilde{X} - (1-\theta)D - W_u\right) f(\tilde{X})d\tilde{X}\right.$$

$$\left. + \theta D\int_{D+W_u}^{\bar{R}+A} f(\tilde{X})d\tilde{X}\right] + (1-\alpha)\left[\int_A^D \tilde{X} f(\tilde{X})d\tilde{X} + D\int_D^{\bar{R}+A} f(\tilde{X})d\tilde{X}\right]$$

$$= \alpha\left[\frac{(1-\theta)^2 D^2 - A^2}{2\bar{R}} + (1-\theta)D\frac{\bar{R}+A-(1-\theta)D}{\bar{R}}\right] + \alpha\left[\theta^2\frac{D^2}{2\bar{R}} + \theta D\frac{\bar{R}+A-D-W_u}{\bar{R}}\right]$$

$$+ (1-\alpha)\left(\frac{D^2-A^2}{2\bar{R}} + D\frac{\bar{R}+A-D}{\bar{R}}\right) = \frac{D^2-A^2}{2\bar{R}} + D\frac{\bar{R}+A-D}{\bar{R}} - \alpha\theta D\frac{W_u}{\bar{R}}.$$

In the first and second steps, the terms in the first square bracket is the market value of senior debt, and those in the second is that of junior debt when the wage is set at W_u. If debt is not fully collateralized by the firm's assets ($D > A$), then due to insolvency risk its market value falls short of its book value ($V^D < D$) even if $\alpha = 0$:

$$V_D - D = \frac{D^2-A^2}{2\bar{R}} + \frac{\bar{R}+A-D}{\bar{R}}D - D = \frac{D^2-A^2}{2\bar{R}} - \frac{D-A}{\bar{R}}D = -\frac{(D-A)^2}{2\bar{R}} < 0.$$

If $\alpha > 0$, the firm's debt trades at a further discount to its book value, which is increasing in the workers' bargaining power α and in their seniority θ.

Proof of Proposition 6. Differentiating expression (16) yields the stated results:

(i) $$\frac{\partial D_{\max}}{\partial \alpha} = -\frac{\theta}{\left[1-\alpha\theta(1-\theta)\right]^2}W_u^* < 0, \qquad \frac{\partial D_{\max}}{\partial \gamma} = -\frac{\alpha\theta}{1-\alpha\theta(1-\theta)}L < 0,$$

$$\frac{\partial D_{\max}}{\partial \theta} = -\frac{\alpha}{\left[1-\alpha\theta(1-\theta)\right]^2}\left\{(2-\alpha\theta)W_u^* + \left[1-\alpha\theta(1-\theta)\right](1-\gamma)L\right\} < 0.$$

(ii) $$\frac{\partial^2 D_{\max}}{\partial A \partial \alpha} = -\frac{\theta}{\left[1-\alpha\theta(1-\theta)\right]^2}\underbrace{\left[\theta - (1-\gamma)\frac{\partial L}{\partial A}\right]}_{\partial W_u^*/\partial A} < 0 \text{ iff } \frac{\partial W_u^*}{\partial A} > 0,$$

$$\frac{\partial^2 D_{\max}}{\partial A \partial \gamma} = -\frac{\alpha\theta}{1-\alpha\theta(1-\theta)}\frac{\partial L}{\partial A} < 0,$$

$$\frac{\partial^2 D_{\max}}{\partial A \partial \theta} = -\frac{\alpha}{\left[1-\alpha\theta(1-\theta)\right]^2}\left\{(2-\alpha\theta)\frac{\partial W_u^*}{\partial A} + \left[1-\alpha\theta(1-\theta)\right](1-\gamma)\frac{\partial L}{\partial A}\right\} < 0 \quad \text{if } \frac{\partial W_u^*}{\partial A} \geq 0.$$

The corresponding derivatives with respect to $\bar{R}/2$ are obtained and signed simply by replacing $\partial L/\partial A$ with $\partial L/\partial(\bar{R}/2)$ and $\partial W_u^*/\partial A$ with $\partial W_u^*/\partial(\bar{R}/2)$ in the previous expressions. ■

Appendix B. Questionnaire on Employees' Rights in Bankruptcy Procedures

Consider an employee of a medium or large company, hired with a permanent employment contract, and suppose that the company becomes **insolvent**. Typically this results in one of two types of bankruptcy procedures:

1. **liquidation** of the company's assets;

2. **reorganization** aimed at preserving the company (at least in part) as a going concern.

This questionnaire aims at determining the degree of protection of the employee's claims on the insolvent company in your country under either scenario.

It also aims at elucidating creditors' rights in the choice between liquidation and reorganization.

1. LIQUIDATION

1.1. Which is the **priority in the distribution** of the proceeds from liquidation? Please rank them by assigning a lower number to higher-priority creditors:[12]

Type of creditors	**Priority in the distribution**	**Amount for which priority is valid** (write "100%" if priority applies to the entire claim)
Creditors with lien on property (e.g., bank mortgage)		
Administrative expenses incurred by the trustee		
Post-petition credit extended to debtor		
(a) Unpaid wages and salaries *and* (b) severance pay of employees		
Claims for contributions to employee pension benefit plans		
Income and other taxes due to local or central government		
Unsecured creditors		No priority

[12] If a claim in one of the first 6 lines is treated on a par with unsecured credit, please write "no priority" in last column.

1.2. Is there a government fund protecting employees' claims if they cannot be repaid fully in bankruptcy?

Type of claim	**Does such fund exist?**	**Is there a limit to the guaranteed amount?** (If so, please indicate it.)	**If such a fund pays off employees' claims, does it acquire the employees' priority in liquidation?**
Unpaid wages and salaries			
*S*everance pay			
Claims for contributions to employee pension benefit plans			

1.3. Since 1980, have there been considerable changes to the rules regarding the protection of the claims of employees (wages, severance pay and pension benefits) in the liquidation of a bankrupt company? If so, please describe the main ones.

2. REORGANIZATION

2.1. Are there different reorganization procedures for companies in your country? Please list the most widely used ones below, in order of importance:

Name of procedure in your language	**English translation (or one-line description)**	**Date of introduction of the procedure (if after 1980)**
(i)		
(ii)		
(iii)		

2.2. Consider the two most common form of reorganization procedures indicated under (i) and (ii) above:

Reorganization procedure:	**(i)**	**(ii)**
Can the reorganization plan impair the claims of employees without their consent?		
Under the plan, can employees be dismissed more easily than in normal circumstances? If so, specify how is their protection attenuated.		
Can collective bargaining agreements previously entered into by the debtor be modified by the reorganization plan?		
Must the employees' representatives (e.g. unions) be informed of the plan?		
Must the plan be proposed to employees' representatives (e.g. unions) for approval?		
If there employees do not approve the plan, can it still be carried out if authorized by court (possibly in a modified version)?		

2.3. Since 1980, have there been considerable changes to the rules regarding the protection of the claims of employees (wages, severance pay and pension benefits) in reorganization? If so, please describe the main ones.

3. CHOICE BETWEEN LIQUIDATION AND REORGANIZATION

3.1. Consider again the reorganization procedures described above:

Reorganization procedure:	**(i)**	**(ii)**
Which is the fraction of creditors who must agree to the reorganization plan? (Indicate whether it refers to the number of creditors or to the claims' value, and whether the fraction refers to unsecured creditors or to all creditors.)		
If not enough creditors agree to it, can the reorganization plan still be authorized by a court decision?		

3.2. If there been considerable changes to the above rules since 1980, please describe the main ones.

3.3. **In your own professional experience**, how frequently have you observed insolvency by a company ending up with the liquidation of assets (as opposed to reorganization)?

<u>Approximate</u> frequency of liquidation of assets by insolvent companies in your experience	**Less than 25%**	**Between 25% and 50%**	**Between 50% and 75%**	**Between 75% and 100%**
Please tick relevant box:				

Appendix C. Variable Definitions

Name of the Variable	Definition
Book Leverage	(Long Term Debt + Debt in Current Liabilities) / Total Assets
Market Leverage	(Long Term Debt + Debt in Current Liabilities) / (Long Term Debt + Debt in Current Liabilities + Market Equity)
Market-to-Book Ratio	Market Value of Equity / Book Value of Common Equity
Asset Tangibility Ratio	Net property, plant and equipment / lagged total assets
Log Total Assets	Natural logarithm of total assets
Return on Assets	Net income / total assets
Stock Returns	Cumulative stock returns over the previous two years
Stock Returns Variability	Standard deviation of monthly stock returns over the previous five years
Employees' Seniority	The workers' priority in the distribution of the proceeds from liquidation against other classes of creditors. The other classes of creditors are: (a) creditors with lien on property (e.g., real estate mortgage), (b) administrative expenses incurred by the trustee, (c) post-petition credit, (d) income and other taxes due to local or central government, and (e) unsecured creditors. Altogether each of the three types of employees' claims sits in an 8-dimensional ranking. We thus use a scale ranging from 1 to 8, 1 being assigned to the class that is ranked the most junior to all other creditors, and 8 to the most senior to all other claims. This methodology is applied to determine the seniority of each of the three workers' claims, namely (i) unpaid wages, (ii) unpaid severance pay, and (ii) employers' pension contributions.
Government Insurance Fund (Pension)	Equals 0 if there is no government fund insuring employees' pension contributions not fully repaid in bankruptcy, 1 if such a fund exists and its insurance coverage is capped at a specific amount stated by the law, and 2 if such a fund exists and provides uncapped insurance coverage.
Rights in Reorganization	Based on the following three questions: (i) "Can collective bargaining agreements previously entered into by the debtor be modified by the reorganization plan?" (ii) "Must the plan be proposed to employees' representatives (e.g. unions) for approval?" (iii) "If there employees do not approve the plan, can it still be carried out if authorized by court (possibly in a modified version)?" The variable ranges from 1 to 6, where 6 (1) is assigned to a country where workers rights are most (least) protected in firm restructuring. The precise algorithm used to assign these values based on the answers to our questionnaire is described in Figure 5.
Bargaining Power	Employment Protection Legislation (EPL), which ranges from 0 to 6, with 6 indicating the highest level of worker protection. It measures the difficulty with which individual and collective dismissal can be made in each country. Obtained from OECD and other sources.
Unemployment Duration	The share of long-term jobless workers (12 months or more).

Appendix D. Robustness Checks

Table D1: Average Worker Seniority in Profitability Regressions

This table presents the coefficient estimates of a panel regression for 13,809 firms from 28 countries controlling for industry-year fixed effects (Column 1), country-industry, and year fixed effects (Column 2), firm, and year fixed effects (Column 3), country-year, and firm fixed effects (Column 4) and country-industry-year, and firm fixed effects (Column 5). The dependent variable is book leverage defined as long term debt and debt in current liabilities scaled by total assets. In this table, Seniority is the average of the seniority level of employees' unpaid wages, of employers' unpaid contributions to pension plans, and unpaid severance pay. Other independent variables are defined in Appendix C. t-statistics are reported in parenthesis. For each specification we use a two-stage procedure to instrument for the firm's Return on Assets (ROA). In the first-stage we predict the firm's profitability using the major commodity price indices and the firm's exposure to each of these commodity indices. In the second stage we investigate how firm-level leverage responds to the exogenous shocks to predicted profitability. T-statistics are reported in parenthesis. Standard errors are clustered at the firm level. Asterisks (*, ** and ***) indicate statistical significance (at the 10%, 5% and 1% level, respectively).

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Profitability × Seniority	0.2156***	0.1910***	0.1822***	0.1580***	0.1509**
	(3.51)	(3.34)	(2.97)	(2.61)	(2.52)
Profitability × Bargaining Power	0.1901***	0.1757***	0.1599**	0.1502**	0.1203**
	(3.05)	(2.82)	(2.60)	(2.41)	(1.97)
Profitability × Rights in Reorganization	-0.1591***	-0.1351**	-0.1210**	-0.1161**	-0.0907*
	(-2.61)	(-2.48)	(-2.33)	(-2.20)	(-1.88)
Profitability × Government-Insurance Fund	0.1378**	0.1205**	0.1092*	0.0811	0.0621
	(2.19)	(2.00)	(1.82)	(1.52)	(1.29)
Seniority	0.0544*	-	-	-	-
	(1.81)				
Bargaining Power	-0.0198**	-0.0181**	-0.0144**	-	-
	(-2.44)	(-2.18)	(-1.99)		
Rights in Reorganization	-0.0147	-	-	-	-
	(-1.20)				
Profitability	0.3522***	0.3319***	0.3008***	0.2837***	0.2711***
	(3.70)	(3.25)	(3.15)	(3.00)	(2.89)
Market-to-Book Ratio	Yes	Yes	Yes	Yes	Yes
Total Assets	Yes	Yes	Yes	Yes	Yes
Stock Returns	Yes	Yes	Yes	Yes	Yes
Asset Tangibility	Yes	Yes	Yes	Yes	Yes
Government Insurance Fund	Yes	No	No	No	No
Unemployment Insurance Benefits	Yes	Yes	Yes	No	No
Unemployment Rate	Yes	Yes	Yes	No	No
GDP Growth	Yes	Yes	Yes	No	No
Creditor Rights	Yes	No	No	No	No
Fixed Effects	Industry-Year	Country-Industry, Year	Firm, Year	Firm, Country-Year	Firm, Country-Industry-Year
R^2	0.42	0.44	0.51	0.57	0.60
Number of Observations	221,835	221,835	221,835	221,835	221,835

Table D2: Effective Worker Rights in Reorganization in Profitability Regressions

This table presents the coefficient estimates of a panel regression for 13,809 firms from 28 countries controlling for industry-year fixed effects (Column 1), country-industry, and year fixed effects (Column 2), firm, and year fixed effects (Column 3), country-year, and firm fixed effects (Column 4) and country-industry-year, and firm fixed effects (Column 5). The dependent variable is book leverage defined as long term debt and debt in current liabilities scaled by total assets. The variable Effective Rights in Reorganization is the interaction between employees' Rights in Reorganization (used in all other tables) and a variable that equals 0.25, 0.5, 0.75 or 1 depending on whether reorganization requires creditors' unanimity, qualified majority, simple majority or no majority. Other independent variables are defined in Appendix C. T-statistics are reported in parenthesis. For each specification we use a two-stage procedure to instrument for the firm's Return on Assets (ROA). In the first-stage we predict the firm's profitability using the major commodity price indices and the firm's exposure to each of these commodity indices. In the second stage we investigate how firm-level leverage responds to the exogenous shocks to predicted profitability. Standard errors are clustered at the firm level. Asterisks (*, ** and ***) indicate statistical significance (at the 10%, 5% and 1% level, respectively).

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Profitability × Seniority	0.2068***	0.1944***	0.1858***	0.1771***	0.1611**
	(3.61)	(3.40)	(2.96)	(2.70)	(2.59)
Profitability × Bargaining Power	0.2100***	0.1907***	0.1786**	0.1752**	0.1003*
	(3.18)	(2.95)	(2.60)	(2.33)	(1.91)
Profitability × Effective Rights in Reorganization	-0.1901***	-0.1760**	-0.1502**	-0.1301*	-0.1159*
	(-2.40)	(-2.21)	(-2.01)	(-1.90)	(-1.79)
Profitability × Government-Insurance Fund	0.1252**	0.1206*	0.0944*	0.0722	0.0710
	(2.20)	(1.92)	(1.82)	(1.41)	(1.34)
Seniority	0.0601*	-	-	-	-
	(1.80)				
Bargaining Power	-0.0201**	-0.0193**	-0.0149**	-	-
	(-2.51)	(-2.28)	(-2.00)		
Effective Rights in Reorganization	-0.0188	-	-	-	-
	(-1.42)				
Profitability	0.3718***	0.3422***	0.2977***	0.2810***	0.2691***
	(3.82)	(3.46)	(3.27)	(3.01)	(2.88)
Market-to-Book Ratio	Yes	Yes	Yes	Yes	Yes
Total Assets	Yes	Yes	Yes	Yes	Yes
Stock Returns	Yes	Yes	Yes	Yes	Yes
Asset Tangibility	Yes	Yes	Yes	Yes	Yes
Government Insurance Fund	Yes	No	No	No	No
Unemployment Insurance Benefits	Yes	Yes	Yes	No	No
Unemployment Rate	Yes	Yes	Yes	No	No
GDP Growth	Yes	Yes	Yes	No	No
Creditor Rights	Yes	No	No	No	No
Fixed Effects	Industry-Year	Country-Industry, Year	Firm, Year	Firm, Country-Year	Firm, Country-Industry-Year
R^2	0.38	0.45	0.54	0.58	0.60
Number of Observations	221,835	221,835	221,835	221,835	221,835

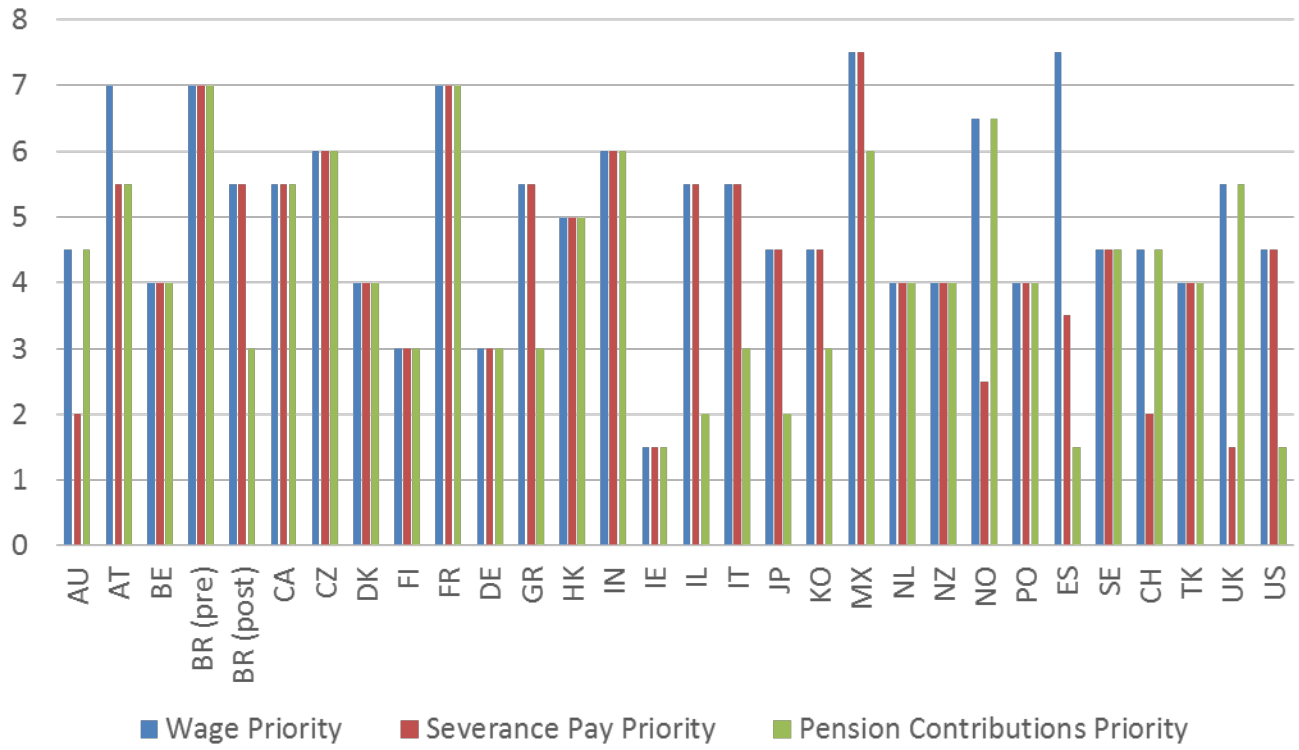

Figure 1. Seniority of employees' claims in insolvent firms' liquidation

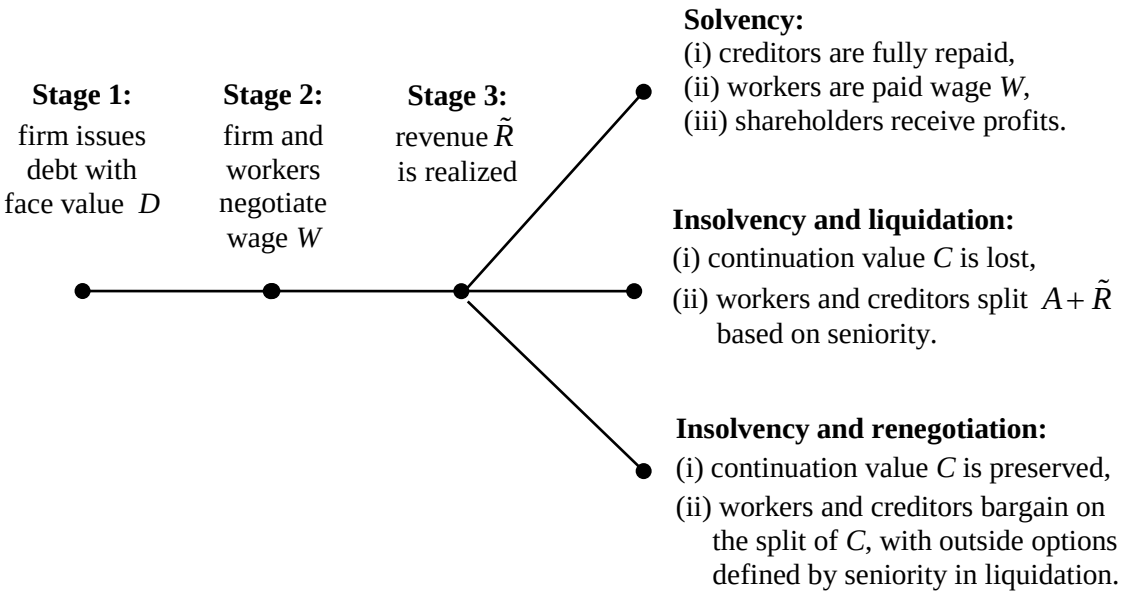

Figure 2. Time line of the model

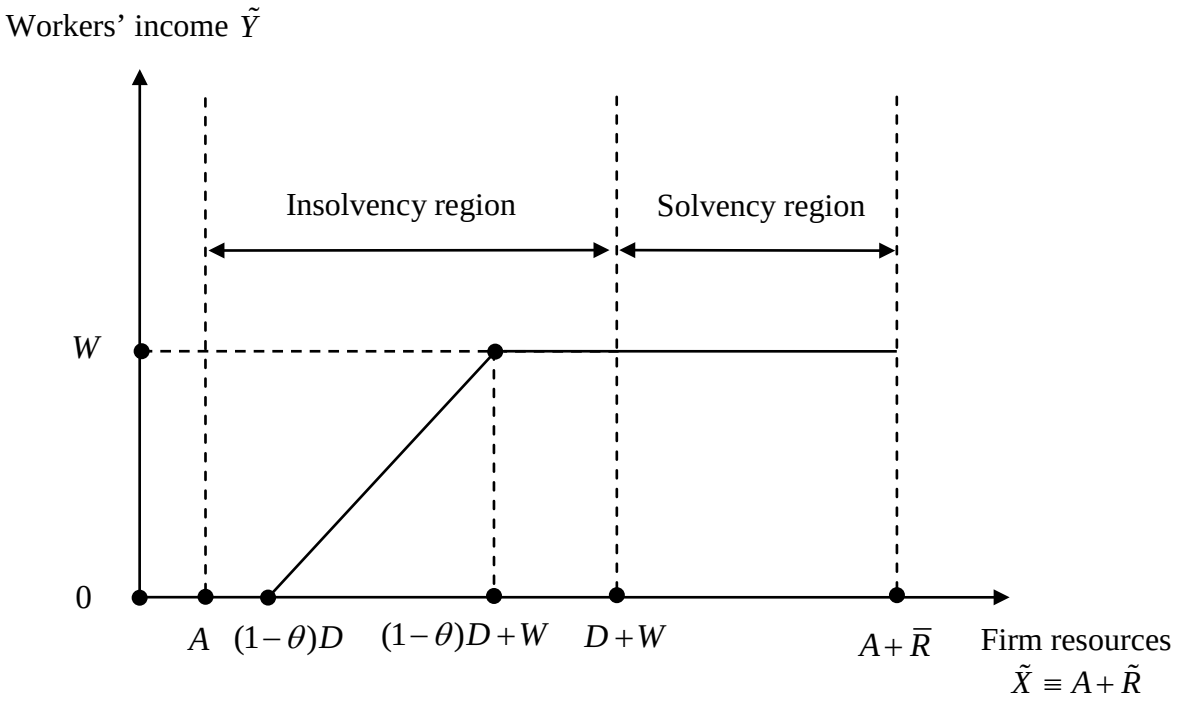

Figure 3. Employees' payoffs as a function of the firm's assets A and revenue $\tilde{R}$, with constant contractual wage W and employee seniority $\theta \in (0,1)$

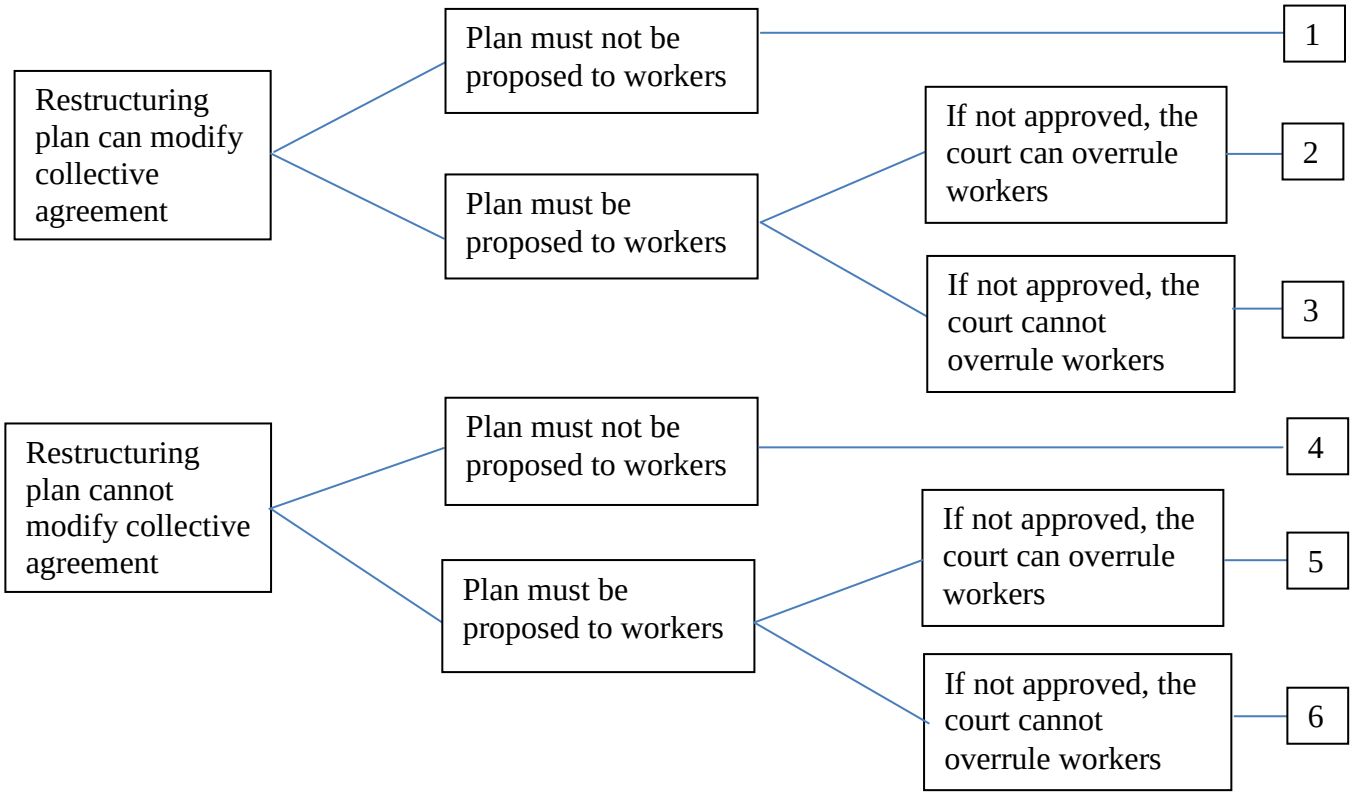

Figure 4. Algorithm used to measure workers' rights in firm restructuring

Table 1. Descriptive Statistics

The table presents firm-level descriptive statistics of the variables used in the regressions. The sample contains firm-year observations of 13,809 firms incorporated in 28 countries, over the period 1988-2013. Variables are defined in Appendix C.

	No. of Observations	Mean	Median	Standard Deviation	Min. Value	Max. Value
Book Leverage	221,835	0.2456	0.2180	0.2605	0	0.9087
Market Leverage	221,835	0.2683	0.2245	0.2324	0	0.9282
Assets (in $000,000)	221,835	4,647	345	20,084	2.92	575,244
Sales (in $000,000)	221,835	3,776	356	12,055	0.23	160,883
Market-to-Book Ratio	221,835	1.6418	1.1702	6.1437	0.3751	12.68
Investments	221,835	0.071	0.058	0.046	0.009	0.182
Return on Assets	221,835	0.0442	0.0548	0.1672	-0.151	0.339
PPE Ratio	221,835	0.3640	0.3194	0.2301	0.0072	0.9284
Market Capitalization (in $000,000)	221,835	4,828	675	14,108	18.70	280,115

Table 2. Country-Level Descriptive Statistics

The table shows country-level descriptive statistics of indicators of employees' rights in bankruptcy and other labor market variables described in Appendix C.

	Workers' Seniority (Pension)	Government Insurance Fund (Pension)	Workers' Rights in Reorganization	Employment Protection Legislation	Union Density	Unemployment Duration	Creditors' Rights
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Australia	4.5	0	1	1.11	34.49	21.67	3
Austria	5.5	1	4	2.12	43.68	24.49	3
Belgium	4	1	1	2.53	52.98	48.88	2
Brazil (pre-reform)	7	0	4	2.75	n.a.	n.a.	1
Brazil (post-reform)	3	0	4	2.75	n.a.	n.a.	1
Canada	5.5	0	6	0.75	32.21	9.84	1
Czech Rep.	6	0	4	1.93	39.72	44.05	3
Denmark	4	1	4	1.74	75.59	19.26	3
Finland	3	2	6	2.09	73.73	25.67	1
France	7	1	2	3.01	10.76	39.8	0
Germany	3	2	1	2.55	29.29	50.43	3
Greece	3	0	4	3.26	33.24	44.05	1
Hong Kong	5	0	1	n.a.	n.a.	n.a.	4
India	6	0	2	2.77	n.a.	n.a.	2
Ireland	1.5	1	4	0.99	49.41	37.52	1
Israel	2	1	1	1.37	n.a.	27.34	3
Italy	3	1	4	2.69	38.74	51.41	2
Japan	2	0	4	1.59	24.45	38.25	2
Mexico	6	0	1	3.13	18.26	1.62	0
Netherlands	4	2	4	2.40	25.3	34.99	3
New Zealand	4	0	4	1.15	38.37	13.16	4
Norway	6.5	1	4	2.70	56.48	9.09	2
Poland	4	2	4	1.53	33.02	41.91	1
South Korea	4.5	0	1	2.32	13.1	1.93	3
Spain	1.5	0	2	3.16	13.86	29.4	2
Sweden	3	1	4	2.47	79.9	19.61	1
Switzerland	4.5	0	4	1.14	22.86	28.5	1
Turkey	4	0	4	3.74	14.16	26.52	2
UK	5.5	1	5	0.66	37.05	27.67	4
United States	1.5	1	2	0.21	15.24	11.42	1

Table 3. Correlation between Measures of Workers' Rights in Bankruptcy, Employment Protection, and Creditors' Rights

The table presents the correlation between the main variables used in the regressions and that measure employees' rights in bankruptcy, the level of employment protection (EPL) given to employees in the course of their employment, union density, unemployment duration and creditors' rights. All variables are described in Appendix C. P-values are shown in parenthesis.

	Workers' Seniority (Wages)	Workers' Seniority (Severance Pay)	Workers' Seniority (Pension)	Workers' Rights in Reorganization	Government Insurance Fund (Pension)	Employment Protection Legislation	Union Density	Creditors' Rights	Automatic Stay on Assets
Workers' Seniority (Wages)	1								
Workers' Seniority (Severance Pay)	0.5968 (0.00)	1							
Workers' Seniority (Pension)	0.5580 (0.00)	0.4326 (0.01)	1						
Workers' Rights in Reorganization	-0.1970 (0.32)	-0.1385 (0.37)	0.0772 (0.71)	1					
Government Insurance Fund (Pension)	-0.2763 (0.09)	-0.2123 (0.11)	-0.0453 (0.41)	0.1052 (0.58)	1				
Employment Protection Legislation	0.2563 (0.09)	0.2879 (0.09)	0.2944 (0.08)	-0.2212 (0.51)	-0.0210 (0.51)	1			
Union Density	-0.2947 (0.15)	-0.2385 (0.25)	-0.0206 (0.92)	0.4248 (0.03)	0.3621 (0.08)	-0.0760 (0.72)	1		
Creditors' Rights	-0.0402 (0.82)	-0.1549 (0.31)	-0.0571 (0.77)	0.0087 (0.41)	-0.0157 (0.98)	-0.1508 (0.23)	0.0933 (0.64)	1	
Automatic Stay on Assets	-0.1532 (0.18)	-0.0501 (0.41)	-0.0779 (0.45)	-0.2366 (0.11)	-0.1363 (0.36)	-0.0250 (0.63)	0.0800 (0.70)	0.7009 (0.00)	1

Table 4: Leverage and Workers' Rights in Bankruptcy: Country-level Real Estate Valuations

This table presents the coefficient estimates of a panel regression for 13,809 firms from 28 countries and controlling for industry-year fixed effects (Column 1), country-industry, and year fixed effects (Column 2), firm, and year fixed effects (Column 3), country-year, and firm fixed effects (Column 4) and country-industry-year, and firm fixed effects (Column 5). The dependent variable in each specification is the book leverage defined as long term debt and debt in current liabilities scaled by total assets. In all specifications we use Real Estate Valuation, which is the market price of land owned by each company. The independent variables are defined in Appendix C. t-statistics are reported in parenthesis. Standard errors are clustered at the firm level. Asterisks (*, ** and ***) indicate statistical significance (at the 10%, 5% and 1% level, respectively).

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Real Estate Valuation × Seniority	0.1381***	0.1260***	0.1103***	0.1041**	0.0907**
	(3.72)	(3.44)	(2.97)	(2.62)	(2.45)
Real Estate Valuation × Bargaining Power	0.1805***	0.1618**	0.1519**	0.1290**	0.0922*
	(2.82)	(2.09)	(2.35)	(2.21)	(1.88)
Real Estate Valuation × Rights in Reorganization	-0.1580**	-0.1309**	-0.1177**	-0.1028**	-0.0818*
	(-2.62)	(-2.44)	(-2.20)	(-1.96)	(-1.91)
Real Estate Valuation × Government-Insurance Fund	0.1508**	0.1411**	0.1251*	0.0908	0.0806
	(2.10)	(2.03)	(1.82)	(1.61)	(1.54)
Seniority	0.0302*	-	-	-	-
	(1.77)				
Bargaining Power	-0.0206**	-0.0179**	-0.0144*	-	-
	(-2.37)	(-2.10)	(-1.88)		
Rights in Reorganization	-0.0140	-	-	-	-
	(-1.02)				
Real Estate Valuation	0.2544***	0.2209***	0.2161***	0.1904***	0.1858***
	(3.73)	(3.06)	(3.98)	(3.46)	(3.35)
Market-to-Book Ratio	Yes	Yes	Yes	Yes	Yes
Total Assets	Yes	Yes	Yes	Yes	Yes
Return on Assets	Yes	Yes	Yes	Yes	Yes
Stock Returns	Yes	Yes	Yes	Yes	Yes
Asset Tangibility	Yes	Yes	Yes	Yes	Yes
Government Insurance Fund	Yes	No	No	No	No
Unemployment Insurance Benefits	Yes	Yes	Yes	No	No
Unemployment Rate	Yes	Yes	Yes	No	No
GDP Growth	Yes	Yes	Yes	No	No
Creditor Rights	Yes	Yes	Yes	No	No
Fixed Effects	Industry-Year	Country-Industry, Year	Firm, Year	Firm, Country-Year	Firm, Country-Industry-Year
R^2	0.39	0.44	0.52	0.56	0.61
Number of Observations	221,835	221,835	221,835	221,835	221,835

Table 5: Leverage and Workers' Rights in Bankruptcy: City- and Region-Level Real Estate Valuations

This table presents the coefficient estimates of a panel regression for 10,116 firms from 20 countries and controlling for country-industry, and year fixed effects (Column 1), firm, and year fixed effects (Column 2), region-year, and firm fixed effects (Column 3), region-industry-year, and firm fixed effects (Column 4) and region-country-industry-year, and firm fixed effects (Column 5). The dependent variable in each specification is the book leverage defined as long term debt and debt in current liabilities scaled by total assets. In all specifications we use Real Estate Valuation, which is the market price of land owned by each company. The independent variables are defined in Appendix C. t-statistics are reported in parenthesis. Standard errors are clustered at the firm level. Asterisks (*, ** and ***) indicate statistical significance (at the 10%, 5% and 1% level, respectively).

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Real Estate Valuation × Seniority	0.1104***	0.1056***	0.0978***	0.0952***	0.0843**
	(3.23)	(2.89)	(2.75)	(2.71)	(2.49)
Real Estate Valuation × Bargaining Power	0.142**	0.1327**	0.1215**	0.0866*	0.0797*
	(1.97)	(2.18)	(2.07)	(1.74)	(1.68)
Real Estate Valuation × Rights in Reorganization	-0.1304**	-0.1106**	-0.0866*	-0.0768*	-0.0707
	(-2.27)	(-2.06)	(-1.84)	(-1.74)	(-1.61)
Real Estate Valuation × Government- Insurance Fund	0.1326*	0.1175*	0.1022	0.0757	0.0707
	(1.87)	(1.71)	(1.57)	(1.34)	(1.39)
Real Estate Valuation	0.2108***	0.1988***	0.1902***	0.1811***	0.1607***
	(3.58)	(3.47)	(3.20)	(3.01)	(2.91)
Market-to-Book Ratio	Yes	Yes	Yes	Yes	Yes
Total Assets	Yes	Yes	Yes	Yes	Yes
Return on Assets	Yes	Yes	Yes	Yes	Yes
Stock Returns	Yes	Yes	Yes	Yes	Yes
Asset Tangibility	Yes	Yes	Yes	Yes	Yes
Unemployment Insurance Benefits	Yes	Yes	No	No	No
Unemployment Rate	Yes	Yes	No	No	No
GDP Growth	Yes	Yes	No	No	No
Fixed Effects	Country-Industry, Year	Firm, Year	Firm, Region-Year,	Firm, Country-Industry-Year	Firm, Region-Industry-Year
R^2	0.44	0.48	0.56	0.59	0.68
Number of Observations	135,011	135,011	135,011	135,011	135,011

Table 6: Leverage and Workers' Rights in Bankruptcy: Profitability

This table presents the coefficient estimates of a panel regression for 13,809 firms from 28 countries and controlling for industry-year fixed effects (Column 1), country-industry, and year fixed effects (Column 2), firm, and year fixed effects (Column 3), country-year, and firm fixed effects (Column 4) and country-industry-year, and firm fixed effects (Column 5). The dependent variable in each specification is the book leverage defined as long term debt and debt in current liabilities scaled by total assets. For each specification we use a two-stage procedure to instrument for the firm's Return on Assets (ROA). In the first-stage we predict the firm's profitability using the major commodity price indices and the firm's exposure to each of these commodity indices. In the second stage we investigate how firm-level leverage responds to the exogenous shocks to predicted profitability. The independent variables are defined in Appendix C. t-statistics are reported in parenthesis. Standard errors are clustered at the firm level. Asterisks (*, ** and ***) indicate statistical significance (at the 10%, 5% and 1% level, respectively).

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
Profitability × Seniority	0.1919***	0.1786***	0.1733***	0.1545***	0.1397**
	(3.92)	(3.84)	(3.01)	(2.75)	(2.46)
Profitability × Bargaining Power	0.1855***	0.1679***	0.1572**	0.1409**	0.1014*
	(3.02)	(2.75)	(2.59)	(2.33)	(1.92)
Profitability × Rights in Reorganization	-0.1638***	-0.1399**	-0.1294**	-0.1108**	-0.0899*
	(-2.72)	(-2.64)	(-2.42)	(-2.15)	(-1.91)
Profitability × Government-Insurance Fund	0.1588**	0.1521**	0.1276*	0.0807	0.0786
	(2.35)	(2.21)	(1.91)	(1.61)	(1.44)
Seniority	0.0312*	-	-	-	-
	(1.84)				
Bargaining Power	-0.0266***	-0.0197**	-0.0158**	-	-
	(-2.71)	(-2.20)	(-2.05)		
Rights in Reorganization	-0.0154	-	-	-	-
	(-1.22)				
Profitability	0.3494***	0.3402***	0.3177***	0.2994***	0.2743***
	(4.11)	(3.31)	(3.07)	(3.01)	(2.88)
Market-to-Book Ratio	Yes	Yes	Yes	Yes	Yes
Total Assets	Yes	Yes	Yes	Yes	Yes
Stock Returns	Yes	Yes	Yes	Yes	Yes
Asset Tangibility	Yes	Yes	Yes	Yes	Yes
Government Insurance Fund	Yes	No	No	No	No
Unemployment Insurance Benefits	Yes	Yes	Yes	No	No
Unemployment Rate	Yes	Yes	Yes	No	No
GDP Growth	Yes	Yes	Yes	No	No
Creditor Rights	Yes	No	No	No	No
Fixed Effects	Industry-Year	Country-Industry, Year	Firm, Year	Firm, Country-Year	Firm, Country-Industry-Year
R^2	0.45	0.47	0.56	0.61	0.64
Number of Observations	221,835	221,835	221,835	221,835	221,835

Table 7: Leverage and Workers' Rights in Bankruptcy: Debt Maturity

This table presents the coefficient estimates of a panel regression for 13,809 firms from 28 countries and controlling for country-year, and firm fixed effects (Columns 1 and 3), and country-industry-year, and firm fixed effects (Columns 2 and 4). The dependent variable in Columns 1 and 2 is the book leverage defined as the debt with a maturity of up to one year scaled by total assets. The dependent variable in Columns 3 and 4 is the book leverage defined as the long-term debt (with a maturity longer than one year) scaled by total assets. For each specification we use a two-stage procedure to instrument for the firm's Return on Assets (ROA). In the first-stage we predict the firm's profitability using the major commodity price indices and the firm's exposure to each of these commodity indices. In the second stage we investigate how firm-level leverage responds to the exogenous shocks to predicted profitability. The independent variables are defined in Appendix C. t-statistics are reported in parenthesis. Standard errors are clustered at the firm level. Asterisks (*, ** and ***) indicate statistical significance (at the 10%, 5% and 1% level, respectively).

	Short-term Debt		**Long-term Debt**	
	(1)	**(2)**	**(3)**	**(4)**
Profitability × Seniority	0.2158***	0.1996***	0.1183**	0.1147*
	(3.31)	(3.07)	(2.19)	(1.93)
Profitability × Bargaining Power	0.1831***	0.1318**	0.1056*	0.0761*
	(2.79)	(2.34)	(1.84)	(1.74)
Profitability × Rights in Reorganization	-0.1541***	-0.1367**	-0.0931*	-0.0674
	(-2.78)	(-2.49)	(-1.81)	(-1.43)
Profitability × Government-Insurance	0.0968*	0.0943*	0.0605	0.0589
	(1.93)	(1.71)	(1.25)	(1.08)
Profitability	Yes	Yes	Yes	Yes
Market-to-Book Ratio	Yes	Yes	Yes	Yes
Total Assets	Yes	Yes	Yes	Yes
Stock Returns	Yes	Yes	Yes	Yes
Asset Tangibility	Yes	Yes	Yes	Yes
Fixed Effects	Firm, Country-Year	Firm, Country-Industry-Year	Firm, Country-Year	Firm, Country-Industry-Year
R^2	0.53	0.57	0.32	0.39
Number of Observations	192,723	192,723	192,723	192,723

Table 8: Leverage and Workers' Rights in Bankruptcy: Role of Asset Tangibility

This table presents the coefficient estimates of a panel regression for 13,809 firms from 28 countries and controlling for country-year, and firm fixed effects (Columns 1 and 3) and country-industry-year, and firm fixed effects (Columns 2 and 4). In Columns 1 and 2 (3 and 4) we show the specifications for firms belonging to industries in the upper tercile (bottom tercile) by asset tangibility as measured by the PPE ratio. The dependent variable in each specification is the book leverage defined as long term debt and debt in current liabilities scaled by total assets. For each specification we use a two-stage procedure to instrument for the firm's Return on Assets (ROA). In the first-stage we predict the firm's profitability using the major commodity price indices and the firm's exposure to each of these commodity indices. In the second stage we investigate how firm-level leverage responds to the exogenous shocks to predicted profitability. The independent variables are defined in Appendix C. t-statistics are reported in parenthesis. Standard errors are clustered at the firm level. Asterisks (*, ** and ***) indicate statistical significance (at the 10%, 5% and 1% level, respectively).

	High Asset-Tangibility Industries		**Low Asset-Tangibility Industries**	
	(1)	**(2)**	**(3)**	**(4)**
Profitability × Seniority	0.2215***	0.2159***	0.1279*	0.1138
	(3.93)	(3.26)	(1.71)	(1.61)
Profitability × Bargaining Power	0.1861***	0.1567**	0.0915	0.0659
	(2.97)	(2.42)	(1.54)	(1.25)
Profitability × Rights in Reorganization	-0.1407**	-0.1241**	-0.0721	-0.0584
	(-2.28)	(-2.11)	(-1.29)	(-1.21)
Profitability × Government-Insurance	0.1124**	0.0998*	-0.0524	-0.0511
	(1.98)	(1.72)	(-0.96)	(-0.92)
Profitability	Yes	Yes	Yes	Yes
Market-to-Book Ratio	Yes	Yes	Yes	Yes
Total Assets	Yes	Yes	Yes	Yes
Stock Returns	Yes	Yes	Yes	Yes
Asset Tangibility	Yes	Yes	Yes	Yes
Fixed Effects	Firm, Country-Year	Firm, Country-Industry-Year	Firm, Country-Year,	Firm, Country-Industry-Year
R^2	0.61	0.67	0.44	0.49
Number of Observations	83,119	83,119	74,582	74,582

Table 9: Leverage and Workers' Rights in Bankruptcy: Role of Financial Constraints

This table presents the estimates of the parameters of regressions obtained by maximum likelihood estimation of an endogenous switching regression model with unknown sample separation, using a sample of 13,809 firms from 28 countries and controlling for industry and year (in Columns 1 and 3) and country-industry-year (in Columns 2 and 4). In Columns 1 and 2 (3 and 4, respectively) we show the specifications for firms identified as non-financially constrained (financially constrained, respectively). The dependent variable in each specification is the book leverage defined as long term debt and debt in current liabilities scaled by total assets. In all specifications we use Real Estate Valuation, which is the market price of land owned by each company. The independent variables are defined in Appendix C. t-statistics are reported in parenthesis. Standard errors are clustered at the firm level. Asterisks (*, ** and ***) indicate statistical significance (at the 10%, 5% and 1% level, respectively).

	Non-financially Constrained Firms		**Financially Constrained Firms**	
	(1)	**(2)**	**(3)**	**(4)**
Real Estate Valuation × Seniority	0.3322***	0.2977***	-0.0588	-0.0471
	(3.44)	(3.12)	(-0.92)	(-0.57)
Real Estate Valuation × Bargaining Power	0.2310**	0.1992**	0.0862	0.0519
	(2.56)	(2.41)	(1.53)	(1.24)
Real Estate Valuation × Rights in Reorganization	-0.1929**	-0.1779**	0.0685	0.0472
	(-2.44)	(-2.37)	(1.02)	(0.94)
Real Estate Valuation × Government-Insurance	0.1208**	0.1112*	0.0722	0.0562
	(2.15)	(1.89)	(0.77)	(0.65)
Real Estate Valuation	Yes	Yes	Yes	Yes
Profitability	Yes	Yes	Yes	Yes
Market-to-Book Ratio	Yes	Yes	Yes	Yes
Total Assets	Yes	Yes	Yes	Yes
Stock Returns	Yes	Yes	Yes	Yes
Asset Tangibility	Yes	Yes	Yes	Yes
Fixed Effects	Industry, Year	Country-Industry-Year	Industry, Year,	Country-Industry-Year
R^2	0.61	0.67	0.44	0.49
Number of Observations	91,643	91,643	130,192	130,192