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 the renegotiation of their debt varies greatly across countries. We show that the balance between these rights of employees and those of other creditors should affect the leverage chosen by firms. In a simple model of strategic leverage, employees' seniority is predicted to increase the positive response of leverage to appreciation of its real estate or an increase in its revenue, while stronger employees' rights in the renegotiation of corporate debt have the opposite effect. These predictions differ starkly from those that obtain if firms' leverage is determined by a collateral constraint. To test them, we construct novel measures of employees' protection in bankruptcy via questionnaires to law firms and other sources, and investigate whether these measures affect the response of firm leverage in a sample of 12,445 companies in 28 countries between 1988 and 2013. We find that increases in the value of these firms' real estate is associated with a greater increase in leverage for companies located in countries where employees have stronger seniority in company liquidation and weaker rights in debt renegotiation, as predicted by the strategic leverage model. For a subsample of 928 mining and oil companies, we find a similar differential response of leverage to profitability shocks resulting from changes in the prices of the commodities produced by these companies.

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Research on corporate capital structure typically assumes that the two main liabilities of firms are debt and equity, and thus neglects the sizeable liabilities that firms typically have to their employees. Between 1992 and 2005, wages amounted to 34% of the total assets of US 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).

Does the presence of such a sizeable stakeholder as employees make a difference to the corporate leverage choices of firms? We argue – and document empirically – that it does, and that its impact on leverage depends 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. While existing models of strategic leverage typically assume workers to be junior stakeholders, 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 liabilities, in 34 countries. Each bar indicates the ranking of these claims relative to those of competing creditors, i.e. secured creditors, the bankruptcy trustee for administrative expenses, post-petition creditors, tax authorities, and unsecured creditors, a higher value indicating lower seniority: for instance, employees' seniority is much higher in Argentina, Belgium, Brazil (before the 2005 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.

These wide differences in the comparative legal protection afforded to creditors and to employees can be expected to affect the financial leverage chosen by firms. Enjoying

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

greater seniority in bankruptcy should raise the aggressiveness of employees when bargaining over wages and pension benefits, and we show that this will affect leverage very differently depending on whether firms have unused debt capacity or are constrained by their existing collateral in their choice of leverage.

If firms have unused debt capacity (for instance due to abundant cash flow or reserves), they may adjust their leverage strategically in response to the legal protection afforded to their employees, as predicted by strategic debt models: in jurisdictions where employees enjoy stronger seniority rights in bankruptcy, such firms might 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 bountiful profits), they will increase their leverage relatively more in jurisdictions where workers have greater seniority, so as to prevent a surge in their wage demands. Similar results emerge when workers' claims are protected not by seniority but by a government insurance scheme in case of bankruptcy: again, the optimal response by their employer is increase leverage, the more so the more generous is the coverage offered by the insurance scheme. 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 while compensating their effect on the probability of default by reducing leverage.

If firms are already constrained by their existing collateral, instead, leverage cannot be used strategically vis-à-vis workers, and therefore the wage demands triggered by strong employee seniority eat into the future cash flows that could otherwise be pledged to creditors, and therefore shrink the firms' debt capacity, and 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 switch sign: the stronger are employees' seniority rights, the more muted must 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 protected by greater seniority rights in bankruptcy, a larger fraction of any increase in cash flow or in the value of corporate assets will go to employees in case of bankruptcy, and a smaller one to creditors. Anticipating that their claims will take a back seat to unpaid wages and pensions, creditors will be strict in providing additional credit. Hence, the sensitivity of leverage to changes in cash flow or in asset values will be lower in countries where employees' seniority rights are stronger.

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

Of course, seniority in the distribution of the proceeds from liquidation captures only one aspect of the legal protection of employees: 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 turn out to have the opposite effect of seniority, in the strategic debt model: the stronger are their rights in debt renegotiation, the less bite the firm's leverage has *ex ante* in deterring their wage demands, and therefore the lower is the firm's optimal leverage. So while the strength of employees' seniority rights in firm liquidation may require 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 be able to test these hypotheses is to have reliable and consistent measures of employees' rights in bankruptcy for a large set of countries. To this effect, we collect novel data about workers' legal rights during liquidation and reorganization in 28 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. (For 2 other countries, we find partial information about employees' rights in other public sources.) 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). Specifically, we collect data on the seniority of employees' unpaid salaries, severance pay and contributions to employee

pension benefit plans relative to five other types of creditors, when the firm enters liquidation: (i) creditors with lien on property (e.g., bank mortgage), (ii) administrative expenses incurred by bankruptcy trustee, (iii) post-petition credit, (iv) claims arising from unpaid taxes, and (v) unsecured credit. We also gather information on the protection of workers' rights during reorganization allowed by the law, namely whether employees' claims and collective agreements can be impaired and whether to do so their consent should be sought. We also collect country-level data that provide measures of employees' bargaining power in wage bargaining (employment protection Legislation, or 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 model's prediction that firms which experience an increase in the value of their assets or of their cash flow increase their leverage more if their employees are better protected by seniority or government-provided insurance mechanisms in case of liquidation, while they increase their leverage less if their employees have stronger rights in case of debt renegotiation.

Our empirical strategy is designed to measure the firm's use of leverage following a change in the firm's surplus, stemming either from the change in the value of the firm's real estate or in its cash flow, the idea being that a change in the firm's surplus should trigger a different response by the firm's leverage depending on its situation. For firms that are able to use leverage strategically, a real estate appreciation or an increase in revenue should lead to a larger increase in leverage for firms incorporated in countries where workers have strong seniority rights than for otherwise identical firms in countries where workers are junior in bankruptcy. The collateral constraint model has exactly the opposite prediction. These contrasting predictions suggest two identification strategies to discriminate between the two models, using plausibly exogenous changes in firms' surplus, stemming from changes in real estate prices or in commodity prices.

More specifically, we use the shock arising from country-level real estate prices that have a direct impact on the firm's market value through the real estate assets it holds. Real estate assets are very important in firms' balance sheets: Cheney et al. (2012) reports that 59% of U.S. firms in their study report some real estate holdings. In our international sample we find that this figure rises to 71%, underlying the importance of this type of asset and, as a consequence, any shock that happens to its valuation. A change in the country-level real estate values is a plausibly exogenous shock to the single firm and we

exploit the impact of the change of the value of real estate owned by the firm to test whether the firm subsequently changes its leverage strategically vis-à-vis its employees. More precisely, we carry out a difference-in-difference estimation comparing the leverage response of firms incorporated in countries with different levels of workers' rights in bankruptcy, following a valuation shock to their real estate assets.

Second, we focus on firms in the extraction and mining industry, and estimate these firms' leverage response to changes in their profitability arising from changes in the price of the commodities that they produce, so as to condition on a plausibly exogenous source of changes in the firm's profitability. For example, we use oil prices, exogenous to the individual oil producer, to instrument for oil companies' profitability, to investigate whether oil companies increase their leverage in response to increases in their profits associated with oil price hikes, so as to avoid sharing the bounty with their employees. This second strategy is reminiscent of the one used by Bertrand and Mullainathan (2001). Similar to the first diff-in-diff strategy, this one compares the leverage reaction of two otherwise identical firms in each of these two industries, but incorporated in countries with different levels of workers' rights, following an exogenous shock to their profitability level and the consequent change in the bargaining positions.

Our main empirical results are as follows. First, as predicted by the strategic debt model, firms incorporated in countries where workers have better legal protection in bankruptcy (i.e. rank high in the distribution of proceeds in liquidation) increase leverage when they experience a positive shock to their real estate valuations. The same result is obtained when we investigate the extraction and mining industries, where the shock being considered concerns the firm's profitability. These results are robust across different measures of leverage and are stronger in labor intensive industries. 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 characteristics at the firm level, and industry-time fixed effects to absorb time-varying industry characteristics. Importantly, we control for country-level time-varying characteristics: in specifications with either firm or industry-time fixed effects, we also control for a gamut of country time-varying characteristics such as unemployment rate, GNP growth and inflation rates. We also estimate specifications

where we use country-level time effects to absorb any country-level time-varying unobserved heterogeneity.

As already noted, the shock to firm's real estate values can also impact directly the firm's collateral constraints and, as a consequence, debt issuance undertaken to fund investment: leverage may change also because the increased value of collateral expands firms' debt capacity and investment. However, this channel also predicts leverage to respond less to collateral shocks for firms incorporated in countries where workers have strong seniority rights than in other countries. Our results run precisely against this prediction, and therefore reject the collateral constraint issuance model for the typical firm of our sample. However, there is non-trivial heterogeneity in the sample: when the estimation is performed separately for two subsamples of firms featuring different distances from distress, we find that for the firms closer to distress the predictions of the model with collateral constraints are not rejected, while they are consistent with those of the strategic debt model for firms that are further away from distress.

Our findings indicate that the balance of workers' and other creditors' rights, as well as the presence of collateral constraints, play an important role in shaping the strategic use of company debt. This may help explain some of the contrasting results reported so far in the literature. Most empirical work based on U.S. firm-level data shows that the strategic use of debt allows companies to compress wages in negotiations: Hanka (1998) finds that U.S. firms with more debt pay lower wages and fund their pension plans less generously, controlling for performance; Benmelech, Bergman and Enriquez (2010) document that U.S. airlines in distress obtain wage concessions from workers with underfunded pension plans; consistently, Myers and Saretto (2010) show that in wage negotiations unions are more likely to strike and "win" if firm debt has decreased in previous years. Moreover, there is evidence that when workers are protected by more favorable regulation or are more unionized, firms choose higher leverage to counter-balance their employees' bargaining power: using U.S. data from 1950 to 2008, Agrawal and Matsa (2011) document that increases in state unemployment insurance benefit entitlements are associated with significant increases in firm leverage, and the increases are larger for firms with greater layoff separation rates, greater probability of firing workers in adversity (low operating cash flow, no dividend) and greater labor intensity. Similarly, Matsa (2010) finds that in the U.S. collective bargaining coverage and pro-union changes in state labor laws increase firm leverage (except in industries with low union presence), and the

same is found for Sweden by Cronqvist, Heyman, Nilsson, Svaleryd and Vlachos (2009). Moreover, Bronars and Deere (1991) report that in the U.S. firms facing greater threat of unionization have higher leverage. Consistently with these results, this does not apply to firms that want to be nice to their workers: Bae, Kang and Wang (2011) report that companies with a high rating as "employee-friendly" keep their leverage low.

However, these results have recently been challenged by Chemmanur, Cheng, and Zhang (2013), who report empirical evidence of a positive relation between wages and leverage, and justify this finding by appealing to the idea that risk-averse employees require greater wages from more levered employers in order to compensate them for the greater bankruptcy risk, an idea formalized by Berk, Stanton and Zechner (2010). Moreover, the cross-country evidence of Simintzi, Vig and Volpin (2015) appears inconsistent with the strategic leverage hypothesis: using firm-level data from 21 countries, they find that greater employment protection (which should increase the power of employees) is associated with lower company leverage. Simintzi et al. argue that when workers have greater bargaining power, their higher wages reduce their employer's debt capacity. However, they do not take into account that the balance of power between workers' and other creditors' rights in bankruptcy law varies greatly across countries. Moreover, our empirical strategy differs from theirs because it centers on how the response of firm-level leverage to cash flow and collateral price shocks differs across firms located in countries where workers are given different legal protection in bankruptcy, whereas they look at the relationship between firm-level leverage and country-level measures of workers' bargaining power.

The rest of the paper is as follows. Section 1 presents two models, whose different predictions of these two models guide our subsequent empirical analysis: first, a simple strategic debt model that allows for different degrees of legal protection of worker's rights in bankruptcy procedures; second, a model where firms do not use their leverage strategically, being collateral constrained. Section 2 maps the key predictions offered by these models into testable hypotheses, describes the data and lays out our empirical strategy. Section 3 presents our empirical results. Section 4 concludes.

1. The Model

As stated in the introduction, existing work on the relationship between corporate leverage and wages neglects the role of the degree of protection of workers in bankruptcy, that is, the extent to which their wage and pension claims are protected by: (i) seniority in liquidation procedures; (ii) their rights in corporate restructuring; and (iii) government-provided insurance schemes. To explore the role of each of these forms of worker protection in bankruptcy, and thereby guide our empirical analysis, in Sections 1.1, 1.2 and 1.3 we study the impact of each of them on the optimal leverage chosen by firms in the context of a simple model of strategic debt choice. Then, in Section 1.4 we contrast the predictions from this model with those that obtain if firms' leverage is determined by a binding rationing constraint, rather than by the firm's wish to improve its wage bargaining position vis-à-vis their employees.

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 that are paid on average to their employees. However, in our model leverage also exposes firms to an increased danger of insolvency and therefore to higher expected bankruptcy costs – a time-honored idea in the literature on capital structure.

In model's baseline version, presented in Section 1.1, workers' claims in bankruptcy are protected only by their seniority. Then, in Section 1.2 the model is extended to allow for the possibility that the firm is restructured rather than liquidated, and that workers' claims are renegotiated in the restructuring process. Next, in Section 1.3 we consider a variant of the model where the employees of an insolvent firm are protected to some extent by a publicly-provided insurance mechanism, even though they have lower seniority than other creditors.

1.1 The Role of Employee Seniority in Firm Liquidation

We 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, and all the claimants to the firm's cash flow (shareholders, creditors and workers) are risk neutral. With no loss of generality, we standardize the number of workers hired by the firm to 1 and the risk-

free interest rate to 0. The firm has initial assets (property, plants and equipment) whose market value is $A \geq 0$. By combining these assets with labor it generates a random revenue $\tilde{R}$ (net of non-labor costs), which is uniformly distributed on the support $\left[0, \overline{R}\right]$, so that its upper bound $\overline{R}$ coincides with its range of variation.[2] The firm is viable, in the sense that its expected revenue exceeds labor costs at least if workers are paid their reservation wage W_0, i.e. lack bargaining power: $\overline{R}/2 - W_0 > 0$.

Before bargaining with workers, shareholders can vote to 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. More precisely, as shown in Figure 1, the time line of the model consists of four stages. At $t = 1$, debt is issued and equity is correspondingly reduced. At $t = 2$, the firm hires workers pledging a wage whose expected value is at least equal to the workers' reservation wage w_0: if not, workers will not even start working in the firm. At $t = 3$, the workers, upon forming a union, negotiate the contractual wage *W*: bargaining occurs via the random proposer model of Binmore (1987): the union makes a take-it-or-leave-it offer with frequency α by the union and the firm does so with probability $1-\alpha$. Hence, the union sets the contractual wage *W* at its preferred level W_u with frequency α and the firm sets it at its preferred level W_f with frequency $1-\alpha$, where α can be regarded as the union's bargaining power. At $t = 4$, the firm's cash flow *y* is realized and, depending on its magnitude, the company is either solvent or insolvent. If the company is solvent, creditors receive *D*; otherwise, the firm incurs a bankruptcy cost *C*, and the firm's net worth $A + \tilde{R} - C$ is divided between creditors and workers according to the seniority rules established by the law.

[Insert Figure 1]

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 $t = 3$, but also on whether at $t = 4$ the company 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 a fraction θ of the agreed wage *W* is senior to the creditors' claim, and the

[2] Up to a constant, the range of variation equals to the standard deviation of *y*, which is $\overline{R}/\sqrt{12}$.

residual fraction $1-\theta$ of the wage W is junior. The parameter $\theta \in [0,1]$ is the degree to which the legal system entitles the employees of a defaulted company to be protected by seniority, and therefore determines the balance between workers' and creditor rights if the company is liquidated in the bankruptcy procedure. As we shall see in Section 3, there are large cross-country differences in workers' seniority rights regarding their unpaid wages.

At $t=4$ the firm is insolvent if the sum of its assets A and of the realized value of its revenue $\tilde{R}$ are insufficient to repay its debt D and the agreed wage W entirely: $A+\tilde{R}<D+W$. As illustrated in Figure 2, when the firm is insolvent, workers' actual income Y falls short of their contractual wage W, and depends on the value of the firm's assets and cash flow $A+\tilde{R}$, hereafter denoted by $\tilde{X}$ for brevity. Specifically, the realization of $\tilde{X}$ determines one of four possible outcomes:

(i) *default on debt and on both workers' claims*: if $\tilde{X}$ falls short even of the workers' senior claim θW (i.e. if $A<\theta W$, which we assume with no loss of generality[3]), it is paid entirely to workers (who then earn $\tilde{Y}=\tilde{X}$), and creditors get nothing;

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

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

(iv) *no default*: if $\tilde{X}$ covers both the workers' entire claim W and the creditors' claim D, i.e. $\tilde{X} \in [W+D, A+\overline{R}]$, both get repaid in full.

[Insert Figure 2]

[3] More precisely, under the alternative assumption that $A>\theta W$ (i.e. that the senior portion of the workers' claim is always safe). the results regarding the comparative statics of leverage with respect to the expected revenue $\overline{R}$ are qualitatively unchanged, while those regarding the differential impact of initial assets A depending on workers' seniority disappear. But this depends only on the simplifying assumption that the value of the firm's initial assets A is non-stochastic. If this assumption is relaxed, also the comparative statics results regarding A are qualitatively unchanged. To see this, suppose that the value of initial assets is a stochastic variable $\tilde{A}$, and that the total firm's payoff $\tilde{X} \equiv \tilde{A}+\tilde{R}$ is uniformly distributed between a lower bound A and an upper bound $\overline{X} \equiv \overline{A}+\overline{R}$. In this case, one can simply study the comparative statics of leverage with respect to the firm's total expected payoff $\overline{X}/2$, which would capture both its response to an increase in the maximal value of the firm's assets $\overline{A}$ and to an increase in its maximal revenue $\overline{R}$.

The contractual wage W is set by bargaining at $t = 3$, and takes a different value depending on whether it is set by the union or by the firm.

When the union makes the take-or-leave-it offer, it sets the contractual wage W_u so as to maximize the expected income that workers can get from the firm. The actual income that employees receive if the wage is set by the union, to be denoted by $\tilde{Y}_u$, is a random variable that takes different values over the four regions (i)-(iv). As shown in Appendix A.1, the contractual wage that maximizes the workers' expected income $\mathrm{E}(\tilde{Y}_u)$ is

$$W_u^* = A + \overline{R} - (1-\theta)D. \qquad (1)$$

Hence the union's wage demands are greater the higher is the value of the firm's assets A and the higher is its maximum revenue $\overline{R}$ (hence also its expected value $\overline{R}/2$ and range of variation). The reason is that when the firm has valuable assets or abundant revenue, employees know that the firm has a substantial expected surplus after paying down its debt, and therefore can accommodate large wage demands. By the same token, such wage demands are moderated if ex ante the firm increases its debt D. 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 ($\theta = 1$).

When instead the firm makes the take-or-leave-it offer, it sets the wage schedule $W_f(\tilde{X})$ so as (i) to pay workers only their reservation wage, i.e. just meet their participation constraint $\mathrm{E}\left[W_f(\tilde{X})\right] = W_0$, and (ii) to minimize expected bankruptcy costs. So the firm will pledge to pay a positive wage only for $\tilde{X} > D$ and in this region it will set it so to avoid defaulting on its employees. Due to the risk neutrality of both workers and shareholders, the precise form of the schedule $W_f(\tilde{X})$ does not matter, once it meets these two conditions.[4] For instance, the firm may offer a wage proportional to its revenue in solvency states, i.e. once debt is repaid: $\tilde{W}_f = \phi\tilde{R}$ for $\tilde{R} \geq D - A$, picking the proportionality constant ϕ so as to just meet the employees' participation constraint, i.e. $\phi = 2\sigma W_0 / \left[\overline{R} - \max\left((D-A)^2, 0\right)\right]$. Hence, the firm designs its offer so as to default only

[4] Any wage schedule is equivalent from the employees' standpoint, insofar as its expected value is w_0.

on creditors, not on its employees: when the firm sets the wage, the workers' actual income equals the contractually agreed wage, i.e. $\tilde{Y}_f = W_f(\tilde{X})$. The results would be slightly more complex, but qualitatively unchanged, if the firm were to pledge a constant wage to its workers, in which case it may default on them as well for low enough realizations of its revenue; but in this case its shareholders would bear the bankruptcy costs more often, without any countervailing labor cost savings.

When the union sets a contractual wage equal to W_u^* in (1), workers obtain a random income $\tilde{Y}_u$, which varies depending across regions (i)-(iv). Its expected value is

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

The workers' expected income is given by expression (2) with probability α and by W_0 with probability $1-\alpha$, recalling that they earn $\mathrm{E}(\tilde{Y}_f \,|\, W = W_f(\tilde{X}))$ when the firm sets the wage. Hence, the workers' expected income is

$$\mathrm{E}(\tilde{Y}) = (1-\alpha)w_0 + \alpha\frac{\left[A + \bar{R} - (1-\theta)D\right]^2 - A^2}{2\bar{R}}. \tag{3}$$

This expression is decreasing in *D*, highlighting the most basic prediction of strategic debt models: on average, employee compensation should be negatively correlated with corporate debt, and the more so the greater is employees' bargaining power α.

From the firm's standpoint, expression (3) is its expected labor cost. Therefore, the firm will want to choose its debt *D* so as to maximize its value *V*, which equals its expected cash flow *minus* expected labor costs $\mathrm{E}(\tilde{Y})$ in (3) and expected bankruptcy costs $\mathrm{E}(\tilde{C})$ (derived in Appendix A.2):

$$V = A + \underbrace{\frac{\bar{R}}{2}}_{\mathrm{E}(\tilde{R})} - \underbrace{\left\{\alpha\frac{\left[A + \bar{R} - (1-\theta)D\right]^2 - A^2}{2\bar{R}} + (1-\alpha)W_0\right\}}_{\mathrm{E}(\tilde{Y})} - \underbrace{\left[1 - \frac{(1-\alpha)(A + \bar{R} - D) - \alpha\theta D}{\bar{R}}\right]C}_{\mathrm{E}(\tilde{C})}, \tag{4}$$

The initial debt D cannot however be so high as to violate the workers' participation constraint, i.e. force the union to set the wage so low that the workers' expected income is below their reservation level. So D must be such that $\mathrm{E}(\tilde{Y}_u \,|\, W = W_u^*) > W_0$, i.e. from (2):

$$\frac{\left[A + \bar{R} - (1-\theta)D\right]^2 - A^2}{2\bar{R}} \geq W_0 . \tag{5}$$

So we must consider two cases:

(i) If the participation constraint (5) is not binding, the optimal debt level is given by the first-order condition obtained maximizing (4) with respect to D:

$$\hat{D} = \frac{A + \bar{R}}{1-\theta} - \frac{\left[1 - \alpha(1-\theta)\right]C}{\alpha(1-\theta)^2}, \tag{6}$$

that is, optimal leverage balances the benefit of lower wages stemming from the strategic use of debt (the first term) with the cost deriving from higher expected bankruptcy costs (the second term).

(ii) If instead the debt $\hat{D}$ prescribed by expression (6) violates the workers' participation constraint (5), the firm's debt is given by this constraint taken with equality, i.e. it is set just high enough as to eliminate any mark-up of the wage over its reservation level. As shown in Appendix A.3, this results in the following debt level:

$$\bar{D} = \frac{1}{1-\theta}\left[A + \bar{R} - \sqrt{2W_0\bar{R} + A^2}\right], \tag{7}$$

which can be shown to be strictly positive due to the assumption that the firm generates a positive expected surplus when it pays the reservation wage to its employees (see Appendix A). So the firm's optimal debt D^* is the smaller of the two levels in (6) and (7):

$$D^* = \min(\hat{D}, \bar{D}) = \frac{\bar{R} + A}{1-\theta} - \max\left(\frac{1 - \alpha(1-\theta)}{\alpha(1-\theta)^2}C, \sqrt{2W_0\bar{R} + A^2}\right). \tag{8}$$

Expression (8) yields several predictions regarding the optimal debt level D^*:

Proposition 1 (Optimal Debt Level and Employee Seniority). *If employees' claims are not senior to all other debt ($\theta < 1$), then*

(i) the optimal debt level is increasing in the value of assets and average revenue, weakly increasing in workers' bargaining power, and decreasing in bankruptcy costs;

(ii) if debt is such that the wage exceeds its reservation level ($D^* = \hat{D}$), an increase in employees' seniority increases the optimal debt level if bankruptcy costs are below a critical threshold, and decreases it otherwise;

(iii) if debt is such that the wage equals its reservation level ($D^* = \bar{D}$), an increase in employees' seniority always increases the optimal debt level.

If employees' claims are senior to all other debt ($\theta = 1$), the optimal debt level is zero.

Proof. See Appendix A.4.

The distinction between bankruptcy regimes in which $\theta < 1$ and those in which $\theta = 1$ is intuitive: if not all of the employees are senior to other debt ($\theta < 1$), leverage has a strategic value, while it loses any bite when employees' claims must be paid before all other claimants in liquidation ($\theta = 1$). Since in this simple model leverage serves only as a strategic device in wage bargaining, the prediction is that in this case the firm chooses zero leverage: of course the model would still predict positive leverage it were to include other advantages of leverage (such as tax shield). So this prediction is to be read as saying only that the firm will not issue debt for strategic reasons.

The intuition behind the effects in point (i) of the proposition is straightforward: more valuable assets, higher revenue and stronger unions tend to elicit more aggressive wage demands, and thus require greater leverage to maximize the value of the firm. Instead, higher bankruptcy costs call for lower debt issuance – as in standard trade-off theories of capital structure. Incidentally, the model can easily incorporate a tax shield motive for debt issuance, which would contribute to its benefits and thus increase debt compared to (8).

The effect of greater worker seniority on debt in points (ii) and (iii) of the proposition is more subtle. As workers' seniority tends to reduce the strategic value of debt, an increase in their seniority 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. This non-monotonic response of leverage to seniority only arises when debt is not so high as to push the wage down to its reservation level ($D^* = \hat{D}$). The non-monotonicity does not arise if bankruptcy costs are so low that leverage is raised to the point where workers are paid just their reservation wage: if $D^* = \overline{D}$, greater employee seniority is invariably associated with more leverage. Intuitively, greater seniority tends to increase the expected income of employees, and therefore calls for more leverage in order to push their expected income down to the reservation wage.

Expression (8) also yields an unambiguous prediction regarding the response of optimal leverage to changes in the firm's asset value and revenue:

Proposition 2 (Optimal Debt Response to Changes in Asset Value and Revenue). *The sensitivity of the optimal debt level to the value of the firm's assets and to its expected revenue is increasing in the seniority of workers.*

Proof. See Appendix A.4.

Intuitively, in the presence of greater surplus shareholders will want to increase leverage *more* in a country that gives strong seniority rights to workers. Also union power is predicted to amplify the response of leverage to these shocks if the bankruptcy cost C is proportional to the firm's size instead of being fixed (as assumed so far for simplicity). In this case, the following corollary holds:

Corollary. *With proportional bankruptcy costs* $C = c(A + \overline{R})$*, where* $c > 0$*, the sensitivity of the optimal debt level to the value of the firm's assets and to its expected revenue is non-decreasing in the bargaining power of workers.*

Proof. See Appendix A.4.

In Section 3 we test the predictions of both Proposition 2 and this corollary, by investigating whether firms' leverage responds more strongly to changes in their asset value and cash flow in countries where bankruptcy law gives employees higher seniority and/or they have greater bargaining power.

1.2 The Role of Workers' Rights in Debt Renegotiation

So far we have assumed that, when the firm is insolvent, it gets liquidated, so that creditors simply cash the firm's value, net of bankruptcy costs and the senior portion of workers' wages. This is a reasonable assumption if it is hard to renegotiate the company's debt, for instance because creditors are dispersed. If instead creditors are concentrated (e.g. a small number of banks) and therefore are able to coordinate, then they will have the incentive to renegotiate their debt with workers to reduce their claims to the firm's actual value, keep it operating as a going concern, and thus save the bankruptcy cost C (which may be thought as also including the continuation value of the firm, which would be lost under liquidation).

We can think of renegotiation as an additional phase in the model's timeline, occurring at $t = 5$, after the realization of the firm's revenue R. In this renegotiation, each of the two parties' outside option will be given by the payoff that it can obtain if the firm is simply liquidated. An important element in the outcome of debt renegotiation is the bargaining power of workers vis-à-vis the firm's creditors, which we shall denote by β. This bargaining power depends on the extent to which workers are protected in a corporate restructuring, which may differ from their bargaining power α in wage negotiations when the firm is still operating.

Thus, if the company is insolvent, at the debt renegotiation stage workers expect to get an additional quasi-rent βC and creditors an additional expected repayment $(1-\beta)C$. In anticipation of the outcome of renegotiation between creditors and workers, the initial value of the firm is reduced only by a fraction β of the bankruptcy cost C (the only portion that is "lost" to workers). Hence, the value of the company will be given by an expression identical to (8) except that C is replaced by βC. As a result, with debt renegotiation the optimal amount of debt becomes

$$D^{**} = \frac{\overline{R} + A}{1-\theta} - \max\left(\frac{1-\alpha(1-\theta)}{\alpha(1-\theta)^2}\beta C, \sqrt{2W_0\overline{R} + A^2} \right). \qquad (9)$$

The only change in this expression relative to (8) is in the first term within the parentheses, which corresponds to the optimal debt when the workers' participation constraint is not binding. From expression (9), one can establish further predictions regarding the optimal debt level D^*:

Proposition 3 (Optimal Debt and Employee Rights in Debt Renegotiation)

(i) If debt is such that the wage exceeds its reservation level ($D^* = \hat{D}$), the optimal debt level is decreasing in employee rights in debt renegotiation. This effect is proportional to the size of bankruptcy costs, is stronger if workers have high seniority rights in liquidation and weaker if they have strong wage bargaining power.

(ii) If debt is such that the wage equals its reservation level ($D^* = \bar{D}$), the optimal debt level is unaffected by employee rights in debt renegotiation.

Proof. See Appendix A.4.

The intuitive reason for result (i) is that workers' bargaining power β in debt renegotiation allows workers to take surplus away from creditors in bankruptcy, which reduces the *ex-ante* value of debt from the standpoint of shareholders, and therefore reduces the debt capacity of the firm. 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 wage-reducing strategic device, as in Matsa (2010) and other models of strategic debt, while workers' power vis-à-vis creditors at the renegotiation stage, β, induces less debt issuance, because it reduces the firm's debt capacity, an effect akin to the idea by Simintzi, Vig and Volpin (2015) that "operating leverage reduces financial leverage". (However, it is important to notice that here this effect does not originate from the firm's limited debt capacity: under that alternative assumption, also the effect of employees' seniority would switch sign, as shown in Section 1.4.) Both effects operate via the bankruptcy cost: the depressing effect of bankruptcy cost on debt issuance is mitigated if workers have great bargaining power in wage negotiations (high α) while it is amplified if workers have great bargaining power vis-à-vis creditors once the firm is in distress (high β). Hence, the empirical prediction here is that the issuance of corporate debt should be greater in countries that offer lower protection to workers and stronger protection to creditors in the restructuring of insolvent companies.

The fact that the leverage effect of employee rights β in debt renegotiation is proportional to the firm's bankruptcy costs follows from the fact that the saving of these costs is precisely what creates the surplus that employees and creditors can share at the renegotiation stage. Incidentally, if these costs were increasing in the size of the assets A

to be liquidated, also in this case we would have an interaction between the value of the firm's assets and the effect of worker protection on leverage, but with the opposite sign relative to employee seniority: an increase in the value of the firm's assets would be predicted to have a smaller effect on firm leverage in countries where employees have comparatively strong rights in debt renegotiation (high β), while it has a larger impact on leverage where they have high seniority in firm liquidation (high θ), from Proposition 2.

The leverage effects of the interactions of employee rights in renegotiation, their seniority and their bargaining power are more subtle. When workers have high seniority θ in liquidation, an increase in debt increases more the likelihood of bankruptcy and thus also that of eventual debt renegotiation, and this amplifies the negative effect of β on debt issuance. The opposite happens when workers have strong wage bargaining power α, which reduces the negative effect of β on debt issuance: hence, not only the two types of bargaining power have opposite direct effects on debt issuance, but they also attenuate each other's effects.

1.3 The Role of Government Insurance in Bankruptcy

In many countries, the government provides direct insurance to the employees of firms in a bankruptcy procedure, by repaying immediately part or all of their claims directly, irrespective of their seniority position, and taking their place in the liquidation procedure. This is for instance the case in Germany, where workers' claims have very low seniority in bankruptcy, but are very well protected by such an insurance scheme. The key difference with seniority rights is that the cost of this form of insurance is borne by taxpayers; in contrast, strengthening workers' seniority rights occurs at the expense of the firm's creditors, and therefore ultimately of the firm itself.

To capture this form of intervention, we consider a variant of the model where the government pays employees a fraction γ of the agreed salary w if their employer is insolvent, and the government is entitled to claim from the employer whatever workers would have been able to obtain otherwise. For simplicity, we consider the case in which employees have no seniority relative to other creditors ($\theta = 0$), so that neither the government does when it surrogates employees in the bankruptcy procedure.

The resulting payoff for employees is shown in Figure 3: in the insolvency states (when $\tilde{X} < D + W_u$), workers are paid γW and the government gets from the firm whatever is left after paying other creditors. So, compared with what they would earn in the absence of this insurance scheme, the workers have an expected gain given by the area of the region shaded in dark grey, and surrender to the government any claims in excess of γw from the firm's liquidation, so that they expected loss is measured by the light grey triangle in Figure 3: when the dark grey area exceeds the light grey one, as in the case shown in Figure 3, workers receive an implicit subsidy from the government. This happens whenever the parameter γ is set high enough that the government cannot expect to recover fully from the failed firm what it has paid to its employees. By the same token, in this case the expected income of the workers no longer coincides with the expected cost paid by the firm.

[Insert Figure 3]

As shown in Appendix A, when the union sets the wage, the expected income of the employees now is

$$E(\tilde{Y}_u) = W_u \left[1 + (1-\gamma) \frac{A - D - W_u}{\overline{R}} \right], \tag{10}$$

which the union maximizes by picking the following contractual wage:

$$W_u^*(\gamma) = 1 + \frac{A - D}{\overline{R}} + \frac{\gamma}{1-\gamma} \frac{\overline{R}}{2}. \tag{11}$$

This exceeds the wage that the union would pick absent the government insurance ($\gamma = 0$), and it is increasing in the generosity of insurance γ. In Appendix A we show that the government insurance scheme raises also the expected income of employees above what it would have been in the absence of insurance if $\gamma > \overline{\gamma} \equiv W_u / (2W_u + D - A)$, where $\overline{\gamma} > 0$ if the firm is insolvent in at least some states. If $\gamma = \overline{\gamma}$, the wage chosen by the union would be independent of γ: the government-provided insurance affects the wage chosen by the union only if it provides a subsidy to workers in default states.

Going through similar steps as in Section 1.1 (see Appendix A), it can be shown that when the government insures workers' claims in bankruptcy, the optimal debt level is

$$\hat{D}(\gamma) = A + \left(1 + \frac{1}{3} \frac{\gamma}{1-\gamma} \right) \overline{R} - \frac{4}{3}(1-\alpha)C, \tag{12}$$

if the employees' participation constraint is not binding. Compared to expression (6), the novelty is that in (12) the optimal debt level is increasing in γ, i.e. the generosity of government-provided insurance, which intuitively plays a role akin to employee seniority θ: it stokes wage demands by the union, and therefore calls for greater strategic leverage. Otherwise, the comparative statics of $\hat{D}(\gamma)$ with respect to other parameters is qualitatively similar to that found in Section 1.1: it is increasing in A and in the mean and variance of the cash flow y, and decreasing in bankruptcy costs C.

As in Section 1.1, one obtains a different expression for the optimal debt level if the employees' participation constraint is binding:

$$\bar{D}(\gamma) = A + \frac{\bar{R}}{1-\gamma} - 2\sqrt{\frac{W_0 \bar{R}}{1-\gamma}}. \tag{13}$$

Also in this case, the optimal debt level can be shown to be increasing in γ, and other comparative statics results are similar to those of expression (12). Considering both cases, the optimal debt level is

$$D^*(\gamma) = \min\left(\hat{D}(\gamma), \bar{D}(\gamma)\right) = A + \left(1 + \frac{1}{3}\frac{\gamma}{1-\gamma}\right)\bar{R} - \max\left(\frac{4}{3}(1-\alpha)C, 2\sqrt{\frac{W_0\bar{R}}{1-\gamma}} - \frac{2}{3}\frac{\gamma}{1-\gamma}\bar{R}\right),$$

whose comparative statics properties can be summarized as follows:

Proposition 4 (Optimal Debt Level and Public Insurance of Employees). *When the government insures a fraction of the employees' claims in bankruptcy states, the optimal debt level is increasing in the fraction of insured claims, in the value of assets and the average cash flow, weakly increasing in workers' bargaining power, and decreasing in bankruptcy costs.*

Proof. See Appendix A.5.

The above expression for $D^*(\gamma)$ also implies that the generosity γ of the public insurance scheme amplifies the response of optimal leverage to the firm's average cash flow, just as it does greater workers' seniority θ,:

Proposition 5 (Optimal Debt Response to Expected Revenue under Public Insurance of Employees). *The sensitivity of the optimal debt level to the firm's expected cash flow*

is increasing in the fraction of the employees' claims insured by the government in bankruptcy states.

Proof. See Appendix A.5.

1.4 Alternative Model with Collateral Constraint and No Strategic Leverage

Before turning to the evidence, 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 collateral constraint and cannot be picked 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 model's baseline structure presented in Section 1.1.

The first change concerns the timeline of the model: suppose that the firm chooses its debt level after the wage bargaining stage, as illustrated in Figure 4, rather than before as in the timeline of Figure 1. Then, 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 $t = 3$ the wage has already been set. Conversely, when they bargain with the firm at $t = 2$, workers set their wage demands in anticipation of the debt to be issued by the firm at $t = 3$.

The second change introduces credit rationing in the model: we 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 $\tilde{R}$. (The analysis could be easily extended to the case where the cash flow generated by the new investment can be partly pledged to external financiers.) 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 $t = 3$ equals the market value that creditors place on its 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

$$V_D = \frac{D^2 - A^2}{2\bar{R}} + \frac{\bar{R} + A - D}{\bar{R}} D - \alpha \left[\frac{\theta W_u}{\bar{R}} D - \frac{A^2}{2\bar{R}} \right]. \qquad (14)$$

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 two terms instead capture the reduction in the market value of debt stemming from the workers' seniority rights and bargaining power in wage setting: to see this, notice that the expression in square brackets is positive (assuming that debt is not fully collateralized by the firm's assets, i.e. $D > A$, and that $\theta W_u > A$, as assumed in the baseline model). Expression (14) shows that both workers' seniority θ and their bargaining power α reduce the market value of debt with a given face value *D*: 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 riskiness stemming from 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 ($\theta > 0$).

At the debt issuance stage $t = 3$, the firm will fully exploit its debt capacity, i.e. will set the face value *D* of debt at the level that maximizes V_D in expression (14):

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

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, to an extent that depends both on workers' bargaining power α and on their seniority θ: in other words, 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 b determined, namely the contractual wage W_u set by the union at $t = 2$. In setting it, the union anticipates that the firm will issue debt $D_{\max}$ at $t = 3$, so that W_u is obtained by combining expressions (1) and (15):

$$W_u^* = A + \bar{R} - (1-\theta) D_{\max} = \frac{\theta}{1 - \alpha\theta(1-\theta)} (A + \bar{R}), \qquad (16)$$

which can be shown to be increasing in the workers' bargaining power α and seniority θ. Substituting the optimal wage (16) into expression (15) yields the optimal (book value of) debt chosen by the firm at $t = 3$:

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

This expression allows us to characterize the response of the firm's debt to the parameters:

Proposition 6 (Optimal Debt with Collateral Constraint). *When the firm issues debt under a binding collateral constraint and not for strategic reasons, its optimal debt is increasing in the value of its assets and expected revenue, and decreasing in the workers' seniority and bargaining power. Moreover, the sensitivity of debt to the value of the firm's assets and to its expected revenue is decreasing in the seniority of workers and in their bargaining power.*

Proof. See Appendix A.6.

The predictions of Proposition 6 are in striking contrast with those of Propositions 1 and 2 regarding the baseline model with strategic leverage. First, workers' seniority and bargaining power 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. Second, and more importantly for our empirical tests, workers' seniority and bargaining power mitigate the positive response of the firm's leverage to increases in collateral values and expected revenue, while in the strategic debt model greater seniority tends to amplify this response. This contrast in predictions sets the stage for a sharp test of the two competing models.

2. Empirical Strategy and Data Description

As illustrated in Section 2, the strategic debt model yields three sets of related predictions: (i) stronger employees' seniority rights in bankruptcy liquidation increases firm leverage, (ii) employees' seniority invariably increases the response of leverage to increases in the value of its assets and in its cash flow, and (iii) stronger employees' rights in the

renegotiation of corporate debt is predicted to decrease firm leverage. The model with collateral constraints has opposite predictions on points (i) and (iii). To test these predictions, we use firm-level data from Worldscope and Osiris (for non-U.S. firms) and Compustat (for U.S. firms) over the sample period from 1988 to 2013. The dataset has detailed income statement and balance sheet data.

2.1 Empirical Methodology

Our methodology is best illustrated by considering the baseline specification that we use to investigate how firm's leverage decisions are affected by workers' rights in bankruptcy when an asset valuation or a profitability shock occurs to a firm in our sample:

$$D_{ijt} = \lambda_0 S_{ijt-1} + \lambda_1 \theta_c S_{ijt-1} + \lambda_2 \beta_c S_{ijt-1} + \lambda_3 \alpha_c S_{ijt-1} + \delta' X_{ijt-1} + \phi' X_{ct} + \mu_i + \mu_t + \varepsilon_{ijt}, \quad (14)$$

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 is employees' seniority rights in bankruptcy in country c, β_c is employees' rights in debt renegotiation in country c, α_c is employees' bargaining power in wage negotiations in country c, S_{ijt-1} is a shock to the value of firm i's assets or to its cash flow in year $t-1$, 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 effect, μ_t is a year effect, and ε_{ijt} is the error term. Some specifications include industry fixed effects or industry-time fixed effects instead of firm effects, and country-industry effects instead of country effects.

The coefficients λ_1, λ_2 and λ_3 respectively measure the response of leverage to workers' seniority rights in bankruptcy, to employees' rights in the renegotiation process, and to employees' bargaining power in wage negotiations, all following a shock to the firm i's asset value or cash flow. Recall that the strategic debt model predicts $\lambda_1 > 0$: ceteris paribus, a shock to asset valuation or profitability should lead a firm to increase leverage in a country where workers have a higher seniority compared to an identical firm facing

the same shock but located in a country with low workers' seniority. In contrast, the credit rationing model predicts $\lambda_1 < 0$. The strategic debt model also predicts $\lambda_2 < 0$ (if bankruptcy costs are increasing in the firm's asset value or cash flow): ceteris paribus, a shock to asset valuation or profitability should lead a firm to decrease leverage in a country where workers have strong rights in reorganization compared to a firm located in a country where workers have weaker rights in reorganization, or to increase leverage less than the second. Third, the model predicts $\lambda_3 \geq 0$, implying that, ceteris paribus, workers' bargaining power should strengthen the response to changes in asset values or profitability or at worst leave it unaffected. Instead, the credit rationing model produces again the opposite prediction, namely $\lambda_3 < 0$.

We use two different identification strategies to measure an exogenous shock to the firm's asset valuation and profitability. The first relies on the change of the value of its real estate to capture the asset valuation shock. When we adopt this strategy, we use the entire sample to estimate the coefficient estimates. The second strategy relies on change in commodity prices as an instrument for the firm's profits. In this case, we use only firms in the extraction and mining industries for the estimation.

In the first identification strategy, we interact the asset value shock (namely, the change in the market value of the firm's real estate assets) with measures of workers' rights in bankruptcy and reorganization and with measures of employment protection, that 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, that 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 methodologies (Chaney et al., 2012, and Cvijanovic, 2015) to get 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.[5] We then use the residential real estate price index in the country where the firm is incorporated to inflate the original value of land and get its market valuation. In this case we measure the change in the value of a firm's real estate based on the market value of land scaled by the lagged valuation of the firm's property, plant and equipment (PPE).

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. (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 we compute the average of 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[6] and then use the residential real estate price index in the country where the firm is incorporated to inflate the original value of land and get its market valuation. 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

[5] Thus, 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.

[6] 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.

country-level residential real estate price index. In this case, our measure of the change in the value of a firm's real estate is based on the market value of land and building 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 because this is likely to be affected by leverage, as shown by the literature. Instead we focus on the extraction and mining industries and use changes in commodity prices as exogenous profitability shocks. Similar to Bertrand and Muillanathan (2001), we argue that the movement of commodity prices is exogenous from the point of view of the single firm but they have a first order impact on cash flow of commodity producing firms. From our sample of firms, we extract a subsample of 928 firms that operate in extraction and mining, and for each we identify the core commodity that it produces. Then we use the commodity price as an instrument for the firm's Return on Assets (ROA).

2.2 Data Sources and Definitions

The data for the variables used in the estimation, which are defined in Appendix C, come from 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 in the period 1988-2013, with two screens: we eliminate financial institutions and utilities and those with at least 9 years of data. We also winsorize the data at the 1% and 99th percentiles. This leaves us with 12,445 firms and 205,192 firm-year observations. Table 1 shows the descriptive statistics of our sample.

[Insert Table 1]

We draw residential real estate price indices from the Banks for International Settlements, and commodity prices from Bloomberg. 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.

2.3 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 law firms. Table 2 shows the most important rights of employees in bankruptcy in each of country for which we have data, based on the replies of law firms to the questionnaire shown in Appendix B.

[Insert Table 2]

The first question relates to the ranking of workers' (a) unpaid salaries and wages, and (b) severance pay against the claims of other creditors when it comes to distribute the proceeds from liquidation. We consider six other types of creditors competing workers in case of liquidation: (a) creditors with lien on property (e.g., bank mortgage), (b) administrative expenses incurred by the trustee, (c) post-petition credit, (d) claims for contributions to employee pension benefit plans, (e) income and other taxes due to local or central government, and (f) unsecured creditors.

Column 1 of Table 2 shows the rank of employees' unpaid salaries and wages. A value of 5 is given in countries where workers are ranked first, 4 where they are ranked second, and so on. There are very significant differences in the rank of workers. In Brazil, Czech Republic, France and Mexico, when an insolvent company is liquidated, its employees have the highest seniority (the value of their value is 5), before any other creditor of the company. The seniority of employees is much different in other countries: for instance, in Austria, Finland, Germany and Ireland they are ranked last (the value of their rank is 1). Employee seniority in other countries lies between these two extremes: it is low in countries such as Sweden, Switzerland and Denmark, and rather high (they come second) in countries such as Israel and South Korea. While employees' ranking among creditors is very important, it should be seen as the only relevant dimension. Another important aspect is whether workers' unpaid wages are capped to a maximum amount payable or not. Even here there are considerable cross-country differences, although for the sake of brevity we do not report this data. We also collect data on the rank of severance payments, which turns out to be very correlated with that of unpaid wages and salaries and again is not reported for sake of brevity.

Even if employees have relatively low seniority, the government can effectively secure (all or part of) their claims by creating an insurance fund to cover workers' unpaid salaries (and even severance pay and pension contributions). 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. Again, it should be noted that any payment made out by this government fund can be limited and capped at a certain level. We show the presence of a government fund to cover (at least part of) unpaid wages in Column 2 of Table 2. Most countries do have such a fund, but the amount covered varies significantly across countries (not reported for brevity). For example, while in both Finland and Germany employees are junior to all other creditors, and both countries have a government-mandated fund, the amounts covered in the two countries is quite different: in Finland the amount is uncapped, while in Germany the maximum amount covered is 3 months of unpaid salaries and wages. Importantly, in the case of Brazil and Mexico, where workers are ranked at the top rank by law, there is no such government fund. On the other hand, while workers are ranked fourth in the Netherlands, Sweden, Switzerland, Turkey and the United States, the first four countries have a government-mandated fund but the United States have none, which aggravates the position of workers in the United States even further.

We also collect information about legal rights of workers during reorganization procedures. The first piece of evidence is information about whether the reorganization plan can impair the claims of employees without their consent. In Column 3 of Table 2 we code with a value of 1 instances where the law allows such impairment. In most countries, such impairment is not allowed but in others – such as Australia, India, Spain and the United States – employees' claims can be impaired. The second piece of information relates to whether collective bargaining agreements previously entered into can be modified by the reorganization plan, and, if so, whether any new plan should be proposed to employees (or their representatives) for approval. In Column 4 we rank the responses from 1 (highest impairment of workers' collective bargaining agreements) to 8 (lowest impairment). The results show significant cross-country heterogeneity: in countries such as the France, Germany, and the United States previously entered into collective bargaining agreements can be modified with relative ease (each have a value of 1) while in countries such as Canada and Finland (each with a value of 8), Austria, Denmark, Norway and Turkey (each with a value of 7) modifying collective bargaining agreements is relatively difficult in reorganization.

The rest of the data in Table 2 provides information on other country-level labor market characteristics and measures of creditor rights, which we use as control variables

in our empirical methodology. Two important labor market variables are the Employment Protection Legislation (EPL) and union density. The EPL indicator, which we shall use as a measure of workers' bargaining power as in Simintzi, Vig and Volpin (2015), is time-varying and takes the value from 0 to 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). Union density measures the level on unionization in each country.

We show the correlations between the different dimensions of workers' rights in bankruptcy and between them and country-level characteristics in Table 3. Starting with workers' seniority (rank) in liquidation, we find that the rank is negatively correlated with the government mandated fund and workers' rights in reorganization. Although these correlations are not statistically significant they do show that these two dimensions of workers' legal rights in bankruptcy tend to be more substitutes rather than complements: where workers enjoy higher seniority, they are more likely to see their collective bargaining agreements get modified during a reorganization process. The rank of workers is positively correlated with EPL, implying that employment protection tends to complements worker' rights in bankruptcy, but does so imperfectly. This indicates that there are important dimensions of workers' rights that are not simply captured by the EPL indicator that the literature on company leverage has widely used so far. It should also be noted that workers' seniority correlate negatively with union density (the same applies for EPL and union density): unions tend to be stronger in countries where employees have low seniority. Finally, employees have low seniority in countries where creditors' rights are stronger (and where creditors' have an automatic stay on assets), thus showing that in these countries the balance between these two groups of stakeholders in case of bankruptcy is strongly skewed in favour of creditors.

[Insert Table 3]

3. Empirical Results

To investigate how firm capital structure is 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, λ_2 and λ_3, namely those of the interaction between our measures of employee protection in bankruptcy and asset value or profitability shocks.

3.1 Regressions Based on Real Estate Valuations

We start from the results obtained from the identification strategy that relies on the shock arising from changes in country-level real estate prices: these should have a direct impact on the firm's market value through its real estate asset 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 maintained hypothesis is that, ceteris paribus, an asset value shock should lead firms incorporated in countries that grant employees greater seniority rights in bankruptcy to increase leverage *more than* firms incorporated in countries where employees have lower seniority. 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 valuation shock to their real estate assets.

The first row of Table 4 shows that the coefficient estimate of the interaction between the real estate assets' value and workers seniority (the parameter θ in our model) is positive, as predicted by the model, and highly significant. Whether we include industry-year fixed effects (Column 1), firm effects (Column 2), country effects (Column 3), country-industry effects (Column 4) or country-year effects (Column 5), we always find that, when they experience a positive shock to their real estate valuations, a firm incorporated in a country where workers have high seniority in liquidation increases leverage more than an identical firm incorporated in countries 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 5) to one where they have the highest seniority (a rank of 1) is associated with an increase in leverage of about 40% of its standard deviation.

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

(parameter α in our model) is positive, as predicted by the model, and highly significant at the 5% confidence level in every specification we use except in the last column (where we include country-year fixed effects) where it is significant at the 10% level.

Finally, the result in the third row shows that the coefficient estimate of the variable that interacts real estate assets' valuation and workers' rights during reorganization (parameter β in our model) is negative, as predicted by the model, but it is significant at the 5% confidence level only in the specifications we use in Column 1 (where we use industry-year fixed effects), Column 3 (where we use country-level fixed effects) and Column 4 (where we use country-industry fixed effects).

We also include the interaction between the insurance provided by government to employees of companies in bankruptcy liquidation and real estate valuation. Ignoring the presence of the government-mandated fund may amplify the importance of workers' priority, and its inclusion gives us comfort about the robustness of the results.

It is important to note that these results, largely consistent with the strategic leverage model of Section 1, are obtained after controlling for various channels that may influence the leverage decision. First, in every specification we control for the traditional firm-level time variant 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). Any time-invariant firm characteristic is absorbed by the firm fixed effects.

Second, the shock to firm's real estate values can also impact directly the firm's financial capacity, which may induce collateral-constrained firms to change their indebtedness, as shown by the model of Section 1.4. In fact we find that the coefficient estimate of real estate valuation is positive, large and statistically significant in every specification. It should be noted, however, that if the collateral constraint model were true for the typical firm in our sample, 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.

Finally, an important channel to consider in our analysis is the impact that country characteristics may have on the outcome. One potential concern is that 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 be accompanied by an increase in real estate prices, providing a stimulus for economic growth to which firms 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. For this concern to be relevant for our analysis, the omitted variables 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.

We address the potential problems arising from omitted country characteristics in two different ways. First, in the specifications shown in Columns 1-4 in Table 4 we control for the unemployment rate and GDP growth, to absorb any effects that country-level economic growth may have on both real estate prices and leverage decisions. In the specification with industry-time fixed effects (Column 1) we also include creditor rights.

Second, we control for any country-level time-invariant unobserved heterogeneity in the specifications shown in Columns 3 and 4 by including either country fixed effects (Column 3) or country-industry (Column 4) fixed effects. Since however the spurious correlation between real estate valuations and firm leverage may be driven by some time-varying country-level variable, in Column 5 we estimate a specification with country-year effects. In all these specifications, including this where we include country-time effects, we continue to find that the three key predictions of the model hold: the coefficient estimate of the interaction of real estate assets' valuation with employee seniority is positive and statistically significant at the 5% level, that of its interaction with workers' wage bargaining power is positive and significant at the 10% level, and that with workers' rights during reorganization is negative, though it is not precisely estimated.

In the strategic debt model of Section 1.1, the seniority of employees' claims in a firm's liquidation was shown to weaken the strategic value of debt in wage bargaining, so that the firm may want to issue more debt, not less. However, as shown by the alternative model of Section 1.4, the ability of a firm to really issue more debt depends on its access to finance: in the presence of moral hazard or limited enforceability, a firm may wish to issue debt but be constrained by its limited collateral. Although the predictions of the two models are at odds with each other, it is possible that each of the two models applies to a different set of firms in our sample: the strategic debt model may apply to financially unconstrained firms, and the model with credit rationing to constrained ones.

We assign firms to the two groups based on their "distance" from financial distress, since typically firms close to a state of distress have a harder time getting financing. Hence, we compute each firm's Altman's *z*-score (see Altman, 1968) in the first five years in which they are present in the sample and rank firms in terciles based on the *z*-score values in each country. We then re-estimate our leverage regression separately for firms in the top tercile and the bottom tercile of the *z*-score, using only observations for subsequent years. We expect the coefficient estimate of the interaction between the real estate assets' value and workers seniority (the parameter θ in our model) be positive for firms that are least likely to be financially constrained (i.e. those in the top tercile ranked by the *z*-score), in keeping with the prediction of the strategic leverage model; in contrast, we expect this coefficient to be negative for the firms most likely to be financially constrained (i.e. those in the bottom tercile by the *z*-score).

[Insert Table 5]

The first two columns of Table 5 present estimates for the firms in the top tercile of the *z*-score: Column 1 refers to the specification with firm fixed effects and Column 2 to that with country-year effects. The last two columns of the table report the estimates of the same specifications for firms in the bottom tercile of the *z*-score, again first with firm fixed effects in Column 3, and with country-year effects in Column 4. The data appear to 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 workers seniority is positive and highly significant only for firms that are not financially constrained (shown in Columns 1 and 2). 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 workers' wage bargaining power between financially constrained and unconstrained firms. The coefficient estimate is found to be strong – both economically and statistically – in the case of firms that are distant from distress and thus are financially unconstrained firms (shown in Columns 1 and 2), while it is weak and barely significant in firms closer to distress and thus more likely to be financially

constrained. Also this result is in line with the different predictions of the strategic leverage model and of the collateral constraint model presented in Section 1.

3.2 Regressions Based on Commodity Prices

We next turn to the analysis of a sample of firms from the extraction and mining industries and on those in the construction industry, and measure the response of their leverage to exogenous shocks to their profitability. We use the price levels of the commodities produced by these firms to instrument the profitability shock. For example, we use oil prices, exogenous to the single oil company, to instrument for the change in firm's profitability which should change the bargaining position vis-à-vis workers. This second strategy is reminiscent of the one used by Bertrand and Mullainathan (2001). Similarly to the first diff-in-diff strategy, this one compares the leverage reaction of two otherwise identical firms in each of these two industries, but incorporated in countries with different levels of workers' rights, following an exogenous shock to their profitability level and the consequent change in the bargaining positions. The results are shown in Table 6.

[Insert Table 6]

The broad results found in Tables 4 and 5 are confirmed in Table 6, where we use specifications with either firm-level fixed effects or country-level effects. Also in this case, the predictions made by the strategic leverage model are broadly borne out, despite the fact that the sample comprises a single industry and therefore much fewer observations (hence reducing the power of our tests): the coefficients of the interactions of profitability with workers seniority and with workers' bargaining power are both positive and statistically significant; the coefficient of the interaction between profitability and workers' rights during reorganization is negative but significant only in the specification shown in Column 1.

3.2 Robustness Checks

We effect various robustness checks of our results. First, we check whether they hold for different measures of leverage, and find that they are not sensitive to whether we use book leverage or market leverage. Second, we use the 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, when we use this second measure we find that results get stronger. Third, larger firms may own real estate assets outside their country of incorporation, which 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. To face this concern, we split the sample in small and large firms in each country, using country median values of market capitalization. We find that the results still hold for both groups of firms, but are stronger for smaller firms. Finally, we split the sample between firms in high and low labor-intensive industries and find results to be stronger in the former.

4. 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 and thus moderate their wage demands. However, 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 therefore the predictions regarding the response of company leverage to changes in the value of its assets and in its expected revenue. In a simple model of strategic leverage, we show that, depending on worker' rights in liquidation and in debt renegotiation procedures, the response of corporate leverage to changes in the value of firms' assets and in their cash flow can even switch sign. We also show that firms' ability to use debt strategically in wage bargaining hinges on them being financially unconstrained: when their debt capacity is limited by a binding collateral constraint, the response of their leverage to both workers' seniority and to their bargaining power should switch sign, which may reconcile some of the conflicting findings reported so far by the empirical literature.

To test the models' predictions about the strategic use of debt to counter workers' claims we collect novel data about workers' legal rights during liquidation and reorganization in 30 countries by way of a questionnaire sent to law firms in each country participating in the Lex Mundi project. Importantly, these rights differ from those attributed to employees by legislation on dismissals outside of bankruptcy and widely used in other studies. We find that, as predicted by the strategic leverage model, upon experiencing a positive shock to their real estate valuations, firms increase their leverage more if their workers have stronger seniority rights and greater bargaining power in wage negotiations. The same result is obtained when we investigate the extraction and mining industries and when the shock is at the firm's profitability level.

Even though the predictions of the strategic leverage model are supported by our estimates for the typical firm in our sample, we find that there is some heterogeneity in the response of firms' leverage to changes in the value of their real estate, depending on their access to capital markets: upon splitting the sample in two subsamples, one of firms likely to be financially unconstrained and another of firms likely to be constrained (respectively, far and close to financial distress), the predictions of the strategic leverage model are supported for the first group of firms, while those of the collateral constraint model are met for the second. In particular, for unconstrained firms employee seniority reinforces the response of leverage to changes in the value of firms' real estate, while for constrained ones it attenuates it.

References

Baldwin, Carliss Y., 1983, "Productivity and Labor Unions: An Application of the Theory of Self-Enforcing Contracts," *Journal of Business* 56 (2).

Söhnke, M. Bartram, 2016, "Corporate Post-Retirement Benefit Plans and Leverage," *Review of Finance*, 20 (2), 575-629.

Benmelech, Efraim, Nittai K. Bergman and Ricardo Enriquez, 2012, "Negotiating with Labor under Financial Distress", *Review of Corporate Finance Studies* 1 (1): 28-67.

Bertrand, Marianne, and Sendhil Mullainathan, 2001, "Are CEOs Rewarded for Luck? The Ones Without Principals Are", *Quarterly Journal of Economics* 116, 901-932.

Binmore, Kenneth G., 1987, "Perfect Equilibria in Bargaining Models", in *The Economics of Bargaining*, edited by Kenneth G. Binmore and Partha Dasgupta, Oxford: Basil Blackwell, 77-105.

Bronars, Stephen G., and Donald R. Deere, 1991, "The Threat of Unionization, the Use of Debt and the Preservation of Shareholder Wealth," *Quarterly Journal of Economics* 106, 231- 254.

Chaney, Thomas, David Sraer and David Thesmar, 2011, "The Collateral Channel: How Real Estate Shocks Affect Corporate Investment," *American Economic Review* 102, 2381–2409.

Chemmanur, Thomas J., Yingmei Cheng and Tianming Zhang (2013), "Human Capital, Capital Structure, and Employee Pay: An Empirical Analysis," *Journal of Financial Economics* 110 (2), 478–502.

Chen, Huafeng (Jason), Marcin Kacperczyk and Hernán Ortiz-Molina, 2012, "Do Non-Financial Stakeholders Affect the Pricing of Risky Debt? Evidence from Unionized Workers," *Review of Finance*, 16 (2), 347-383.

Cronqvist, Henrik, Fredrik Heyman, Mattias Nilsson, Helena Svaleryd, and Jonas Vlachos, 2009, "Do Entrenched Managers Pay Their Workers More?" *Journal of Finance* 64(1), 309-339.

Cvijanovic, Dragana, 2015, "Real Estate Prices and Firm Capital Structure," *Review of Financial Studies* 28(8), 2399-2428.

Graham, John R. Hyunseob Kim, Si Li, and Jiaping Qiu, 2015, "The Labor Impact of Corporate Bankruptcy," unpublished manuscript.

Hanka, Gordon, 1998, "Debt and the Terms of Employment," *Journal of Financial Economics* 48(3), 245-282.

Matsa, David A., 2010, "Capital Structure as a Strategic Variable: Evidence from Collective Bargaining," *Journal of Finance* 65 (3), 1197–1232.

Myers, Brett, and Alessandro Saretto, 2010, "Union Strikes and the Impact of Non-Financial Stakeholders on Capital Structure," unpublished manuscript.

Perotti, Enrico C., and Kathryn E. Spier, 1993, "Capital Structure as a Bargaining Tool: The Role of Leverage in Contract Renegotiation," *American Economic Review*, 83(5), 1131-41.

Shivdasani, Anil, and Irina Stefanescu, 2010, "How Do Pensions Affect Corporate Capital Structure Decisions?" *Review of Financial Studies* 23 (3), 1287-1323.

Simintzi, Eleni, Vikrant Vig and Paolo F. Volpin, 2015, "Labor and Capital: Is Debt a Bargaining Tool?" *Review of Financial Studies*, 28(2), 561-591.

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' actual income $\tilde{Y}_u$ is

$$\mathrm{E}(\tilde{Y}_u) = \int_{A}^{\theta W_u} \tilde{X} f(\tilde{X}) d\tilde{X} + \int_{\theta W_u}^{D+\theta W_u} \theta W_u f(\tilde{X}) d\tilde{X} + \int_{D+\theta W_u}^{D+W_u} (\tilde{X} - D) f(\tilde{X}) d\tilde{X} + \int_{D+W_u}^{A+\overline{R}} W_u f(\tilde{X}) d\tilde{X}$$

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

As this expression is increasing and concave in W_u, the optimal value of W_u is given by the first-order condition, which yields expression (1). Substituting W_u^* from (1) in the previous expression yields the maximal value of workers' expected income, i.e. (2).

A.2. Derivation of the expected bankruptcy cost

The firm defaults on creditors and/or workers if the wage is set by the union at W_u^* and $\tilde{X} \in \left[A, D + W_u^*\right)$, and on creditors if the wage is set by the firm and $\tilde{X} \in \left[A, D\right)$. The expected bankruptcy cost is the product of the default probability and the bankruptcy cost *C*, where the default probability is

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

A.3. Derivation of the debt level $\overline{D}$

The debt $\overline{D}$ is defined by the workers' participation constraint (5) taken with equality:

$$\overline{D} = \frac{1}{1-\theta}\left(A + \overline{R} \pm \sqrt{2\overline{R}W_0 + A^2}\right),$$

where we must take the smaller root, since the large one would imply $\overline{D} > \hat{D}$, so that it would violate the workers' participation constraint (5) whenever $\hat{D}$ violates it. This yields expression (7). To show that $\overline{D} > 0$, notice that expression (7) is positive if and only if

$$(A+\overline{R})^2 > 2\overline{R}W_0 + A^2 . \qquad \text{(A1)}$$

This can be rewritten as $\overline{R}/2 + A > W_0$, which is implied by the assumption that the firm is viable if workers have no bargaining power, i.e. $\overline{R}/2 > W_0$.

A.4. 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 (4) for the firm's value *V*: with $\theta = 1$, expected labor income $\mathrm{E}(\tilde{Y})$ no longer depends on *D*, while the expected bankruptcy cost $\mathrm{E}(C)$ is still increasing in *D*. Hence, it is optimal to set *D* equal to zero. If instead $\theta < 1$, we show that:
(i) D^* is increasing in the value of assets *A*:

$$\frac{\partial \hat{D}}{\partial A} = \frac{1}{1-\theta} > 0, \qquad \frac{\partial \overline{D}}{\partial A} = \frac{1}{1-\theta}\left[1 - \frac{A}{\sqrt{2\overline{R}W_0 + A^2}}\right] > 0,$$

where the second inequality follows from the observing that the ratio is smaller than 1. D^* is also increasing in expected revenue $\overline{R}/2$, being increasing in $\overline{R}$:

$$\frac{\partial \hat{D}}{\partial \overline{R}} = \frac{1}{1-\theta} > 0, \qquad \frac{\partial \overline{D}}{\partial \overline{R}} = \frac{1}{1-\theta}\left(1 - \frac{W_0}{\sqrt{2W_0\overline{R} + A^2}}\right) > 0,$$

where the second inequality follows from the assumption $\overline{R}/2 > W_0$ Finally, D^* is non-decreasing in α:

$$\frac{\partial \hat{D}}{\partial \alpha} = \frac{C}{\alpha^2(1-\theta)^2} > 0, \qquad \frac{\partial \overline{D}}{\partial \alpha} = 0.$$

(ii) If $D^* = \hat{D}$, its derivative with respect to the worker's seniority θ is

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

whose sign depends on the bankruptcy cost *C*: it is positive if $C < \overline{C}$, zero if $C = \overline{C}$, and negative if $C > \overline{C}$, where $\overline{C} = \left[\alpha(1-\theta)(A+\overline{R})\right] / \left[2-\alpha(1-\theta)\right]$.

(iii) If $D^* = \overline{D}$, its derivative with respect to the worker's seniority θ is positive:

$$\frac{\partial \overline{D}}{\partial \theta} = \frac{\overline{D}}{1-\theta} > 0,$$

recalling that $\overline{D} > 0$ (see point A.3 above in this Appendix).

Proof of Proposition 2. The response of D^* to an increase in the value of assets A and in expected revenue $\overline{R}$ is an increasing function of employee seniority θ:

$$\frac{\partial^2 \hat{D}}{\partial A \partial \theta} = \frac{\partial^2 \hat{D}}{\partial \overline{R} \partial \theta} = \frac{1}{(1-\theta)^2} > 0,$$

and

$$\frac{\partial^2 \overline{D}}{\partial A \partial \theta} = \frac{1}{(1-\theta)^2}\left[1 - \frac{A}{\sqrt{2\overline{R}w_0 + A^2}}\right] > 0, \quad \frac{\partial^2 \overline{D}}{\partial \overline{R} \partial \theta} = \frac{1}{(1-\theta)^2} > 0.$$

Proof of Corollary. With proportional bankruptcy costs $C = c(A + \overline{R})$, where $c > 0$, the response of D^* to an increase in the value of assets A and in in expected revenue $\overline{R}$ is non-decreasing in workers' bargaining power α:

$$\frac{\partial^2 \hat{D}}{\partial A \partial \alpha} = \frac{\partial^2 \hat{D}}{\partial \overline{R} \partial \alpha} = \frac{c}{\alpha^2 (1-\theta)^2} > 0, \quad \frac{\partial^2 \overline{D}}{\partial A \partial \alpha} = \frac{\partial^2 \overline{D}}{\partial \overline{R} \partial \alpha} = 0.$$

Proof of Proposition 3. It is immediate that in expression (9) D^{**} is decreasing in β when it equals the first expression (i.e. the employees' participation constraint is not binding), and is invariant to β when it equals the second (i.e. the employees' participation constraint is binding). To show the additional comparative statics in point (i) of Proposition 3, note that if D^{**} equals the first expression in expression (9), then

$$\frac{\partial^2 D^{**}}{\partial \beta \partial \alpha} = \frac{C}{\alpha^2 (1-\theta)^2} > 0, \quad \frac{\partial^2 D^{**}}{\partial \beta \partial \theta} = -\frac{2 - \alpha(1-\theta)}{\alpha^2 (1-\theta)^2} C < 0.$$

A.5. Derivations of results in Section 1.3

To derive the expected income of employees when the union sets the wage, consider that the government insurance is provided in insolvency region $\tilde{X} \in [A, D+W_u)$, not in the solvency region $\tilde{X} \in [D+W_u, A+\overline{R}]$:

$$\int_{A}^{D+W_u} \gamma w_u f(X)dX + \int_{D+W_u}^{A+\overline{R}} \gamma W_u f(X)dX = \gamma W_u \frac{D+W_u-A}{\overline{R}} + W_u \frac{A+\overline{R}-D-W_u}{\overline{R}} = \frac{W_u}{\overline{R}}\left[(1-\gamma)(A+\overline{R}-D-W_u)+\gamma\overline{R}\right], \quad \text{(A2)}$$

which can be rearranged to yield expression (10). Differentiating expression (10) with respect to W_u, one finds the wage $W_u^*(\gamma)$ chosen by the union and shown in expression (11). This is to be compared with the wage $W_u^* = A+\overline{R}-D$ in the absence of insurance (obtained by setting $\theta = 0$ in equation (1)), which would entail an expected income:

$$W_u \frac{A+\overline{R}-D}{\overline{R}} - \frac{W_u^2}{2\overline{R}}. \quad \text{(A3)}$$

Expressions (A2) and (A3) are equal for $\gamma = \overline{\gamma} \equiv W_u/(2W_u+D-A)$. Hence, only for this choice of γ, government insurance does not affect the workers' expected income; instead, for larger values of γ, it raises it relative to the case of no government insurance.

To derive the optimal debt $\hat{D}(\gamma)$ when the participation constraint of employees does not bind, the first step is to compute the firm's expected labor cost when the union sets the wage $W_u^*(\gamma)$ given by (11). Notice that in this case the firm's expected labor cost generally differs from employees' expected labor income as government insurance creates a wedge between the two (unless $\gamma = \overline{\gamma}$). The firm's expected labor cost is

$$\mathrm{E}(\tilde{Y}) = \alpha \int_{D}^{D+W_u^*(\gamma)} (\tilde{X}-D) f(\tilde{X})d\tilde{X} + W_u^*(\gamma) \int_{D+W_u^*(\gamma)}^{A+\overline{R}} f(\tilde{X})d\tilde{X} + (1-\alpha)W_0$$

$$= \alpha \frac{W_u^*(\gamma)}{\sigma}\left[A+\overline{R}-D-\frac{W_u^*(\gamma)}{\sigma}\right] + (1-\alpha)W_0$$

$$= \alpha\left[\frac{3}{8}\frac{A+\overline{R}-D}{\overline{R}}\right]^2 + \frac{1}{4}\frac{\gamma}{1-\gamma}(A+\overline{R}-D) - \frac{1}{8}\left(\frac{\gamma}{1-\gamma}\right)^2 \overline{R} + (1-\alpha)W_0,$$

where in the last step $W_u^*(\gamma)$ has been replaced by expression (11).

Hence, the firm's value is

$$V = A + \underbrace{\frac{\overline{R}}{2}}_{\mathrm{E}(\tilde{R})} - \underbrace{\left\{\alpha\left[\frac{3}{8}\frac{A+\overline{R}-D}{\overline{R}}\right]^2 + \frac{1}{4}\frac{\gamma}{1-\gamma}(A+\overline{R}-D) - \frac{1}{8}\left(\frac{\gamma}{1-\gamma}\right)^2\overline{R} + (1-\alpha)W_0\right\}}_{\mathrm{E}(\tilde{Y})}$$

$$- \underbrace{\left[1 - \frac{(1-\alpha)(A+\overline{R}-D) - \alpha\theta D}{\overline{R}}\right]C}_{\mathrm{E}(\tilde{C})},$$

whose first-order condition with respect to *D* yields the optimal debt level $\hat{D}(\gamma)$ in (12).

If instead the employees' participation constraint is binding, the optimal debt is obtained by computing the expected income of employees in (A2) when W_u is at its optimal level $W_u^*(\gamma)$ and setting it equal to the reservation wage W_0:

$$\frac{W_u^*(\gamma)}{\overline{R}}\left[(1-\gamma)(A+\overline{R}-D-W_u^*(\gamma)) + \gamma\overline{R}\right] = \frac{1}{4\overline{R}(1-\gamma)}\left[(1-\gamma)(A+\overline{R}-D) + \gamma\overline{R}\right] = W_0,$$

which yields

$$D = A + \overline{R} + \frac{\gamma}{1-\gamma}\overline{R} \pm 2\sqrt{\frac{w_0\overline{R}}{1-\gamma}}.$$

Taking the smaller root (as the larger one would imply a negative wage $W_u^*(\gamma)$) yields expression (13) for the optimal debt $\overline{D}(\gamma)$. Using (13) in the expression for $W_u^*(\gamma)$ given by (11), it turns out that a necessary condition for the participation constraint to hold is

$$W_0 \le \frac{\overline{R}}{1-\gamma}. \qquad \text{(A4)}$$

If condition (A4) were not to hold, it would be $W_u^*(\gamma) < W_0$; as in bankruptcy employees receive $\gamma W_u^*(\gamma)$ from the government, this would imply that employees are paid less than their reservation wage in all states. Assumption (A4) is important in the comparative statics of $\overline{D}(\gamma)$, as shown below.

Proof of Proposition 4. First, it is immediate from expression (12) that $\hat{D}(\gamma)$ is increasing in A and $\overline{R}$ (and therefore in the average cash flow $\overline{R}/2$), increasing in α, and decreasing in C. Finally, it is increasing in γ:

$$\frac{\partial \hat{D}(\gamma)}{\partial \gamma} = \frac{1}{3}\frac{1}{(1-\gamma)^2}\overline{R} > 0. \tag{A5}$$

It is also immediate from expression (13) that $\overline{D}(\gamma)$ is increasing in A, and invariant to changes in α and in C. Its derivatives with respect to $\overline{R}$ and γ are

$$\frac{\partial \overline{D}(\gamma)}{\partial \overline{R}} = \frac{1}{1-\gamma}\left[1-\sqrt{\frac{W_0(1-\gamma)}{\overline{R}}}\right] > 0, \quad \frac{\partial \overline{D}(\gamma)}{\partial \gamma} = \frac{\overline{R}}{(1-\gamma)^2}\left[1-\sqrt{\frac{W_0(1-\gamma)}{\overline{R}}}\right] > 0, \tag{A6}$$

where the positive sign of both derivatives follows from inequality (A4).

Proof of Proposition 5. Differentiating the derivative $\partial \hat{D}(\gamma)/\partial \gamma$ in (A5) with respect to $\overline{R}$ yields

$$\frac{\partial^2 \hat{D}(\gamma)}{\partial \gamma \partial \overline{R}} = \frac{1}{3}\frac{1}{(1-\gamma)^2} > 0.$$

Similarly, differentiating the derivative $\partial \overline{D}(\gamma)/\partial \overline{R}$ in (A6) with respect to γ yields:

$$\frac{\partial^2 \overline{D}(\gamma)}{\partial \gamma \partial \overline{R}} = \frac{1}{(1-\gamma)^2}\left[1-\sqrt{\frac{W_0(1-\gamma)}{\overline{R}}}\right] + \frac{1}{1-\gamma}\sqrt{\frac{W_0}{\overline{R}(1-\gamma)}} > 0,$$

where the positive sign follows from inequality (A4).

A.6. Derivations of results in Section 1.4

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

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

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

$$= \frac{D^2-A^2}{2\overline{R}} + \frac{\overline{R}+A-D}{\overline{R}}D - \alpha\left[\frac{\theta W_u}{\overline{R}}D - \frac{A^2}{2\overline{R}}\right].$$

Suppose that 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 $\alpha = 0$:

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

If $\alpha > 0$, the firm's debt will trade at a further discount to its book value, since the term in square brackets is positive when $D > A$, under the maintained assumption $\theta W_u > A$ (but in fact the weaker assumption $\theta W_u > A/2$ would suffice).

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

$$\frac{\partial D_{\max}}{\partial \theta} = -\alpha\theta\frac{2-\alpha\theta}{\left[1-\alpha\theta(1-\theta)\right]^2}(A+\overline{R}) < 0, \quad \frac{\partial D_{\max}}{\partial \alpha} = -\frac{\theta^2}{\left[1-\alpha\theta(1-\theta)\right]^2}(A+\overline{R}) < 0,$$

$$\frac{\partial^2 D_{\max}}{\partial A \partial \theta} = \frac{\partial^2 D_{\max}}{\partial \overline{R} \partial \theta} = -\alpha\theta\frac{2-\alpha\theta}{\left[1-\alpha\theta(1-\theta)\right]^2} < 0,$$

$$\frac{\partial^2 D_{\max}}{\partial A \partial \alpha} = \frac{\partial^2 D_{\max}}{\partial \overline{R} \partial \alpha} = -\frac{\theta^2}{\left[1-\alpha\theta(1-\theta)\right]^2} < 0.$$

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:[7]

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

[7] 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
Measures of Workers' Rights	
Workers Seniority	The workers' priority in the distribution of the proceeds from liquidation against other creditors. It ranges from 1 to 5, 5 being assigned to a country where workers are senior to all other creditors, and 5 to one where they are junior to all other claims
Government Insurance Fund (Salary)	Equals 1 if there is a government fund protecting employees' claims (unpaid wages and salaries) if they cannot be repaid fully in bankruptcy, 0 otherwise
Impairment of Workers Rights in Reorganization	Equals 0 if the reorganization plan can impair the claims of employees without their consent
Workers' Rights in Reorganization	Based on the following three questions aimed at measuring if workers' collective bargaining agreements can be changed during reorganization: (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 0 to 8, where 8 (0) is assigned to a country where it is harder (easier) for collective bargaining agreements to be changed without the consent of workers and where workers will have the right to approve any new plan.
Workers' 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).

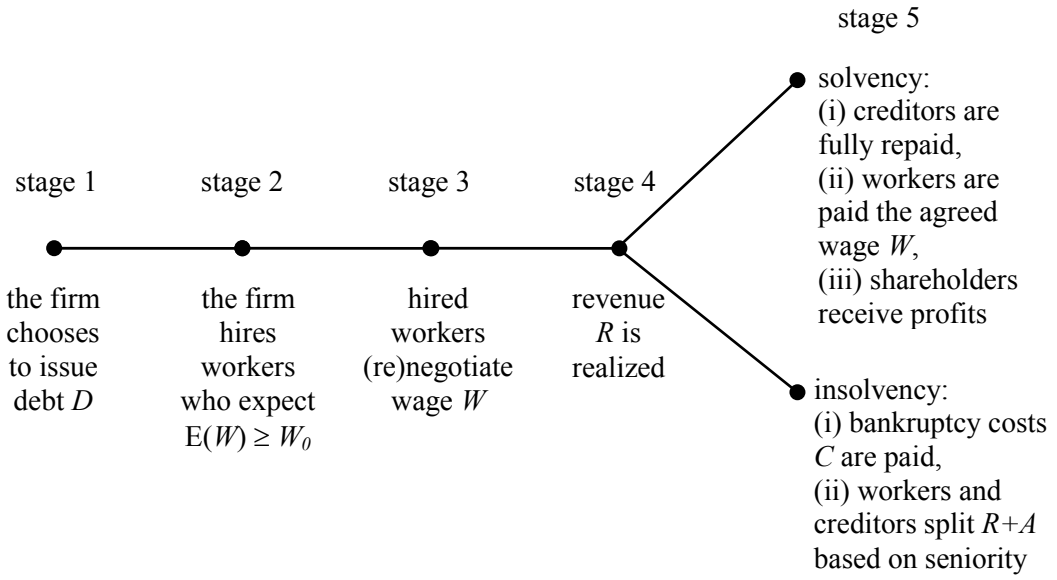

Figure 1. Timing of the baseline model

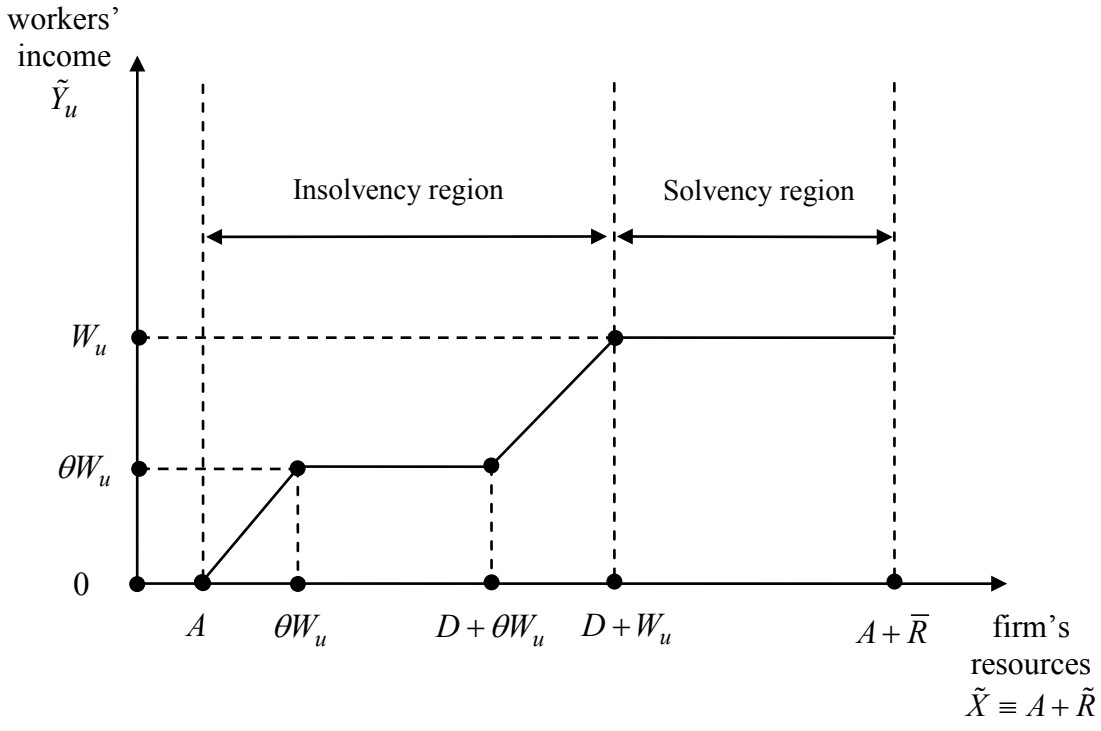

Figure 2. Employees' Payoffs as a Function of the Firm's Asset A and Revenue $\tilde{R}$, with Union-Set Wage w_u and Employee Seniority $\theta \in (0,1)$

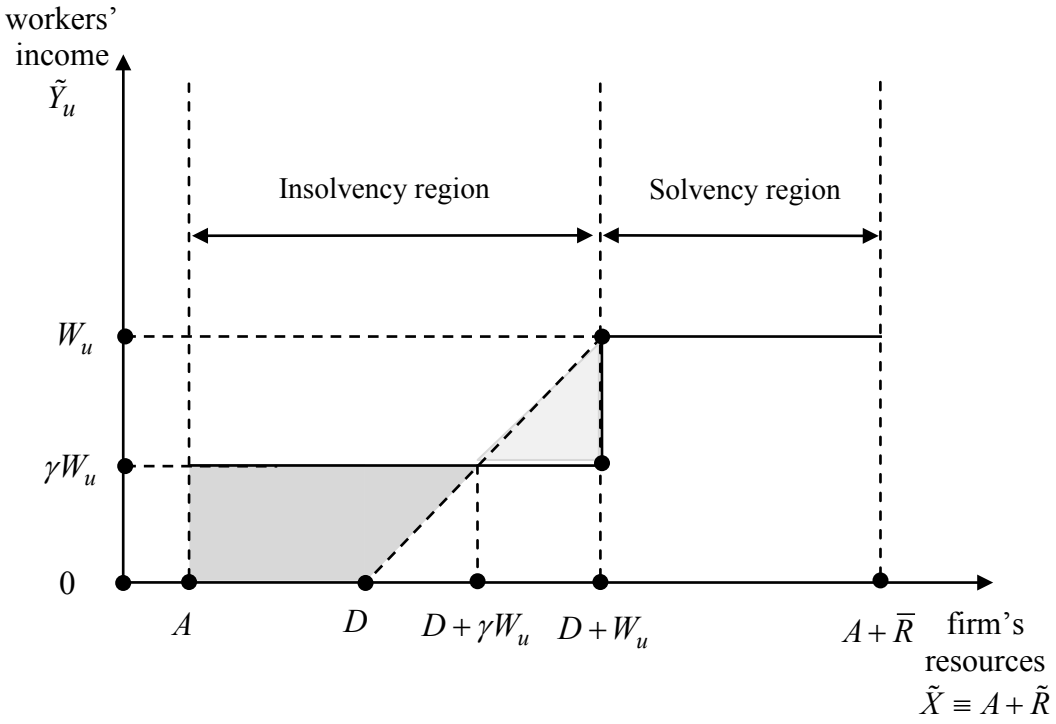

Figure 3. Employees' Payoffs as a Function of the Firm's Asset A and Revenue $\tilde{R}$, with Union-Set Wage W_u, Government Insurance $\gamma \in (0,1)$ and No Employee Seniority $\theta = 0$

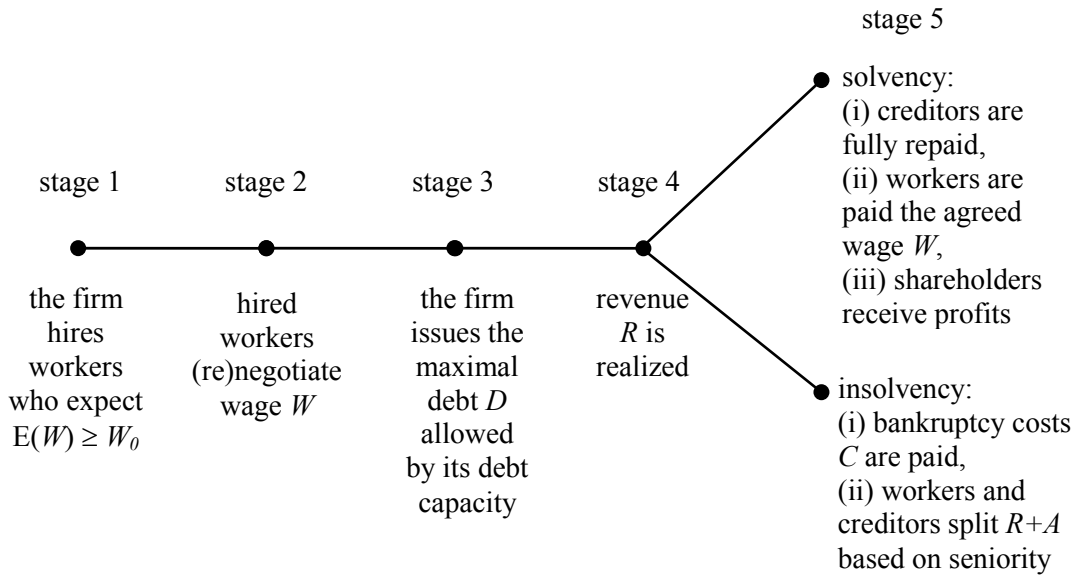

Figure 4. Timing of the model with credit rationing and no strategic leverage

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 12,445 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	205,192	0.2456	0.2180	0.2605	0	0.9087
Market Leverage	205,192	0.2683	0.2245	0.2324	0	0.9282
Assets (in $000,000)	205,192	4,647	345	20,084	2.92	575,244
Sales (in $000,000)	205,192	3,776	356	12,055	0.23	160,883
Market-to-Book Ratio	205,192	1.6418	1.1702	6.1437	0.3751	12.68
Investments	205,192	0.071	0.058	0.046	0.009	0.182
Return on Assets	205,192	0.0442	0.0548	0.1672	-0.151	0.339
PPE Ratio	205,192	0.3640	0.3194	0.2301	0.0072	0.9284
Market Capitalization (in $000,000)	205,192	4,828	675	14,108	18.70	280,115

Table 2. Country-level Descriptive Statistics

This table shows the country-level descriptive statistics of the main variables that measure employees' rights in bankruptcy (Columns (1) to (5)), 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.

	Workers' Seniority	Government Insurance Fund (Salary)	Impairment of Workers' Rights in Reorganization	Workers' Rights in Reorganization	Ease of Renegotiation	Employment Protection Legislation	Union Density	Unemployment Duration	Creditors' Rights
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Argentina	4	0	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	1
Australia	2	1	0	0	6	1.11	34.49	21.67	3
Austria	1	1	0	7	3	2.12	43.68	24.49	3
Belgium	3	1	n.a.	n.a.	n.a.	2.53	52.98	48.88	2
Brazil	5	0	n.a.	n.a.	n.a.	2.75	n.a.	n.a.	1
Canada	3	1	1	8	3	0.75	32.21	9.84	1
Czech Rep.	5	1	1	7	5	1.93	39.72	44.05	3
Denmark	2	1	1	7	8	1.74	75.59	19.26	3
Finland	1	1	1	8	1	2.09	73.73	25.67	1
France	5	1	1	1	8	3.01	10.76	39.8	0
Germany	1	1	1	1	4	2.55	29.29	50.43	3
Greece	3	1	0	5	3	3.26	33.24	44.05	1
Hong Kong	3	1	1	5	3	n.a.	n.a.	n.a.	4
India	4	0	0	0	3	2.77	n.a.	n.a.	2
Ireland	1	1	1	5	5	0.99	49.41	37.52	1
Israel	4	1	1	2	3	1.37	n.a.	27.34	3
Italy	3	1	1	7	5	2.69	38.74	51.41	2
Japan	4	1	1	5	5	1.59	24.45	38.25	2
Mexico	5	0	1	0	5	3.13	18.26	1.62	0
Netherlands	2	1	1	5	6	2.40	25.3	34.99	3
New Zealand	2	0	0	5	3	1.15	38.37	13.16	4
Norway	4	1	1	7	1	2.70	56.48	9.09	2
Poland	4	1	1	7	3	1.53	33.02	41.91	1
South Korea	4	0	0	0	8	2.32	13.1	1.93	3
Spain	3	1	0	3	5	3.16	13.86	29.4	2

Sweden	2	1	1	5	8	2.47	79.9	19.61	1
Switzerland	2	1	1	5	3	1.14	22.86	28.5	1
Turkey	2	1	1	7	3	3.74	14.16	26.52	2
UK	3	1	1	6	6	0.66	37.05	27.67	4
United States	2	0	0	1	4	0.21	15.24	11.42	1

Table 3. Correlation between Measures of Workers' Rights, 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	Government Insurance Fund (Salary)	Impairment of Workers' Rights in Reorganization	Workers' Rights in Reorganization	Employment Protection Legislation	Union Density	Creditors' Rights	Automatic Stay on Assets
Salary Priority	1							
Government Insurance Fund (Salary)	-0.2521 (0.15)	1						
Impairment of Workers' Rights in Reorganization	0.1109 (0.29)	0.4287 (0.10)	1					
Workers' Rights in Reorganization	-0.3103 (0.14)	0.5097 (0.00)	0.3497 (0.07)	1				
Employment Protection Legislation	0.4112 (0.09)	0.0815 (0.29)	0.0316 (0.46)	-0.1881 (0.16)	1			
Union Density	-0.4508 (0.06)	0.6295 (0.00)	0.3186 (0.12)	0.6299 (0.00)	-0.1008 (0.23)	1		
Creditors' Rights	-0.3134 (0.14)	-0.0197 (0.42)	-0.2868 (0.12)	0.1103 (0.26)	-0.2826 (0.12)	-0.0891 (0.35)	1	
Automatic Stay on Assets	-0.2831 (0.16)	-0.0700 (0.37)	-0.4082 (0.06)	-0.1784 (0.15)	-0.0552 (0.42)	0.0891 (0.36)	0.8546 (0.00)	1

Table 4: Leverage and Workers' Rights in Bankruptcy

This table presents the coefficient estimates of a panel regression for 12,445 firms from 28 countries and controlling for industry-year effects, firm effects, country effects, country-industry effects and country-year effects by using industry-year fixed effects (Column 1), firm fixed effects (Column 2), country fixed effects (Column 3), country-industry fixed effects (Column 4) and country-time 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 × Workers' Seniority	0.2311***	0.2162**	0.2803***	0.2508***	0.2007***
	(2.81)	(2.56)	(3.90)	(3.72)	(2.97)
Real Estate Valuation × Workers' Bargaining Power	0.1805**	0.1618**	0.2219**	0.1990**	0.1610*
	(2.42)	(2.09)	(2.35)	(2.15)	(1.92)
Real Estate Valuation × Workers' Rights in Reorganization	-0.1380*	-0.1109	-0.1490**	-0.1328*	-0.1018
	(-1.82)	(-1.60)	(-2.10)	(-1.86)	(-1.57)
Real Estate Valuation × Government-provided Insurance	0.2008	0.1911	0.2551	0.2288	0.1906
	(1.04)	(0.98)	(1.42)	(1.35)	(1.18)
Workers' Seniority	0.0302**	-	-	-	-
	(1.77)				
Workers' Bargaining Power	-0.0206**	-0.0179**	-0.0144*	-0.0118	-
	(-2.37)	(-2.10)	(-1.88)	(-1.56)	
Workers' Rights in Reorganization	-0.0140	-	-	-	-
	(-1.02)				
Real Estate Valuation	0.2531***	0.2109***	0.2861***	0.2404***	0.2308***
	(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-provided Insurance	Yes	No	No	No	No
Unemployment Rate	Yes	Yes	Yes	Yes	No
GDP Growth	Yes	Yes	Yes	Yes	No
Creditor Rights	Yes	No	No	No	No
Fixed Effects	Industry-Year	Firm	Country	Country-Industry	Country-Year
Year Fixed Effects		Yes	Yes	Yes	
R^2	0.45	0.59	0.40	0.46	0.52
Number of Observations	205,192	205,192	205,192	205,192	205,192

Table 5: Leverage and Workers' Rights in Bankruptcy: Financially Constrained vs. Unconstrained Firms

The table presents estimates of a pooled regression for firms with low financial distress risk (those in the top tercile of firms ranked by the Altman's z-score) in Columns 1 and 2, and for firms with high financial distress risk (those in the bottom tercile of firms ranked by the Altman's z-score) in Columns 3 and 4. The dependent variable 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)
Real Estate Valuation × Workers' Seniority	0.2911***	0.2782***	-0.1081	-0.1219
	(3.89)	(3.77)	(-0.92)	(-0.96)
Real Estate Valuation × Workers' Bargaining Power	0.1984***	0.1809***	0.1105*	0.0986*
	(2.80)	(2.71)	(1.93)	(1.74)
Real Estate Valuation × Workers' Rights in Reorganization	-0.1002*	-0.1104*	-0.0964*	-0.0904*
	(-1.90)	(-1.88)	(1.82)	(-1.71)
Real Estate Valuation × Government-provided Insurance	0.2081	0.2100	0.1859	0.1792
	(1.27)	(1.25)	(1.08)	(0.99)
Real Estate Valuation	Yes	Yes	Yes	Yes
Market-to-Book Ratio	Yes	Yes	Yes	Yes
Total Assets	Yes	Yes	Yes	Yes
Return on Assets	Yes	Yes	Yes	Yes
Stock Returns	Yes	Yes	Yes	Yes
Asset Tangibility	Yes	Yes	Yes	Yes
Workers' Bargaining Power	Yes	No	Yes	No
Unemployment Rate	Yes	Yes	Yes	Yes
GDP Growth	Yes	Yes	Yes	Yes
Creditor Rights	Yes	No	No	No
Fixed Effects	Firm	Country-Year	Firm	Country-Year
Year Fixed Effects	Yes		Yes	
R^2	0.38	0.41	0.26	0.29
Number of Observations	68,255	68,255	67,997	67,997

Table 6: Leverage and Workers' Rights in Bankruptcy: Mining and Extraction Industries

This table presents the coefficient estimates of a panel regression for 928 firms in the mining and extraction industries and controlling for firm-level and country-level time invariant heterogeneity. The dependent variable is book leverage defined as long term debt and debt in current liabilities scaled by total assets. In all specifications we instrument for Return on Assets (Profitability) by using the market prices of the firm's core commodity. 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)
Profitability × Workers' Seniority	0.1683***	0.1780***	0.1410**	0.1291**
	(2.92)	(2.88)	(2.45)	(2.23)
Profitability × Workers' Bargaining Power	0.1084**	0.1047**	0.1011**	0.0976*
	(2.45)	(2.29)	(2.05)	(1.87)
Profitability × Workers' Rights in Reorganization	-0.0920*	-0.0785	-0.0751	-0.0718
	(-1.76)	(-1.51)	(-1.29)	(-1.22)
Profitability × Government-provided Insurance		0.1233	0.1237	0.1240
		(0.54)	(0.56)	(0.58)
Workers' Bargaining Power	-0.0145	-0.0172*	-0.0124	-0.0108
	(-1.60)	(-1.81)	(-1.54)	(-1.42)
Market-to-Book Ratio	Yes	Yes	Yes	Yes
Total Assets	Yes	Yes	Yes	Yes
Profitability	Yes	Yes	Yes	Yes
Stock Returns	Yes	Yes	Yes	Yes
Asset Tangibility	Yes	Yes	Yes	Yes
Capital Investments	Yes	Yes	Yes	Yes
Unemployment Rate	Yes	Yes	Yes	Yes
GDP Growth	Yes	Yes	Yes	Yes
Fixed Effects	Firm	No	Country	Firm
Year Fixed Effects	Yes	Yes	Yes	Yes
R^2	0.28	0.32	0.37	0.48
Number of Observations	14,286	14,286	14,286	14,286