Abstract

Firms file for bankruptcy reorganization (Chapter 11) not only to restructure debt but also to restructure labour contracts. Starting from this observation, I present a novel channel through which pro-creditor bankruptcy reforms can backfire. When workers extract rents, restructuring labour contracts helps distressed firms to regain economic soundness. Shareholders weigh the cost of restructuring labour contracts against their claims on the value of the firm. In this environment, bankruptcy reforms face a trade-off. A more creditor-friendly law raises recovery values of successful reorganizations. Yet, it reduces shareholders’ claims and discourages the restructuring of labour contracts: reorganizations are more likely to fail and firms get liquidated. As a result, pro-creditors reforms can cause expected recovery values to fall and raise the cost of debt. I characterize this trade-off in a static model and show that the optimal level of creditor rights decreases with the bargaining power of workers. To test the theory, I exploit the heterogeneity in the U.S. states unionization coverage, and a shift towards a more creditor-friendly Chapter 11 in 1998. I then develop a firm dynamic model and calibrate it to the pre-1998 period. The model can account for the larger fall in the relative use and likelihood of success of Chapter 11 in regions where workers extract more rents.

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1. Introduction

Do workers’ rents matter for corporate bankruptcy reforms? The main argument in favour of pro-creditor bankruptcy reforms is that creditors recover more, and therefore lend more. This paper presents a novel channel through which this argument might break down: when workers extract rents, an increase in creditor rights ought not to increase expected recovery values. Pro-creditor bankruptcy reforms can actually backfire.

I start with the theory. Firms file for Chapter 11 (Ch 11) not only to restructure debt but also to restructure labour contracts. From this observation, I build a theory where shareholders weigh the cost of restructuring labour contracts against their claims on the going-concern value of the firm. In this environment bankruptcy reforms face a tradeoff. A more creditor-friendly bankruptcy law raises recovery values upon successful reorganizations, but at the expenses of the other stakeholders: workers and shareholders. Shareholders have less incentives to restructure labour contracts, making more likely that reorganizations fail and firms get liquidated. When the drop in the likelihood of success of Ch 11 is larger than the increase in recovery values upon success, expected recovery values fall, the cost of debt rises and the bankruptcy reform backfires.

The bargaining power of workers determines when this happens. When workers do not extract rents, restructuring labour contracts does not affect the success of the reorganization. Conversely, when workers extract a lot of rents, failing to restructure labour contracts can prevent the firm from regaining economic soundness, and cause the reorganization to fail.

1 In U.S. corporations can ask for debt relief under Chapter 7 (Ch 7) - which disciplines the liquidation of the assets of the firm and ends with its dissolution - and Chapter 11 (Ch 11) - which disciplines the reorganization process among the stakeholders - bondholders, shareholders and workers - in the attempt of preserving the corporation as a going concern. Under Ch 11 a debtor is granted the possibility to reject any executory contract bondage that impairs the firm viability (§365 (a)). These contracts include debt obligations but, by far, do not reduce to them.

2 By law, when a Chapter 11 reorganization fails, the case is converted to Chapter 7.

3 The bankruptcy experiences of Delta Airlines and Hostess-Brands are illustrative in this sense. Both corporations filed for Ch 11 to reduce labour expenses, but the latter failed to find an agreement with the unions. While Delta airlines emerged on April 2007 with a 20% reduction in the employees and an healthier
As a result, the effect of bankruptcy reforms on credit markets depends on the bargaining power of workers.

To study the implications of bankruptcy reforms for economic activity, I propose a static model where resources are misallocated from their productive alternative because of an enforcement constraint, which I microfound using the corporate bankruptcy law. The expected recovery upon default determines the ex-ante lending, and the fraction of resources that are misallocated. I use this framework to answer analytically a normative question: what is the optimal level of creditor rights? For a given bargaining power of workers, the optimal (output maximizer) level of creditor rights weighs the benefit of higher recovery values upon successful reorganizations against a lower likelihood of success of the procedure. Since restructuring labour contracts matters more (for the success of Ch 11) as workers rents increase, the optimal level of creditor rights decreases with the bargaining power of workers.

The model illustrates how the bankruptcy law affects credit markets through the labour and debt restructuring activity, and how workers’ rents alter this linkage. I call this channel the restructuring channel.

I turn to facts. In the late 90s the U.S. shifted towards a more pro-creditor bankruptcy reorganization process. I use this legal experiment to test the theory in the data. The empirical question is whether the shift in creditor rights protection affected in the same way firms facing different bargaining power of workers. To address it, I exploit two sources of variation: historical differences in the degree of unionization across states, and the change in the creditor rights protection regime. The analysis uses firm level accounting data from Compustat, bankruptcy information from UCLA LoPucki Bankruptcy Research Database, and a proxy for the bargaining power of workers from the Union Membership and Coverage database (CPS), for the period 1979-2012.

financial structure, Hostess Brand assisted at the piece-meal sale of its popular brands.
I identify the break in the creditor rights protection regime in 1998 as the structural change in the relative use of the Ch 11 procedure with respect to the liquidation alternative, Ch 7. The break is associated with a drop in the likelihood of success of Ch 11 (from 95% to 92%), driven by highly unionized firms (from 96% to 92%). In the same spirit, Ch 11 becomes less attractive than Ch 7, especially for firms in highly unionized states. At the country level, firms experienced a dramatic deleveraging (−28%), mainly concentrated among highly unionized firms (−43%). Besides, dividend yields halved, and the Tobin-Q cross-sectional volatility tripled, again with significant differences across regions. Using regression techniques, I control for many sources of bias impairing the previous descriptive statistics analysis. The results hold through.

To quantify the positive implications of bankruptcy reforms, I build and characterize a general equilibrium dynamic model with heterogenous firms and default in equilibrium, where the default options capture salient features of the U.S. corporate bankruptcy law. I model the reorganization problem among the firms’ stakeholders - shareholders, bondholders and workers - as a two stage Nash bargaining over labour and debt contracts, and a restructuring effort decision of the shareholders. Shareholders bargain first with workers and then with creditors. The rationale behind this assumption is legal. The U.S. Corporate bankruptcy law recognizes higher priority to workers over creditors on the firm surplus[^507]. The consequence of this assumption is economic. Shareholders use the threat of liquidation in the second stage to reduce the bargaining position of workers in the first stage. The success of the reorganization process is stochastic and depends on the restructuring effort that shareholders decide to exert when bargaining with workers. In case of failure, the case is converted to Ch 7.

I conclude with policy counterfactual experiments. I calibrate the dynamic model to the U.S. economy from 1979 to 1998 to assess the macroeconomic and firm level implications of

[^507]: §507 (a) of the Bankruptcy Code.
changes in the bankruptcy law. Then, I run two experiments.

In the first experiment, I examine the effects of the shift in creditor rights protection regime experienced by the U.S.. I discipline the increase in creditor rights to match the likelihood of success of Ch 11 in the post-break period. The model predicts changes in firms’ bankruptcy choices and financial structure which are consistent with the data. In the model economy, the shift does not produce significant changes in aggregate TFP, output, and consumption, but has sizable regional effects: output increases in lowly unionized regions by 0.60% and decreases in highly unionized region by 0.36%. Consumption displays a similar behaviour.

In a second experiment, I try to attach a value to the bankruptcy reorganization procedure. The motivation rests on historical reasons. Ch 11 was introduced in 1978, with the enactment of the Corporate Bankruptcy Code. What if it had never been introduced? The model records a sizeable deleveraging (-20%) and drop in the dividend-price ratio (80%), driven by lowly unionized firms. Despite consumption and output would have barely changed in aggregate (−0.11%), the regional dynamics would have been dramatically different: output would have been 14% lower in highly unionized states, and 24% higher in lowly unionized ones.

The rest of the paper is organized as follows. Section 2 reviews the literature. Section 3 presents the restructuring channel mechanism. Section Appendix D lays out the Static Model to study the normative implications of the mechanism. Section 5 organizes the empirical evidence to test the positive implications of the mechanism. Section 6 builds up the Dynamic Model. Section 7 performs the Quantitative Analysis, and Section 10 concludes.
2. Related Literature

This paper seats in the nexus between the macro-finance and the corporate-bankruptcy literature. It contributes to recents macroeconomic studies of the interaction between the labour and credit market in presence of limited commitment, by foregrounding a novel mechanism within the lines of the U.S. corporate bankruptcy law: the restructuring channel. As in these papers, the mechanism works through a collateral constraint, but its legislative hallmark allows me to study the effect of changes in the law on economic activity. As in Biais and Mariotti [2009], the final effect of bankruptcy reforms depends on the interplay between the credit and labour market. In both frameworks pro-creditor bankruptcy reforms can backfire, but for different reasons: while in Biais and Mariotti [2009] an increase in creditor rights yields higher expected recovery values (for a fixed wage), it ought not to be

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5 In particular, the macroeconomic literature that studies the impact of financial frictions on firm dynamics. Among others, Cooley and Quadrini [2001], Jermann and Quadrini [2008], Jermann and Quadrini [2012].

6 Michelacci and Quadrini [2009] firstly studies the interaction between financial frictions and the labour markets in order to explain a few stylized facts about wages and firm dynamics. Hence Monacelli et al. [2011] looks at the business cycle implications of the presence of search friction under limited enforcement of debt contracts for the (un)employment fluctuations. In conclusion, Quadrini and Sun [2015] studies in a firm dynamic framework the use of capital structure policy to lower the hiring cost of the workers and provide empirical evidence of a strong correlation between hiring growth and debt growth, which increases with a proxy of the bargaining power of workers.

7 In particular, §365 of Ch 11 of the U.S. corporate Bankruptcy law. Despite the restructuring of labour contract is a well established phenomenon in the bankruptcy literature (among others, Geva [2012]), it has not received the same attention by the economic literature.

8 Hints on this nexus between bankruptcy and economic growth can already be found in La Porta et al. [1997, 1998], where financial development is partially proxied by variables that measure the efficiency of bankruptcy laws and the extent they protect the rights of the creditors. The seminal papers La Porta et al. [1997, 1998] pioneered the burgeoning literature that investigates the implications of institutions and regulations on the development of financial and credit markets. They find that better institutions and regulations are crucial to establish well-functioning financial and credit markets. Following, King and Levine [1993] and Rajan and Zingales [1998] document that improvements in the financial and credit markets foster economic growth, an idea that traces back to Schumpeter (1911).

9 To the best of my knowledge, Biais and Mariotti [2009] represents the first attempt to study the general equilibrium implications of changes in the bankruptcy law, and the first attempt to illustrate how bankruptcy laws affect economic activity by altering the general equilibrium linkage between the credit market and labour market.

10 In Biais and Mariotti [2009] theory a more pro-creditors bankruptcy law foster investment and labour demand, driving up wages and reducing profitability. This generates a trade-off, for which soft-laws can generate more utilitarian welfare than tough laws.
the case in my framework.

In this respect, the paper also departs from Corbae and D’Erasmo [2015]11 and Peri [2015]12 - which, in the spirit of Chatterjee, Corbae, Nakajima, and Rios-Rull [2007], firstly investigate in a firm dynamic model á la Hopenhayn13 the macroeconomic implications of changes in the U.S. corporate bankruptcy law - where an increase in the bargaining power of creditors yields higher recovery values. By breaking the identity between stakeholders14 and stockholders15 (enlarging the definition of stakeholders to include workers), and modelling the bargaining over labour contracts, expected recovery values can actually drop.

The focus on the misallocation of resources in the static model adds to the literature pioneered by Erosa and Cabrillana [2008]. As in Moll [2014]16, I investigate in a tractable framework the sources of misallocation in an economy where the severity of the financial frictions is pinned down by the court-supervised bankruptcy process and the bargaining power of workers.

The empirical analysis complements the findings of Klasa et al. [2009] and Matsa [2010]17 - which find that highly unionized firms tend to be more leveraged and to herd less on cash

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11 Corbae and D’Erasmo [2015] investigates in a fully fledged firm dynamic model the macroeconomic implication of a longly debated bankruptcy reform suggested by Aghion et al. [1994] and recently proposed by the American Bankruptcy Institute. As a result, they document - among other aspects - an increase in consumption (2.32%), output (1.99%) and measured TFP (1.03%) after the adoption, due to cheaper borrowing, and better allocation of resources in the economy.

12 Peri [2015] tries to identify the channels through which changes in the actual bankruptcy law design might affect TFP. Among others, I found that changes in the bankruptcy law that reduce the efficiency of liquidation affect TFP through the negative effect it exerts on large firms, despite large firms tend not to file for Ch 7. In doing so, I foreground a close relation between recovery value under Ch 11 and the equity issuance cost of the firm, which works through the forward looking nature of the debt restructuring process.

13 This paper adds to the vast literature on firm dynamics pioneered by Hopenhayn [1992], in which the author extends the long run industry equilibrium theory by introducing a concept of stationary equilibrium, which allows him to investigate the phenomena of entry, exit and heterogeneity in the size and growth rates of firms.

14 Stakeholders are formally defined as the agents that have an economic interest in the corporation.

15 Namely, bondholders and shareholders

16 Moll [2014] studies the effect of financial frictions on capital misallocation and aggregate productivity.

17 Klasa et al. [2009] and Matsa [2010] study, respectively, the strategic use of corporate cash holdings and capital structure in collective bargaining with labor unions.
(than lowly unionized) - and the suggestive evidence of Quadrini and Sun [2015]18 - which find a positive correlation between employment growth and debt growth that is increasing in the level of unionization - by studying the effect of bankruptcy reforms on firms’ bankruptcy choices and financial structure when workers extract rents.

In conclusion, I provide statistical support of the narrative approach followed by the bankruptcy literature - which has highlighted a shift in the creditor rights protection regime in the late 90s19 - by identifying a break in the relative use of the Ch 7 and Ch 11 procedures by publicly listed firms in 1998.

3. The Restructuring Channel Mechanism

To illustrate the mechanism, let us focus on the restructuring problem of a distressed firm in bankruptcy reorganization (Ch 11) with one shareholder, one worker and a continuum of lenders. In reorganization, the stakeholders enter in a two stage Nash bargaining process over the going-concern value of the firm, which is normalized to 1. The shareholder bargains first with the worker and then with the lenders. This assumption formalizes the higher priority that the U.S. Corporate bankruptcy law recognizes to the worker over lenders on the firm’s surplus20. By law it is responsibility of the judge to guarantee that creditors recover under Ch 11 at least as much as under Ch 7, ψ21. Crucially I assume that the liquidation value of the assets ψ is not known when the reorganization starts, but is drawn from a uniform distribution $U[0, 1]$ upon bargaining with the lenders. The timing unfolds as follows. The

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18 Quadrini and Sun [2015] studies how workers extract rents affect firms’ hiring choices in a dynamic model where firms use leverage to reduce the bargaining position of the workers at the cost of a higher likelihood of distress (the bargaining channel).

19 Among others, Warren [1999] and Miller [2007].

20 §507 (a) of the Bankruptcy Code.

21 Pursuant to §1129 of Ch 11 impaired class of claims or interests ‘will receive or retain under the plan on account of such claim or interest property of a value, as of the effective date of the plan, that is not less than the amount that such holder would so receive or retain if the debtor were liquidated under chapter 7 of this title on such date.
shareholder enters in reorganization and choose the optimal level of costly effort $e$ - interpreted as resources, such as lawyers and consultants - to spend in order to reduce the bargaining power of the worker, $\theta_U$, by a fraction $\alpha : [0, 1] \rightarrow [0, 1]$, with $\alpha'(\cdot) < 0$, and maximize his expected share of the surplus, net of restructuring costs. He then enter in the debt and labour restructuring activity. In the first stage he nash-bargains with the worker over the wage, for a given level of effort (the labour restructuring problem). In the second stage he nash-bargains with the lenders over a debt haircut, for a given wage compensation and level of effort (the debt restructuring problem).

The next sections illustrate the backward induction solution in details. The interested reader can refer to Appendix C for all the derivations.

3.1. The Debt Restructuring

In the second stage, for a given effort choice ($e$), wage ($v$), and realization of the liquidation value ($\psi$) the shareholder and lenders bargain over the debt repayment ($r$) to maximize the nash bargaining product between their expected surpluses

$$NB_{v,e}^C = \max_{r \in [0,1]} \left[ \frac{1 - v - r}{\text{Shareholder's Expected Surplus}} \right]^{1-\theta_C} \left[ \frac{r - \psi}{\text{Lenders' Expected Surplus}} \right]^{\theta_C}$$

s.t. $\psi < 1 - v \quad 1 - v - r \geq 0 \quad r - \psi > 0$ (1)

If $\psi \geq 1 - v$ and there is no surplus to share, the reorganization fails, the firm gets liquidated, the shareholder receives nothing, $V^L = 0$, and lenders get the recovery value under Ch 7, $\psi$. In this context, the bargaining power of lenders, $\theta_C$, proxies for the level of creditor rights protection.

As a result of the bargaining process, the expected recovery value under Ch 11 and the
expected surplus of the shareholder are, respectively,

\[
R_{e}^{11}(v) = \frac{1}{2} + \frac{[1 - v] \cdot \theta_C \cdot (1 - v)}{2}
\]  
\hspace{1cm} (2)

\[
S_{e}^{F}(v) = \frac{[1 - v] \cdot (1 - \theta_C) \cdot (1 - v)}{2}
\]  
\hspace{1cm} (3)

3.2. The Labour Restructuring

In the first stage, for a given effort choice \(e\) the shareholder bargains with the worker over the wage compensation

\[
NB_{e}^{U} = \max_{v \in [0,1]} \left[ \frac{S_{e}^{F}(v)}{\mathbb{P}[\psi < 1 - v]} \right]^{1 - \alpha(e) \cdot \theta_U} \cdot \left[ \frac{S_{e}^{W}(v)}{\mathbb{P}[\psi < 1 - v]} \right]^{\alpha(e) \cdot \theta_U}
\]  
\hspace{1cm} (4)

that maximizes the nash bargaining product between the expected surpluses of the shareholder \(S_{e}^{F}(v)\) and the expected surplus of the worker \(S_{e}^{W}(v)\)

\[
S_{e}^{W}(v) = \frac{[1 - v] \cdot v}{\mathbb{P}[\psi < 1 - v]}
\]

If Ch 11 fails the case is converted to Ch 7, where both the shareholder and worker get nothing. Substituting (3) in (4) we derive the optimal wage compensation

\[
w = \frac{\alpha(e) \cdot \theta_U}{2}
\]  
\hspace{1cm} (5)

**Proposition 1.** The expected wage compensation upon labour restructuring

\[
S_{e}^{W}(w) = w - w \cdot \mathbb{P}[\psi > 1 - w]
\]  
\hspace{1cm} (6)

decreases with the likelihood that the liquidation value \(\psi\) is higher than the remaining surplus.
The threat of liquidation reduces the bargaining position of the worker. This conclusion is consequence of the enforcement of §1129, the best interest of creditor test. Substituting (5) in the objective function, it is easy to show that - for a given effort level \(e\) - the expected recovery value under Ch 11 and the expected surpluses of the shareholder and worker are, respectively,

\[
R_{e}^{11} = \frac{1}{2} + \theta_C \cdot \left( \frac{1 - \alpha(e) \cdot \theta_U}{2} \right) \cdot \frac{\left(1 - \frac{\alpha(e) \cdot \theta_U}{2}\right)}{1 - w - E[\psi|\psi < 1-w]}
\]

\[
S_{e}^{F} = (1 - \theta_C) \cdot \left( \frac{1 - \alpha(e) \cdot \theta_U}{2} \right) \cdot \frac{\left(1 - \frac{\alpha(e) \cdot \theta_U}{2}\right)}{1 - w - E[\psi|\psi < 1-w]}
\]

\[
S_{e}^{W} = \left( \frac{1 - \alpha(e) \cdot \theta_U}{2} \right) \cdot \frac{\alpha(e) \cdot \theta_U}{w}
\]  

3.3. The Restructuring Effort Problem

Upon entering reorganization, the shareholder chooses the restructuring effort, \(e \in [0, 1]\), that maximizes his claims on the expected surplus of the firm,

\[
V^R = \max_{e \in [0, 1]} S_{e}^{F} - c(e)
\]

By substituting (8), assuming \(c(e) = \frac{e^2}{4} \cdot c_{11}\) and taking first order condition we derive the following proposition.

**Proposition 2.** The optimal level of effort in restructuring labour contracts

\[
e^* = \frac{(1 - \theta_C) \cdot \theta_U / 2 \cdot (1 - \theta_U / 2)}{c_{11} - (1 - \theta_C) \cdot (\theta_U / 2)^2}
\]
• **Property 1:** decreases with the bargaining power of the creditors: \( \frac{\partial e^*}{\partial \theta_C} < 0 \)

• **Property 2:** decreases with the bargaining power of the creditors, especially when workers extract rents: \( \frac{\partial^2 e^*}{\partial \theta_U \partial \theta_C} < 0 \)

Property 1 and Property 2 drives the main result of the paper: when workers extract rents, an increase in creditor rights ought not to increase expected recovery values

\[
R^{11} = \frac{1}{2} \cdot \mathbb{E}[\psi] + \theta_C \cdot \mathbb{P}\left[\psi < 1 - \frac{\alpha(e^*) \cdot \theta_U}{2}\right] \cdot \left(1 - \frac{\alpha(e^*) \cdot \theta_U}{2}\right) \left(1 - \mathbb{E}[\psi | \psi < 1 - \alpha(e^*) \cdot \theta_U]\right) \tag{11}
\]

Upon successful reorganization, creditors recover more, \( \theta_C \), but at the expenses of the shareholders. By Property 1, shareholders have less incentives to restructure labour contracts, making more likely that the reorganization fails

\[
\frac{\partial \mathbb{P}[\psi < 1 - \frac{\alpha(e^*) \cdot \theta_U}{2}]}{\partial \theta_C} < 0
\]

especially when workers extract rents (Property 2).

\[
\frac{\partial^2 \mathbb{P}[\psi < 1 - \frac{\alpha(e^*) \cdot \theta_U}{2}]}{\partial \theta_U \partial \theta_C} < 0
\]

As a result, pro-creditor bankruptcy reforms can backfire. The next section investigate the normative implications of the restructuring channel mechanism, in a model where resources are misallocated because of the presence of an enforcement constraint.

### 4. The Static Model

The economy lasts for one period, and is populated by a representative firm, a representative worker and a mass one of identical lenders. The firm is run by a risk neutral shareholder and
has access to a leontief technology that transforms capital, $k$, and a labour unit in output, $A \cdot \max\{k, \bar{k}\}$. The project scale, $\bar{k}$, denotes the threshold beyond which returns on capital sharply decrease. For simplicity let me assume that $\bar{k} = 1$. After production, the capital fully depreciates. The representative worker owns the firm, supplies a unit of labour inelastically, and consumes his income, $C = w + \Pi$, which consists of a wage, $w$, and firm’s profits, $\Pi$.

In conclusion, there is a competitive market of risk neutral lenders, which own $1^{22}$ unit of capital that can lend to the representative firm or use to produce with a linear technology, $k$. To make the problem interesting, I assume that the firm’s technology is more productive than the lenders’ technology, $A > 1$.

The timing of the model is the following. At the beginning of the period the firm is paired with the worker, and lending takes place. At the end of the period the output is shared among the agents as follows. The shareholder chooses how much to borrow, $k$, to maximize profits

$$A \cdot \max\{k, 1\} - R_k \cdot k - w$$

The interest rate on the loan, $R_k$, and the wage, $w$, determines the shares of output that go to lenders and to the worker, respectively. On one side, price competition in the credit market bids the loan interest rate down to the return on the lenders’ linear technology, $R_k = 1$. On the other side, the surplus of the firm - net of the capital repayment, $k$ - is split between the shareholder and the worker in a nash bargaining fashion,

$$w = \arg \max_v \left( (A - 1) \cdot k - v \right)^{1-\theta_U} \cdot \left[ v - w \right]^{\theta_U}$$

where $\theta_U$ denotes the bargaining power of the worker and $w$ his outside opportunity. Since the worker does not value leisure, $w = 0$.

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22 The fact that the aggregate amount of capital coincides with the project potential is for technical reasons (simplifies the algebra). Footnote 23 explains how.
An equilibrium in this economy is the set of prices \( \{w, R_k\} \) and allocations such that the firm maximizes profits and the bond market clears.

This environment is peculiar. Resources are in the wrong hands: lenders own capital but do not have access to the productive technology, and vice versa the firm. In this economy, the misallocation arises if frictions impede that capital moves from the lenders to the firm. To study it, I compare outcomes under two polar assumptions on the enforceability of debt contracts: perfect and limited.

4.1. Perfect enforceability of debt contracts

If debt contracts are perfectly enforceable, in equilibrium all capital is invested in the firm technology, \( k^* = \frac{1}{23} \). Henceforth, I refer to the output under perfect enforceability of debt contracts

\[ Y^{FB} = A \]  

(12)

as the first best aggregate output, and use it to contrast outcomes under limited enforceability of debt contracts.

4.2. Limited enforceability of debt contracts

This section introduces a twist: after producing, the shareholder can default on his debt obligations by filing either for reorganization (Ch 11) or liquidation (Ch 7). Bankruptcy is costly: upon bankruptcy all output is swiped out. In this environment, the firm value depends on the project scale. The two procedures differ on how they dispose of the project and share the surplus among the stakeholders: the shareholder, the lenders and the worker. Under Ch 7, lenders liquidate the project, net of a clearance loss \( \psi \in U[0, 1] \);

\[ 23 \text{ By assuming that the aggregate capital coincides with the project scale, we have that in first best all capital is invested in the productive technology. Assuming it differently - as long as the aggregate capital is greater than the project scale - would complicate the algebra but would keep unchanged the economic intuition.} \]

\[ 24 \text{ The liquidation clearance loss captures the presence of frictions in the cash-auction procedure. As instance, the \textit{financing problem} and the \textit{lack of competition problem} (See Aghion et al. [1994]). The first} \]
the shareholder and the worker get nothing. Under Ch 11, the project is not liquidated, and it is used to produce. Let \( \zeta = 1 < A \) be the going-concern value of the firm in Ch 11. In Ch 11 all contracts \( \{w, R_k\} \) are annulled, and the shareholder enter in the restructuring channel mechanism described in the previous section.

4.3. Characterization of the equilibrium

The participation constraint, requires the debt repayment \( R_k \cdot k \) to be no larger than the expected recovery value \( L = \max \{ R^{11}, R^7 \} \),

\[
R_k \cdot k \leq L
\]

By price competition in the credit market, \( R_k = 1 \), and the monotonicity of the firm’s preferences over \( k \) we get the equilibrium level of borrowing

\[
k^* = \mathbb{E}[\psi] + \theta_C \cdot \left(1 - \alpha(\psi^*)\cdot\theta_U\right)^2
\]

(13)

Let \( k^* \) denote the fraction of resources that is invested in the firm’s technology. Then, let \( m = (1 - k^*) \) denote the fraction of resources that is misallocated and invested in the un-productive linear technology. Then, the equilibrium output

\[
Y = \left[1 - \frac{(1 - m)}{A} + \frac{1}{A} \cdot \frac{m}{Y_{FB}} \right]
\]

(14)

problem relates to the difficulties in raising big amount of fundings in a brief amount time. The second problem depends on the lack of competition on the bidding sides. See Shleifer and Vishny [2011] for an amplification of the financing problem in recessions due to the congestion of the secondary markets (fire-sales).

\( \zeta \) captures the output disruption occurring during the reorganization: lost of supply-client relationship, best managers, etc..

\( \S 365 \) (a) of the Bankruptcy Code.

The recovery value under bankruptcy has to be greater equal than the recovery value under Ch 7, independently on the procedure.
is smaller than the first best output, $Y^{FB}$. In turn, the misallocation of resources

$$m = 1 - \left( E[\psi] + \theta_C \cdot \frac{\left(1 - \frac{\alpha(e^* \cdot \theta_U)}{2}\right)^2}{2}\right)$$

depends on the level of creditor rights protection and bargaining power of workers, $(\theta_U, \theta_C)$.

### 4.4. Normative Analysis

What is the (optimal) output maximizing level of creditor rights? To answer this question I study the problem of a social planner which takes as given the bargaining power of the worker, and maximizes output by choosing the level of creditor rights protection, $\theta_C$. This problem is equivalent to the one of minimizing the misallocation of resources

$$\max_{\theta_C \in [0,1]} Y(\theta_C; \theta_U) = \max_{\theta_C \in [0,1]} \theta_C \cdot \frac{\left(1 - \frac{\alpha(e^*(\theta_C, \theta_U) \cdot \theta_U)}{2}\right)^2}{2} \quad (15)$$

**Proposition 3.** In an interior solution\(^{28}\), the optimal level of creditor rights

$$\theta^*_C(\theta_U) = \frac{c_{11}}{2 - c_{11}} \left[\frac{4}{\theta_U} - 1\right] \quad (16)$$

decreases with the bargaining power of the worker.

The existence of a blissful point in the social planner problem is consequence of the countervailing effect that the increase in creditor rights has on the likelihood of success of reorganization (Property 1), especially when workers extract rents (Property 2). In economies where worker extract a lot of rents, an increase in creditor rights can increase the misallocation of resources, by suffocating the incentives to restructure labour contracts in reorganization.

\(^{28}\) When $\zeta > (1 - \psi)$, or equivalently when, $R^{11} > R^7$. 

16
This result might shed light on why more unionized countries - as Italy, France - have lower creditor rights protection than less unionized ones - say, U.S.

5. Empirical Analysis

To test the positive implications of the restructuring channel mechanism, I collect firm level accounting data from Compustat North-America Fundamentals Annual, bankruptcy information from the UCLA LoPucki Bankruptcy Research Database and a proxy for the bargaining power of workers from the Union Membership and Coverage database (CPS)\(^{29}\), for the period 1979-2012. I then exploit two sources of variations: a shift towards a more pro-creditor bankruptcy reorganization process that has interested the U.S. in the late 90s (\textit{time dimension}), and historical differences in the degree of unionization across states (\textit{geographical dimension}).

Because of the absence of a control group, these findings do not have a causal interpretation and should be interpreted as suggestive.

5.1. The Shift in the Creditor Rights Protection Regime

Ch 11 looks nowadays more creditor-friendly than it did 30 years ago\(^{30}\): when did the shift in creditor rights protection regime happen? Since an increase in creditor rights makes the reorganization procedure less attractive than its liquidation alternative, I identify the shift as the structural break in the relative use of the bankruptcy procedures. Two bankruptcy filing regimes emerge from the plot of annual filings for Ch 7 liquidation and Ch 11 reorganization by publicly traded firms from 1979 to 2012 (Fig. 1, Compustat data): while Ch 11 filings dominates Ch 7 filings in the pre-1998 period\(^{31}\), the liquidation alternative is steadily more

\(^{29}\) The interested reader can refer to Appendix A for a detailed description of the data.

\(^{30}\) Baird and Rasmussen \citeyear{baird2003}, Ayotte and Morrison \citeyear{ayotte2009} sustain that the reorganization process is now in the hands of the creditors. Warren and Westbrook \citeyear{warren2003} pushes this argument further, by claiming that the debt-in-possession era has meet his end at the hands of the secured-party-in-possession era.

\(^{31}\) With the exception of 1979-1980, Ch 11 filings always exceeds Ch 7 filings.
attractive in the ever after. The Quandt-likelihood-ratio test - for the presence of a structural 
break at an unknown date in the number of annual Ch 11 filings - corroborates the eye-ball 
inspection of a break in 1998 (Fig. B.5).

Figure 1: Annual Ch 7 and Ch 11 filings

(NAICS 52) and public administration (NAICS 92) corporations, American Depository Receipts (ADR).

The legal literature substantiates this finding (narrative approach). Warren [1999] and 
Miller [2007] explanations point at financial institutions lobbying for their bankruptcy agenda 
in 1997-1998\(^{32}\).

5.2. The U.S. Unionization Regions

I proxy the bargaining power of workers with the unionization coverage - the fraction of 
all employed civilian wage and salary workers covered by a collective bargaining agreement

\(^{32}\) In Warren [1999], professor at Harvard Law School Elizabeth Warren says and I quote ‘According to the 
bankruptcy agenda - an amount matched only by the enormous tobacco lobby. One can only dream about how 
many millions were spent when lobbying intensified during 1998.’. Miller [2007] reinforces this argument, 
arguing that these efforts have been channelled not only in the consumer bankruptcies but also on provisions 
related to Ch 11 reorganization. These provisions became statutory with the enactment of the Bankruptcy 
of the U.S. state where the firm’s headquarter is located. I then organize U.S. states in two regions based on their historical levels of unionization. I assign states to the highly [lowly] unionized region if their 1983-2014 average coverage is above [below] the median of the U.S. states 1983-2014 average coverages. Figure 2 displays the results: highly unionized region in dark-blue and lowly unionized region in light-blue.

Figure 2: Time series average coverage rate by unionization region over the period 1983-2014

![Map of the United States with states colored in dark-blue and light-blue.](image)

Note: U.S. States organized in highly unionized (13.9%, dark blue) and lowly unionized (6.7%, light blue) region. Source: Union Membership and Coverage database (CPS), 1983-2014.

The stability of the cross-sectional standard deviation of the U.S. states unionization coverage over time suggests that the cross-sectional long-run unionization coverage rankings was preserved over time (Figure B.6, Appendix B.2).

5.3. The Testable Implications of the Restructuring Channel Mechanism

The restructuring channel has clear positive implications on the relative effect of pro-creditor bankruptcy reforms. An increase in creditor rights suffocates the incentives of shareholders to restructure labour contracts and makes more likely that reorganizations fail. This effect is stronger when workers extract rents and a successful restructuring of labour contracts is required for the reorganization to succeed (H1: intensive margin channel). The reduction in the firms’ expected value under reorganization makes ex-ante the reorganization procedure less attractive than the liquidation alternative, tilting firms’ bankruptcy choices.
Firms tend to file more for Ch 7 than for Ch 11, especially when workers extract rents and firms experience a stronger drop in the likelihood of success of Ch 11 (H2: extensive margin channel). Since creditors recover less in liquidation than in reorganization (Bris et al. [2006]), the drop in expected recovery values triggers general equilibrium dynamics that affect firms’ financing decisions. As workers rents increase and the debt service gets more expensive, it is more costly for the firms to target the optimal debt-equity ratio. Firms reduce the speed of adjustment of the leverage ratio (H3: increase in the cost of adjustment of the capital structure), and - in the spirit of Almeida et al. [2004] - cope with an increase in the external financing cost associating the dividend smoothing with lower level of dividends (H4 - higher speed of adjustment of dividends and lower level of dividends).

I test the positive implications of the theory by looking at the differential effect of pro-creditor bankruptcy reforms on lowly unionized firms, \(d_{1998}\) - dummy variable which takes value 1 after the break in 1998 - and highly unionized firms, \(d_{>1998} \cdot d_U\), where \(d_U\) takes value 1 when a firm is located in a highly unionized state. The order of the columns in Table 1 mirrors the unfolding of the mechanism.

The probit regression in Column 1 investigates the relative effect of pro-creditor bankruptcy reforms on the likelihood of success of reorganization. The sample includes the population of voluntary filings for bankruptcy reorganization by publicly listed firms whose reorganization plan is confirmed or that are converted to Ch 7 liquidation at disposition date (UCLA LoPucki Bankruptcy Research Database). I define a successful reorganization as a dummy variable that takes value 1 if the reorganization plan is confirmed and the firm emerges against the alternative that it is converted to Ch 7 liquidation\(^{33}\). Standard t-tests on the estimated coefficients \(d_{1998}, d_{>1998} \cdot d_U\) corroborates the positive implications of the theory. While we can reject a statistically significant effect of an increase in creditor rights on the likelihood of

\(^{33}\) Results are robust to stronger definitions of successful reorganization that require that firms do not refile for bankruptcy reorganization.
Table 1: The Restructuring Channel Mechanism

<table>
<thead>
<tr>
<th></th>
<th>Likelihood Success</th>
<th>Ch 11/Ch 7</th>
<th>Leverage</th>
<th>Dividends</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>H1</td>
<td>H2</td>
<td>H3</td>
<td>H4</td>
</tr>
<tr>
<td>( d_{&gt;1998} )</td>
<td>0.443</td>
<td>-0.310***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.303)</td>
<td>(0.075)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( d_{&gt;1998} \cdot d_U )</td>
<td>-4.793***</td>
<td>-0.610***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.276)</td>
<td>(0.095)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \text{Leverage}<em>{t-1} \cdot d</em>{&gt;1998} )</td>
<td>0.001</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.011)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \text{Leverage}<em>{t-1} \cdot d</em>{&gt;1998} \cdot d_U )</td>
<td>0.016**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.008)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \text{Div}<em>{t-1} \cdot d</em>{&gt;1998} )</td>
<td>0.225**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.106)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( \text{Div}<em>{t-1} \cdot d</em>{&gt;1998} \cdot d_U )</td>
<td>-0.202*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.105)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>( TP^* \cdot E_{i,t} \cdot d_{&gt;1998} )</td>
<td>-0.027***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.006)</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Time dummies</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Firms Controls</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Observations</td>
<td>273</td>
<td>8,008</td>
<td>20,486</td>
<td>22,772</td>
</tr>
<tr>
<td>( \hat{\beta}<em>{&gt;1998} + \hat{\beta}</em>{&gt;1998,U} ) ; s.e.</td>
<td>-4.350</td>
<td>-0.920</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.19</td>
<td>0.06</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Regression coefficients, Standard error clustered at state level in parenthesis

\* \( p < 0.1, \; \ast \ast \; p < 0.05, \; \ast\ast\ast \; p < 0.01 \)

Note: **Column (1) - Likelihood of Success of Ch 11**: Probit of Ch 11 cases confirmed (=1) vs. Ch 11 converted to Ch 7 (=0) over: 1) Treatment variables: structural break, \( d_{>1998} \), unionization dummy, \( d_U \), interaction term, \( d_{>1998} \cdot d_U \); 2) Firms level controls: log real total assets, \( a_{t,i}/P_t \), leverage, \( b_{t,i}/a_{t,i} \).

**Column (2) - Bankruptcy Choice**: Probit of Ch 11 (=1) vs. Chapter 7 (=0) over: 1) Treatment variables: structural break, \( d_{>1998} \), unionization dummy, \( d_U \), interaction term, \( d_{>1998} \cdot d_U \); 2) Firms level controls: age, Asset Tangibility, Market to Book Value Ratio, log real total assets, \( a_{t,i}/P_t \). Leverage is measured as total liabilities over total assets (compustat identifiers: it, at).

**Column (3) - Leverage**: Fixed effect regression of change in the Leverage Ratio, \( \Delta b_{t,i}/a_{t,i} \) over: 1) Treatment variables: premultiplication of the level of the lagged dependent variable for: a) structural break, \( d_{>1998} \), unionization dummy, \( d_U \), interaction term, \( d_{>1998} \cdot d_U \); 2) Firms level controls: age, Asset Tangibility, Market to Book Value Ratio, log real total assets, \( a_{t,i}/P_t \). Leverage is measured as total liabilities over total assets (compustat identifiers: it, at).

**Column (4) - Dividends**: Fixed effect regression of change in Dividends (per share), \( \Delta \text{Div}_{t,i} \) over: 1) Treatment variables: premultiplication of the level of the lagged dependent variable for: a) structural break, \( d_{>1998} \), unionization dummy, \( d_U \), interaction term, \( d_{>1998} \cdot d_U \); 2) Firms level controls: earnings (per share). Source: Compustat North-America Fundamentals Annual, 1979-2012. Union Membership and Coverage database (CPS), 1983-2014.
success of reorganization of lowly unionized firms, we cannot reject a 46% statistically and economically significant drop in the likelihood of success of reorganization of highly unionized firms (H1: intensive margin channel). Results are robust to different specification of the correlation structure of the errors (clustering at industry and state level) and to the inclusion of: variables proxying the complexity of the process (number of days in bankruptcy), CEO replacement at filings, presence of 363 sale, variable proxying for forum shopping decisions (See Table B.7).

The probit regression in Column 2 focuses on the population of publicly listed firms in bankruptcy and explores the relative effect of pro-creditor bankruptcy reforms on the probability of filing for Ch 11 reorganization versus Ch 7 liquidation. The model does not reject an economically significant 11% fall in the likelihood of filing for Ch 11 of lowly unionized firms, even more pronounced (-36%) for highly unionized firms (H2: extensive margin channel).

The table turns then to the general equilibrium implications of changes in the corporate bankruptcy phenomenon on two dimensions of the firms’ financing decision: debt and dividend smoothing. I use the speed of adjustment proposed in the partial equilibrium models of Flannery and Rangan [2006] and Leary and Michaely [2011] to measure differences in the degree of debt and dividend smoothing. I then run a linear fixed effect regression of changes in the leverage ratio (Column 3) and dividend ratio (Column 4) on their lagged values, interaction of the lagged value with the regressors of interest (d_{1998}, d_{>1998} \cdot d_U), and a proxy of the target ratios using firms’ characteristics. The empirical models do not reject a reduction in the speed of adjustment of the leverage ratio, a reduction in the targeted dividends per share and an increase in the speed of adjustment of the dividend payout policies: it takes almost a week more per year for firms to adjust the leverage ratio (H3: increase in the cost of adjustment of the capital structure), firms reduce their targeted payout ratio by 2.7% (per unit of earnings) and reduce by a quarter of year the time required to adjust their dividend
payout policy (H4 - higher speed of adjustment of dividends and lower level of dividends).

6. The Dynamic Model

The economy is populated by firms, credit intermediaries and a household. In the economy there are two regions. Regions differ by the bargaining power of workers - highly and lowly unionized - and by the measure of firms\textsuperscript{34}.

Firms are run by risk neutral shareholders\textsuperscript{35}, who maximize the expected discounted stream of dividends. They articulate in two types: incumbents and entrants.

There is a continuum of incumbents, which differ by the region where they are located, their (fixed) capital scale of production, their (fixed) productivity and their histories. The incumbents are the producing firms in the economy. They combine capital and labour into a decreasing returns-to-scale technology and experience uninsurable persistent idiosyncratic productivity shocks. The labour cost varies across regions and across firms: the (region-specific) bargaining power of workers determine the fraction of the (firm-specific) surplus that is extracted by workers. Incumbents finance investment and dividends using internal and external funds: retained profits, one-period non-contingent loans and equity issuance. Incumbents can renege on their debt obligations and default. In compliance with the bankruptcy law, they have access to two bankruptcy procedures: liquidation (Ch 7) and reorganization (Ch 11). In Ch 7 an incumbent relinquishes all its assets to the creditors (net of a liquidation loss) and exits from the market; workers are laid off. Conversely, in Ch 11 an incumbent enters in a reorganization procedure with the other stakeholders: workers and creditors. The process articulates in a two stage [nash] bargaining with workers (first)

\textsuperscript{34} The household and the credit intermediaries abstract from the spatial dimension.
\textsuperscript{35} The model abstracts from agency frictions arising from the separation of governance and control. Recent empirical studies suggests that managers vs shareholders does not characterize the key tension in large corporate reorganizations, where 70\% of CEO are replaced within 2 years of the bankruptcy filing (Ayotte and Morrison [2009]).
and creditors (later) over labour and debt contracts. The success of the Ch 11 procedure is stochastic. If the reorganization fails, the case is transferred to Ch 7. By exerting costly effort in restructuring labour contracts, the firm can increase the likelihood of success of the procedure.

In each period, a positive mass of potential entrants starts production with a time-to-build lag. At entry, each firm draws a region, a capital-scale, and a permanent productivity level, that remain fixed over life. Then it draws a persistent idiosyncratic productivity shock and decide whether to actually enter or not. Actual entrants finance their capital scale by issuing equity or debt.

Firms have access to a competitive financial sector with free entry. Each financial intermediary offers a menu of loan sizes and interest rates to firms, wherein each loan makes zero expected profits.

In conclusion, the representative household owns the firms, saves in the credit market, supplies inelastically labour to firms, and consumes out of the wage income, returns on savings and the aggregate amount of dividends distributed by firms.

6.1. The State of the Incumbents

An incumbent is defined as a tuple \((r, k, z, b, x)\) where: \(r \in \mathbb{R} \equiv \{L, H\}\) is the index of the location, where \(L \ [H]\) denotes the lowly [highly] unionized region; \(k \in \mathbb{K} \equiv [k_{\text{min}}, k_{\text{max}}] \subset \mathbb{R}^+\) is the physical capital stock scale, as drawn at entry; \(z \in \mathbb{Z} \equiv [z_{\text{min}}, z_{\text{max}}]\) denotes the permanent productivity, as drawn at entry; \(x \in \mathbb{X} \equiv [x_{\text{min}}, x_{\text{max}}] \subset \mathbb{R}^+\) is an uninsurable idiosyncratic productivity shock; \(b \in \mathbb{B} \equiv \{b_{\text{min}}, \ldots, b_{\text{max}}\} \subset \mathbb{R}\) is the amount of outstanding debt/savings, where \(\mathbb{B}\) is a finite set with cardinality \(|\mathbb{B}|\), and \(b_{\text{min}} < 0, b_{\text{max}} > 0\).

To simplify notation, I summarize with \(\mathbb{p} \equiv (r, k, z) \in \mathbb{P} \equiv \mathbb{R} \times \mathbb{K} \times \mathbb{Z}\) the permanent characteristics, and with \(\mathbb{s} \equiv (b, x) \in \mathbb{S} \equiv \mathbb{B} \times \mathbb{X}\) the endogenous state variables.
6.2. The Production Technology

Firms use capital, $k$, and labour, $n \in N \equiv [n_{\text{min}}, n_{\text{max}}] \subset \mathbb{R}_+$, to produce an homogeneous consumption good, $y \in Y \subset \mathbb{R}_+$, using a decreasing returns-to-scale production technology,

$$y(p, x, n) \equiv (z \cdot x)^{(1-\alpha\eta)}(k^{1-\alpha}n^\alpha)^{\eta} \quad (17)$$

where $\eta$ is the decreasing return to scale parameter and $\alpha$ is the value-added share of labour. The idiosyncratic productivity, $x$, follows a stochastic process defined on the measurable space $(X, \mathcal{B}(X))$ with transition function $Q(x, dx')^{38}$, where hereafter $\mathcal{B}(\cdot)$ denotes the Borel algebra on $X$. The operating profits are

$$\pi(p, s, n) \equiv y(p, x, n) - w(p, s, n) \cdot n - \chi_o \quad (18)$$

where the wage contracts $(p, s, n, w(p, s, n)) \in W(p, s, n)$ are firm specific and determined through nash bargaining, as described in Section 6.7. To produce the firm has to incur a fixed maintenance cost of operation, $\chi_o$. Capital depreciates at rate $\delta$. Thereby, to maintain a constant capital scale, investment equals $i = \delta k^{39}$.

---

36 The normalization parameter $(\cdot)^{1-\alpha\eta}$ on the actual productivity level, $z \cdot x$, ensures that the firm’s profit function after wage compensation $\pi(p, s)$ is linear on $z \cdot x$

37 The parameter $(1 - \eta)$ is sometimes referred to as the span of control (Lucas [1978]).

38 I assume that $Q(x, dx')$ is continuous on $(x, x')$, is decreasing in a first order stochastic dominance sense on $x$. This property is satisfied by many processes - e.g. the first order autoregressive process on which I focus in the calibration - and capture the idea that the higher is the idiosyncratic productivity today, the more likely it will be higher tomorrow. On the top of that, I assume that $Q(x, dx')$ satisfies the Feller property.

39 The result follows from the law of motion of capital $k' = (1 - \delta)k + i$ and the fact that $k' = k$. 

---

25
6.3. The Financing Technology

Incumbents finance investment using retained profits, one-period non-contingent loans and equity issuance\(^{40}\). Let

\[ g(d) \equiv \left[ \mathbb{I}_{\{d \geq 0\}} + \iota \cdot \mathbb{I}_{\{d < 0\}} \right] \cdot d \]

denote the flow of dividends [equity issuance] \( d \in D \equiv [\underline{d}, \bar{d}] \subset \mathbb{R} \) between the household and the firm. Henceforth, as a convention, let \( \mathbb{I}_{\{y\}} \) denote an indicator function, which takes value 1 when \( y \) is true. The previous formula says that firms can issue equity by setting \( d < 0 \) and incurring an additional proportional cost, \( \iota > 1 \).\(^{41}\)

The presence of a default option yields a substantial departure of the loan-market arrangement from the Arrow-Debreu world. This departure formalizes in the device of firm specific one-period non-contingent loan contracts, \((p, x, b', q(p,x,b'))\), where \( q : P \times S \to Q \) is the pricing function in the space of continuous and bounded functions \( C^Q \), with \( Q \equiv [0, q_{\max}] \subset \mathbb{R} \), \( 0 \leq q_{\max} \leq 1 \). In particular, a firm with characteristics \((p, x)\) is allowed to save \((b' < 0)\) or borrow \((b' > 0)\) at the price \( q(p,x,b') \). This specification highlights the dependence of the loan price on five key firms characteristics: the permanent \((z)\) and persistent productivity \((x)\), the assets \((k)\), the region \((r)\), and the size of the loan \((b')\). If shocks are persistent\(^{42}\), a high productivity today, \( x \), predicts a higher productivity next period. Thereby, the firm is less likely to default and can issue debt at a higher price. Similar argument holds for \( z \). A higher capital scale, \( k \), yields a larger collateral, which tempers creditors’ losses upon default, and mitigates downward pressures on the debt price. The region, \( r \), affects the labour cost and therefore the firm’s profitability; by doing so, it alters the likelihood of financial distress and the associated interest rate on debt. In conclusion,

\(^{40}\) To maintain tractable the state space, I do not consider the outright hierarchical layers of ownership (bonds, debentures, preferred equity, common equity) but just a neat pattern of layered debt and equity.

\(^{41}\) Following the literature, equity issuance is expensive (Hennessy and Whited [2007]).

\(^{42}\) If productivity shocks were i.i.d., the price \( q \) would not depend anymore on the current \( x \).
larger loans increase the probability of default and commands higher interest rates.

As a result, firms preferences over the financing sources are in line with the pecking order theory: first retained profits, then debt and only then equity issuance. In equilibrium, the equity issuance cost, \(i - 1\), establishes a lower bound to the debt price.

6.4. The Firm Choices

Firms take ordinary decisions \((n, d, b')\), and extra-ordinary decisions. In particular, they decide whether to continue \((\phi_X = 0)\) or exit \((\phi_X = 1)\). Upon exit, they decide whether to default \((\phi_D = 1)\) or repay the debt \((\phi_D = 0)\). If they default, they have to choose the bankruptcy procedure: reorganization \((\phi_R = 1)\) or liquidation \((\phi_R = 0)\).

6.5. The Bankruptcy Law Technology

The bankruptcy procedures formalize the legal ways by which firms can repudiate their debt obligations. In the model, a bankruptcy procedure, \(\phi_R\), is: 1) a set of stipulations, \(S_{\phi_R}^R \in \mathbb{R}^3\), on firms’ ordinary decisions, \((n, d, b')\); 2) a legal environment whereby stakeholders agree on how to split the surplus; 3) a resolution about the existence of the firm as a going concern.

6.5.1. Bankruptcy Liquidation

In bankruptcy liquidation \((\phi_R = 0)\), a firm does not produce, and cannot take any ordinary decision \((n, d, b')\), \(S_0^R(p, s) \equiv \emptyset\). Creditors seize the collateral of the firm - which consists of undepreciated capital -

\[
R^7(p, s) \equiv \min \{ b , (1 - \psi)(1 - \delta)k \}
\]  

\(\text{Equation 19}\)

\(^{43}\) The definition of stakeholders include: shareholders, workers and credit intermediaries.

\(^{44}\) Indeed, in Ch 7 the firm ceases the ordinary activity. The judge appoints a trustee with the precise purpose of marshalling the assets of the firm and reimburse the creditors.
suffering a liquidation clearance loss, $\psi \in (0, 1)$, which captures frictions in the cash-auction procedure\textsuperscript{45}. Workers and shareholders get nothing. Once the firm is liquidated, it exits the market.

6.5.2. Bankruptcy Reorganization

During bankruptcy reorganization, a firm cannot distribute dividends, and cannot save\textsuperscript{46,47}

$$S_1^R(p, s) \equiv \left\{ (n, d, b') \in N \times D_\times B_+ : 
\begin{align*}
&d - q(p, x, b')b' + k \leq y(p, x, n) - w^R(p, s, n) \cdot n - \chi_o + (1 - \delta)k - \alpha^C(p, s)b
\end{align*}
\right\} \quad (20)$$

The reorganization procedure involves a two stage nash bargaining, first with workers over labour contracts, $w^R(p, s)$, and then with creditors over debt contracts, $\alpha^C(p, s)b$. Reorganizations can fail. By exerting costly effort (in restructuring labor contracts) the firm can increase the likelihood of success. Section 6.8 elaborates the details.

6.6. The Timing

The timing is the following: i) productivity shocks realize and incumbents decide ii) whether to continue, to exit or to default; iii.a) if they continue, they produce and take dividend, investment and financing decisions; iii.b) if they exit, they sell the assets, and use the proceedings to repay the debt and distribute dividends (if any); iii.c) if they file for liquidation, they do not produce and exit the market; iii.d) if they file for reorganization, they produce, restructure labour expenses, bargain over a debt haircut and take financing decisions (\textit{jointly} with the creditors); if the reorganization succeeds they continue, otherwise they are liquidated.

\textsuperscript{45} As instance, the \textit{financing problem} and the \textit{lack of competition problem} (See Aghion et al. [1994]). The first problem refer to the difficulties of raising large fundings in short time. The second problem arise from the lack of competition on the bidding sides. See Shleifer and Vishny [2011] for a study of the amplification of the \textit{financing problem} in recessions due to the congestion of the secondary markets (fire-sales).

\textsuperscript{46} These restrictions arise from an application of the Absolute Priority Rule: to secure the higher priority of creditors’ claims over the shareholders’ ones, most bankruptcy laws do not allow firms to divert funds (by distributing dividends or save).

\textsuperscript{47} $Y_- = Y \setminus \mathbb{R}_{++}$, and $Y_{++} = Y \setminus \mathbb{R}_-$. 

28
6.6.1. The Incumbents

Let the value $V : P \times S \rightarrow \mathbb{R}$ of an incumbent $(p, s)$ be

$$V(p, s) = \max_{\phi} \left\{ \max_{\phi_X} \left\{ V^C(p, s), \max_{\phi_R} \left\{ V^X(p, s), \max_{\phi_D} \left\{ V^R(p, s), V^L(p, s) \right\} \right\} \right\} \right\}$$

(21)

where

$$V^X(p, s) = (1 - \delta)k - b$$

denotes the value at exit,

$$V^L(p, s) = 0$$

denotes the value of liquidation, and $V^C(p, s), V^R(p, s)$ denote the value of a firm that decides, respectively, to continue and reorganize, as characterized in the following sections.

6.7. The Continuation Problem

Let

$$V^C(p, s) = \max_{(n,d,b') \in N \times D \times B} g(d) + \beta \cdot \mathbb{E}_{x'|x} \left[ V(p, s') \right]$$

(22)

s.t. $d \leq y(p, x, n) - w(p, s, n) \cdot n - x_o - \delta k + q(p, x, b')b' - b$

$$(p, s, n, w(p, s, n)) \in W(p, s, n)$$

describe the problem of a firm that decides to continue. The menu of wage contracts $(p, s, n, w(p, s, n)) \in W(p, s, n)$ defines the wage compensation $w(p, s, n)$ to be paid by a firm $(p, s)$ that hires $n$ workers. Let $\theta_U(r) \in [0, 1]$ denote the bargaining power of workers, which varies across regions, with $\theta_U(L) < \theta_U(H)$. Let $w : P \times S \times N \rightarrow W \equiv [0, w_{\text{max}}]$ be the wage function in the space $C^W(P \times S \times N)$ of continuous functions bounded between $[0, w_{\text{max}}]$.  

29
Then, I can define the wage correspondence \((Ww) : W \subseteq \mathbb{R}^+ \rightarrow \mathbb{R}^+\) as

\[
(Ww)(p, s, n) \equiv \arg \max_{v \in W} V^C_{v,n}(p, s)^{(1-\theta_U(r))} \cdot [v \cdot n - w \cdot n]^{\theta_U(r)}
\]  

\[\text{s.t. } V^C_{v,n}(p, s) \geq 0, \quad v \geq w\]

where \(w\) is the wage that satisfies the free entry condition, as specified in Section 6.9.1 and

\[
V^C_{v,n}(p, s) \equiv \max_{b' \in B} \left[ y(p, x, n) - \delta k - \chi_o + q(p, x, b') \cdot b' - b - v \cdot n \right] + \beta \mathbb{E}_{x'|x} \left[ V(p, s') \right] ;
\]

is the continuation value when the wage is \(v\) and the number of workers hired is \(n\).

**Theorem 1.** There exists a unique \(w^* \in C(W(p \times s \times N))\) such that \(w^* = (Ww)^*\).

**Proof.** See Appendix E.1.

**Proposition 4.** Given a number of workers, \(n\), and a continuing firm \((p, s)\), in an interior solution:

- the nash bargaining surplus is

\[
S(p, s, n) \equiv \max_{b' \in B} \left[ y(p, x, n) - \delta k - \chi_o + q(p, x, b') \cdot b' - b - w \cdot n + \beta \cdot \mathbb{E}_{x'|x} \left[ V(p, s') \right] \right] \cdot \mathbb{E}_{d \geq 0} \cdot \mathbb{E}_{d < 0} \cdot \mathbb{I}_{d \geq 0} + \mathbb{I}_{d < 0} \cdot \mathbb{I}_{d < 0} \cdot \mathbb{E}_{x'|x} \left[ V(p, s') \right] \]
\]

(24)

- the wage compensation is

\[
w(p, s, n) \cdot n = w \cdot n + \theta_U(r) \cdot S(p, s, n)
\]

(25)

Accordingly, the continuation problem (22) can be rewritten as

\[
V^C(p, s) = (1 - \theta_U(r)) \max_{n \in N} S(p, s, n)
\]

(26)

**Proof.** See Appendix E.2.
Proposition (4) says that the continuation problem (22) boils down to (26): the firm chooses \((n, b')\) to maximize the share of expected discounted value of future dividends that is not extracted by workers, (26). Appendix E.2 discusses the separability of the max operator over the firm’s choices, \(b'\) and \(n\). Proposition 5 characterizes the problem.

**Proposition 5.** The labour demand, \(n^*\), and output, \(y^*\), of firm \((p, s)\) are

\[
n^*(p, s) = z \cdot x \cdot \left(\frac{\alpha \eta}{w}\right)^{\frac{1}{1-\alpha \eta}} k^{\frac{(1-\alpha \eta)}{1-\alpha}} \quad (27)
\]

\[
y^*(p, s) = z \cdot x \cdot \left(\frac{\alpha \eta}{w}\right)^{\frac{1}{1-\alpha \eta}} k^{\frac{(1-\alpha \eta)}{1-\alpha}} \quad (28)
\]

**Proof.** See Appendix E.2. \(\square\)

Proposition 5 says that the firm’s labour demand does not depend on \(w(p, s, n)\), but on the outside opportunity cost, \(w\). In words, this result means that firm and workers’ interests are aligned in making the pie as big as possible, \(S(p, s, n^*)\), and contrast only on how to split it, \(w(p, s, n^*)\). It also means, that the class of wage contracts studied is the weakest, in the sense that it does not directly distort ordinary decisions - say, to generate inefficient size choices - but it distorts directly only extensive margin ones: entry, exit and default.

Substituting the optimal choices, the wage compensation becomes

\[
w(p, s) = w + \theta_U \cdot \frac{S(p, s, n^*)}{n^*} \quad (29)
\]

### 6.8. The Reorganization Problem

Let

\[
V^R(p, s) = \max_{e \in E} \alpha^R(e; \theta_U(r)) \cdot \left[ \max_{\{n, d, b'\} \in N \times D_+ \times B_+} g(d) + \beta \cdot E_{x'|x} \left[ V(p, s') \right] \right] - c(e)
s.t. \quad d \leq y(p, x, n) - \underbrace{w^R(p, s, e, n)}_{\text{Labour Restructuring}} - n - \chi_o - \delta k + q(p, x, b') \cdot b' - \underbrace{\alpha^C(p, s, e, n, w^R(p, s, e, n))}_{\text{Debt Restructuring}} \cdot b
\]

\[
(p, s, e, n, v, \alpha^C(p, s, e, n, v)) \in A^C(p, s, e, n, v)
\]

\[
(p, s, e, n, w^R(p, s, e, n)) \in W^R(p, s, e, n)
\]

\[31\]
describe the problem of a firm that decides to file for Ch 11. In reorganization, shareholders enter in a two stage nash bargaining, first with workers over the wage compensation $w^R$ (labour restructuring problem) and then with creditors over the debt haircut $\alpha^C$ (debt restructuring problem). The timing reflects the super-priority that the U.S. Corporate bankruptcy law recognizes to workers claims over creditors’ ones on the firm’s surplus. The reorganization succeeds with probability $\alpha^R(e, \theta_U(r))$, that depends on the restructuring effort, $e$, and the regional bargaining power of workers, $\theta_U(r)$. By backward induction, shareholders solve, first, the debt restructuring problem (for a given effort choice, number of workers, and wage), and then the labour restructuring problem (for a given effort choice). In conclusion, upon entering reorganization, they choose the effort that maximizes their share of the expected discounted value of future dividends net of a restructuring cost. The next sessions develop the details.

6.8.1. The Debt Restructuring

In the second stage, for a given effort choice, $e$, number of workers, $n$, and wage, $v$, shareholders bargain with the credit intermediaries over the due recovery rate $a \in [0, 1]$ on the defaulted loan, $b$. Let the expected surplus of a firm $(p, s)$ that files for reorganization be

$$S^F_{e,n,v}(p,s;a) \equiv \alpha^R(e; \theta_U(r)) \cdot \max \left\{ \max_{b' \in B_+} v \cdot \left[ y(p,x,n) - v \cdot n - \chi_o - \delta k + q(p,x,b') \cdot b' - ab \right] + \beta \cdot E_{x' \mid x} \left[ V(p,s') \right], 0 \right\}$$

s.t. $y(p,x,n) - v \cdot n - \chi_o - \delta k + q(p,x,b') \cdot b' - ab \leq 0 \quad \text{(Equity Issuance)} \quad (32)$

Let the credit intermediaries surplus be

$$S^C_{e,n,v}(p,s;a) \equiv \min \left\{ b, \max[\alpha^R(e; \theta_U(r)) \cdot a \cdot b + (1 - \alpha^R(e; \theta_U(r))) \cdot R^T(p,s), R^T(p,s)] \right\}$$

Best Interest of creditors test

(33)
The minimum operator controls for the fact that creditors cannot recover more than the outstanding debt. Conversely, the maximum operator formalizes the following legal requirements - sometimes referred to as the best interest of creditors test\textsuperscript{48}: it is responsibility of the judge to guarantee that creditors recover under Ch 11 at least as much as under Ch 7.

Let $\theta_C \in (0, 1)$ denote the bargaining power of creditors and $\alpha^C : P \times S \times E \times N \times W \to \mathbb{R}^+$ denote the Ch 11 recovery rate function. Then, I can define the reorganization recovery rates correspondence $(A^C \alpha^C) : \mathbb{R}^+ \to \mathbb{R}^+$ as

\[(A^C \alpha^C)(p, s, e, n, v) \equiv \arg \max_{a \in [0, 1]} \left\{ \left[ S_{e,n,v}^F (p, s; a) \right]^{(1-\theta_C)}, \left[ S_{e,n,v}^C (p, s; a) \right]^{\theta_C} \right\} \] (34)

s.t. $S_{e,n,v}^F (p, s; a) \geq 0$, $S_{e,n,v}^C (p, s; a) \geq 0$

Theorem 2. There exists a unique $\alpha^{C,\ast} \in \mathcal{C}^A(P \times S \times E \times N \times W)$ such that $\alpha^{C,\ast} = (N \alpha^{C,\ast})$.

Proof. See Appendix E.1. \qed

Proposition 6. Given $(e, n, v)$, and a reorganizing firm $(p, s)$, in an interior solution:

- the nash bargaining surplus is

\[ S_{e,n,v}^R (p, s) \equiv \max \left\{ \max_{b' \in B^+} y(p, x, n) - \chi_o + q(p, x, b')b' - \delta k - vn + \beta \cdot \frac{1}{\iota} \cdot E_{x'|x} [V(p, s')] - R^7(p, s), 0 \right\} \] (35)

- the expected Ch 11 recovery value is

\[ R_{e,n,v}^{11} (p, s) \equiv \alpha^C (p, s, e, n, v) b = R^7(p, s) + \alpha^R(e; \theta_V (r)) \cdot \theta_C \cdot S_{e,n,v}^R (p, s) \] (36)

\textsuperscript{48} Pursuant to §1129 of Ch 11 impaired class of claims or interests ‘will receive or retain under the plan on account of such claim or interest property of a value, as of the effective date of the plan, that is not less than the amount that such holder would so receive or retain if the debtor were liquidated under chapter 7 of this title on such date.
- the share of expected surplus that goes to shareholders is

\[ S_{e,n,v}^F(p,s) \equiv \alpha R(e; \theta_U(r)) \cdot (1 - \theta_C) \cdot \iota \cdot S_{n,v}^R(p,s) \] (37)

**Proof.** See Appendix E.3.1. \(\square\)

### 6.8.2. The Labour Restructuring

In the first stage, for a given effort choice, \(e\), and number of workers, \(n\), shareholders bargain with workers over the wage compensation. Let \(w^R : \mathbb{P} \times \mathbb{S} \times \mathbb{E} \times \mathbb{N} \rightarrow W \equiv [0, w_{\text{max}}]\) be the wage function in the space \(\mathcal{C}^W(\mathbb{P} \times \mathbb{S} \times \mathbb{E} \times \mathbb{N})\) of continuous functions bounded between \([0, w_{\text{max}}]\). Then, I can define the wage correspondence \((W^R w^R) : W \subseteq \mathbb{R}^+ \rightarrow \mathbb{R}^+\) as

\[
(W^R w^R)(p, s, e, n) \equiv \arg \max_{v \in W} [S_{e,n,v}^F(p,s)]^{(1 - \theta_U(r))} \cdot [\alpha R(e; \theta_U(r)) \cdot (v \cdot n - w \cdot n)]^{\theta_U(r)}
\] (38)

s.t. \(S_{e,n,v}^F(p,s) \geq 0, \quad v \geq w\)

where I assume that workers get nothing if the reorganization procedure fails (and the case is transferred to Ch 7).

**Theorem 3.** There exists a unique \(w^{R,*} \in \mathcal{C}^W(\mathbb{P} \times \mathbb{S} \times \mathbb{E} \times \mathbb{N})\) such that \(w^{R,*} = (W^R w^{R,*})\).

**Proof.** See Appendix E.1. \(\square\)

The menu of wage contracts \((p, s, n, e, w^R(p, s, e, n)) \in W(p, s, e, n)\), establishes the wage compensation \(w^R(p, s, e, n)\) that a firm \((p, s)\) has to pay when decides to hire \(n\) workers, and exert \(e\) effort in restructuring labour contract.

**Proposition 7.** Given \((n, e)\), and a reorganizing firm \((p, s)\), in an interior solution:

- the nash bargaining surplus is

\[
S_{n}^R(p,s) \equiv \max \left\{ \max_{\bar{b}' \in B_+} y(p,x,n) - \chi_o + q(p,x,b')b' - \delta k - \frac{wn + \beta}{\iota} \cdot \mathbb{E}_{x', \mathbb{P}}[V(p,s')] - R^7(p,s) \right\}
\] (39)
- the wage compensation is

\[ w^R(p, s, e, n) \cdot n = w \cdot n + \theta_U(r) \cdot S^R_n(p, s) \] (40)

- the expected recovery value under Ch 11 is

\[ R_{e,n}^{11}(p, s) \equiv R^7(p, s) + \alpha^R(e; \theta_U(r)) \cdot \theta_C \cdot (1 - \theta_U(r)) \cdot S^R_n(p, s) \] (41)

- the share of expected surplus that goes to shareholders

\[ S^F_{e,n}(p, s) \equiv \alpha^R(e; \theta_U(r)) \cdot (1 - \theta_C) \cdot (1 - \theta_U(r)) \cdot \iota \cdot S^R_n(p, s) \] (42)

Accordingly, the reorganization problem (30) can be rewritten as

\[ V^R(p, s) = \max_{e \in E} \alpha^R(e; \theta_U(r)) \cdot (1 - \theta_C) \cdot (1 - \theta_U(r)) \cdot \iota \cdot \max_{n \in N} S^R_n(p, s) - c(e) \] (43)

Proof. See Appendix E.3.2. □

By substituting (39) in (40), the main result of Proposition 1 carries through the dynamic framework: the firm uses the threat of liquidation to reduce the bargaining position of the workers. (Again, this result stems from the timing of the restructuring problems.) The reorganization problem (30) boils down to (43): the firm chooses \((n, b')\) to maximize the share of expected discounted value of future dividends that is not extracted by the workers, or creditors (43). Appendix E.3 discusses the separability of the max operator over the firm’s choices, \(b'\) and \(n\).

Proposition 8. The labour demand, \(n^*\), and output, \(y^*\)
\[ n^*(p, s) = z \cdot x \cdot \left( \frac{\alpha \eta}{w} \right)^{\frac{1}{1-\alpha \eta}} k^{\frac{(1-\alpha)\eta}{1-\alpha \eta}} \]  \hspace{1cm} (44) \hspace{1cm} y^*(p, s) = z \cdot x \cdot \left( \frac{\alpha \eta}{w} \right)^{\frac{\alpha}{1-\alpha \eta}} k^{\frac{(1-\alpha)\eta}{1-\alpha \eta}} \]  \hspace{1cm} (45)

coincides with the ones under continuation (Proposition (5)).

**Proof.** See Appendix E.3.3.

The model does not capture the lay-offs of workers that firms experience during bankruptcy. Since firms and workers bargain over the wage (and not over wage and number of workers) there are no distortions in size choices. That said, the wage compensation \( w^R(p, s, e^*, n^*) \cdot n^* \) shrinks during bankruptcy (as in the data), because of the reduction in the surplus due to the threat of liquidation. Beside tractability, this particular class of labour contracts allows me to get sharper predictions: in the model, all the inefficiencies arise from extra-ordinary decisions (extensive margin) and not from inefficient size choices (intensive margin). This has important consequences on the interpretation of the quantitative results, which should be taken as a conservative measure of the impact of pro-creditor bankruptcy reforms.

Substituting the optimal choices, we get an expression for the nash bargaining surplus in reorganization, the expected recovery value under Ch 11, and the expected share of the surplus that goes to shareholders and workers

\[ S^R(p, s) \equiv \max \left\{ \max_{b' \in B} y(p, x, n^*) - \chi_o + q(p, x, b') + \delta k - w n^* + \beta \cdot \frac{1}{\iota} \cdot E_{x'|x}[V(p, s')] - R^7(p, s), 0 \right\} \]  \hspace{1cm} (46)

\[ R^1_{e}(p, s) \equiv R^7(p, s) + \alpha^R(e; \theta_U(r)) \cdot \theta_C \cdot (1 - \theta_U(r)) \cdot S^R(p, s) \]  \hspace{1cm} (47)

\[ S^F_{e}(p, s) \equiv \alpha^R(e; \theta_U(r)) \cdot (1 - \theta_C) \cdot (1 - \theta_U(r)) \cdot \iota \cdot S^R(p, s) \]  \hspace{1cm} (48)

\[ S^W_{e}(p, s) \equiv \alpha^R(e; \theta_U(r)) \cdot \theta_U(r) \cdot S^R(p, s) \]  \hspace{1cm} (49)

Expressions (47), (48), (49) are the dynamic version of the solution to the debt restructuring and labour restructuring problem in the static model (7), (8), (9).
6.8.3. The Restructuring Effort Problem

The effort cost function \( c : P \times S \times E \to \mathbb{R}_+ \), with \( c'(p, s, \cdot) > 0 \), gives the shareholders’ cost in firm \((p, s)\) to exert \( e \) units of effort to restructure labour contracts (in output units). Let \( \alpha^R : E \times R \to [0, 1] \), with \( \alpha^{R*}(\cdot; r) > 0 \), denote the likelihood of success of Ch 11 for a given effort, \( e \), and bargaining power of workers, \( \theta_U(r) \), with \( r \in R \equiv \{L, H\} \). Shareholders choose the amount of effort \( e \in E \subseteq \mathbb{R}_+ \) that solves

\[
V^R(p, s) = \max_{e \in E} S^F_e(p, s) - c(p, s, e)
\]  

(50)

where \( V^R(p, s) \) is the value of reorganization that results from the restructuring activity.

Because of the symmetry between the dynamic and static model, it is easy to show that at optimum, \( e^* \), the expected recovery value under Ch 11

\[
R^{11}(p, s) \equiv R^g(p, s) + \underbrace{\alpha^R(e^*; \theta_U(r)) \cdot \theta_C \cdot (1 - \theta_U(r)) \cdot S^R(p, s)}_{\text{Trade off}}
\]  

(51)

carries on the main trade-off illustrated in (11): an increase in creditor rights \( \theta_C \) ought not to increase expected recovery values.

6.9. The Credit Intermediaries

In the economy there is a competitive financial sector. Each risk neutral credit intermediary offers a set of firm-specific contracts \((p, x, b', q(p, x, b')) \in \Omega(p, x, b')\). Let the pricing function \( q : P \times S \to Q \equiv [0, q_{\text{max}}] \subseteq \mathbb{R}_+ \) be
\[
q(p, x, b') = \begin{cases} 
\frac{1}{1 + r_F} & b' \leq 0 \\
\frac{1}{b'(1 + r_F)} \mathbb{E} \left[ (1 - \phi_X \cdot \phi_D) \cdot b' + \phi_X \cdot \phi_D \cdot (\phi_R \cdot R^{11}(p, z) + (1 - \phi_R) \cdot R^7(p, z)) \right] & b' > 0 
\end{cases}
\]

with \( \phi_i \equiv \phi_i(p, z') \), \( i = \{X, D, R\} \). Under price competition, we have that (52) holds with equality whenever contracts are traded in strictly positive quantities\(^{49}\). So, firms earn the risk-free interest rate, \( r_F \), on their savings, \( b' \leq 0 \). Conversely, loans’ prices depend on the endogenous probability that the firm will meet its debt obligation and the recovery rates upon default; both these factors are function of firms’ bankruptcy choices. In conclusion, let \( a(p, x, b') \) denote the aggregate amount of contracts \( (p, x, b', q(p, x, b')) \) issued

\[
a(p, x, b') = \frac{q(p, x, b') \cdot b'}{\text{Amount of Loan granted}} \int_{P \times X} \left[ (1 - \phi_X) + \phi_X \cdot \phi_D \cdot \phi_R \cdot \mathbb{I}_{\phi_r = \phi}(b, ds) + M \int_{P \times X} \phi_E \cdot \mathbb{I}_{\phi_E = \phi}(ds) \right] 
\]

(53)

6.9.1. Entrants

A large number of ex-ante identical potential entrants, \( M \), decides whether to pay a fixed cost to enter, \( \chi_E \).

If they pay, they draw from the probability measure space \( (P \times X, B(P \times X), G_{r,k,z,x}) \) a region, \( r \), a permanent idiosyncratic productivity, \( z \), a permanent capital scale, \( k \), and an idiosyncratic persistent productivity shock, \( x \).

Upon the realization \( (r, k, z, x) \), entrants decide whether to actually enter \( (\phi_E = 1) \) or not

\(^{49}\) As a result of the optimization problem of a profit maximiser risk neutral credit intermediary with deep pockets.
If they decide to enter, they finance their capital scale, $k$, by accessing a menu of firm specific not contingent debt contracts $(p, x, b', q(p, x, b')) \in \Omega(p, x, b')^{50}$ and, ultimately, by issuing equity. The problem of a potential entrant, can be described as

$$V^E(w) = \int_{\mathbb{R}^+} \max \phi_E \cdot \left[ \max_{(d, b') \in D \times B} g(d) + \beta \cdot \int_{X} V(p, s') Q(x, dx') \right] G_{r, k, z, x}(r, d, k, dz, dx)$$

s.t. $d + k \leq q(p, x, b') \cdot b'$

$$g(d) = \left( I_{\{d \geq 0\}} + I_{E} \cdot I_{\{d < 0\}} \right) \cdot d$$

(54)

By assuming free entry in the credit industry, the wage $w \in \mathbb{R}^+$ is such that

$$V^E(w) \geq \chi_E$$

(55)

with equality if in steady state, $M > 0$. Henceforth I will refer to (55) as the free entry condition (FEC) and to $w$ as the FEC-wage. Differently from Hopenhayn [1992], firms finance the capital scale, $k$, by issuing equity or firm specific debt contracts $q(p, x, b') \cdot b'$ that depends on the bankruptcy law. In conclusion, because of the decreasing returns-to-scale production technology and the proportional investment cost, $\delta k$, firms can finance a high capital scale, $k$, only if they draw a high permanent productivity, $z$. As a result, in equilibrium large firms have to be productive.

6.9.2. Invariant Distribution

Let $\Pi^I_\mathbb{Z} : (B \times X) \times (2^B \times B(X)) \to [0, 1]$ be the transition function of a $(r, k, z)$-type incumbent from the state $(b, x)$ to the state $Z \equiv Z' \times Z''$, 

$$\Pi^I_\mathbb{Z}((b, x), Z) = \left[ 1 - \phi_X(p, s) \cdot (1 - \phi_D(p, s) \cdot \phi_R(p, s)) \right] \cdot \mathbb{I}_{\{p, z, z' \in Z''\}} \cdot \int_{Z''} Q(x, dx')$$

$^{50}$ Notice how the bankruptcy law affects firms entry decision by changing the feasible set of external financing opportunities.
where \(Z^b', Z^x'\), are the projections of \(Z \in (2^B \times \mathcal{B}(X))\).

Similarly, let \(\Pi^E_p : X \times (2^B \times \mathcal{B}(X)) \to [0, 1]\) be the transition function of a \((r, k, z)\)-type entrant, defined as

\[
\Pi^E_p(x, Z) = \phi_E(p, x) \cdot \mathbb{1}_{b'(p, x) \in Z'} \cdot \int_{Z'} Q(x, dx')
\]

Let \(\mu\) a probability measure in the space \(\Gamma \left( B \times X, 2^B \times \mathcal{B}(X) \right)\) of probability measures. Then, I can define the operator \((\Psi \mu)\):

\[
(\Psi \mu)(Z) = \sum_{B'} \int_{P \times X} \Pi^I_p((b, x), Z) \mu(dp, dz) + M \int_{P \times X} \Pi^E_p(x, Z) G_{r, k, z, x}(r, dk, dz, dx)
\]

6.10. The Household

The economy is populated by a unit measure of infinitely-lived, identical households, with preferences over streams of consumption - represented by an instantaneous Bernoulli utility function \(u(C)\) - that discount the future as the firms, \(\beta\).

In each period each household is endowed with \(N_s\) unit of time that supplies inelastically. It further decides how much to consume, \(C\), and how much to lend to the financial intermediaries, \(B'\). Accordingly, the problem of the representative household can be described as

\[
V_H(B; \mu) = \max_{\{C, B\}} u(C) + \beta \cdot V_H(B')
\]

s.t. \(C + q_{\text{max}} B' = W + D + B\)

where \(D\) is the aggregate dividend, and \(q_{\text{max}} \equiv \frac{1}{1 + r_F}\), where \(r_F\) is the risk free interest rate. Then in steady state

\[
\beta = q_{\text{max}} \equiv \frac{1}{1 + r_F}
\]

40
The producing firms in the economy are the incumbents that either do not exit or reorganize. As a result, the net aggregate output

\[
Y \equiv \sum_B \int_{P \times X} \left[ 1 - \phi_X (1 - \phi_D \phi_R) \right] y^*(p, g) \mu(d_p, g) \\
+ \sum_B \int_{P \times X} \phi_X (1 - \phi_D) \cdot (1 - \delta) \cdot k \cdot \mu(d_p, g) \\
- \sum_B \int_{P \times X} \left[ [1 - \phi_X (1 - \phi_D \phi_R)] \cdot \chi_o + \phi_X \phi_D \phi_R \cdot c(p, g, e^*) \right] \mu(d_p, g) \\
- \sum_B \int_{P \times X} [1 - \phi_X (1 - \phi_D \phi_R)] \cdot [\mu_I - 1] \cdot \mathbb{I}_{\{d < 0\}} \cdot \mu(d_p, g) \\
- M \int_{P \times X} \phi_E \cdot [\mu_I - 1] \cdot \mathbb{I}_{\{d < 0\}} \cdot G_{r,k,z,x}(r, dk, dz, dx) - M \cdot \chi_E
\]

The aggregate investment is

\[
I \equiv \sum_B \int_{P \times X} [1 - \phi_X (1 - \phi_D \phi_R)] \cdot \delta k \cdot \mu(d_p, g) + M \int_{P \times X} \phi_E \cdot k \cdot G_{r,k,z,x}(r, dk, dz, dx)
\]

and, by national income accounting (resource constraint) aggregate, consumption is

\[
C = Y - I
\]

The aggregate dividends amount to

\[
D \equiv \sum_B \int_{P \times X} [1 - \phi_X \phi_D (1 - \phi_R)] g(d^*(p, g)) \mu(d_p, g) \\
+ M \int_{P \times X} \phi_E g(d^*(p, g)) \cdot G_{\delta}(ds)
\]
The aggregate demand of labour equals

\[ N^d \equiv \sum_B \int_{P \times X} n^*(p, s) \mu(dp, ds) \tag{63} \]

where \( n^*(\cdot) \) is defined in (27).

Then, the aggregate demand of loans is

\[ B^d \equiv \sum_B \int_{P \times X} a(p, x, b') \mu(b, ds) \tag{64} \]

where \( a(p, x, b') \) is defined in (53).

In conclusion, the aggregate wage equals

\[ W \equiv \sum_B \int_{P \times X} w(p, s) \cdot n^*(p, s) \mu(dp, ds) \tag{65} \]

6.12. The Equilibrium

Definition. A steady-state competitive equilibrium is a wage \( w \), a set of price schedules \( \{w^*, q^*, w^{R*}, \alpha^{C*}\} \), a measure \( \mu^* \), a mass of potential entrants \( M^* \), the incumbents policies \( \{\phi^*_X, \phi^*_D, \phi^*_R, b'^*_s, n^*, d^*\} \), the entrants policy functions \( \{\phi^*_E, b'^*_e, d^*_e\} \), and the household decisions \( (C^*, B'^*) \) such that:

1. given \( w \) and \( \{w^*, q^*, w^{R*}, \alpha^{C*}\} \), then \( \{\phi^*_X, \phi^*_D, \phi^*_R, b'^*_s, n^*, d^*\} \) solve the incumbents problem (21);

2. given \( w, \{w^*, q^*, w^{R*}, \alpha^{C*}\} \) and \( \{\phi^*_X, \phi^*_D, \phi^*_R, b'^*_s, n^*, d^*\} \), then \( \{\phi^*_E, b'^*_e, d^*_e\} \) solve the entrants problem (54);

3. given \( w, \{w^*, q^*, w^{R*}, \alpha^{C*}\}, \{\phi^*_X, \phi^*_D, \phi^*_R, b'^*_s, n^*, d^*\} \), and \( \{\phi^*_E, b'^*_e, d^*_e\} \), and \( B'^* \), then \( C^* \) solves the household problem (57);
4. given \( w, \{w^*, q^*, w^{R*}\} \), and \( \{\phi_X^*, \phi_D^*, \phi_R^*, b'^*, n^*, d^*\} \), then \( \alpha^{C,*} \) is the nash bargain solution (34);

5. given \( w, \{w^*, q^*, w^{R*}, \alpha^{C,*}\} \), \( \{\phi_X^*, \phi_D^*, \phi_R^*, b'^*, n^*, d^*\} \), then \( q^* \) satisfies the zero-profit condition (52);

6. given \( \{w^*, q^*, w^{R*}, \alpha^{C,*}\} \), \( \{\phi_X^*, \phi_D^*, \phi_R^*, b'^*, n^*, d^*\} \), and \( \{\phi_E^*, b'_e^*, d'_e^*\} \), then \( \mu^* \) satisfies FEC (55);

7. given \( w, \{w^*, q^*, w^{R*}, \alpha^{C,*}\} \), \( \{\phi_X^*, \phi_D^*, \phi_R^*, b'^*, n^*, d^*\} \), and \( \{\phi_E^*, b'_e^*, d'_e^*\} \), then \( \mu^* = \Psi \mu^* \), \( \forall M \);

8. given \( w, \{w^*, q^*, w^{R*}, \alpha^{C,*}\} \), \( \{\phi_X^*, \phi_D^*, \phi_R^*, b'^*, n^*, d^*\} \), and \( \{\phi_E^*, b'_e^*, d'_e^*\} \), \( \mu^* \) and \( C^* \):

8.1. \( M^* \) is such that labour market clears, \( N^s = N^d(M^*) \), where \( N^d \) defined in (63);

8.2. \( B'^{t,*} \) is such that the loan market clears, \( B^d = B'^{t,*} \), where \( B^d \) defined in (64).

7. Quantitative Analysis

How did the shift in creditor rights protection regime affect firms’ bankruptcy choices, and the firms distribution? What would have happened if Ch 11 had never been introduced in 1979? To answer these questions I calibrate the dynamic model to the U.S. economy from 1979-1998. The firm level accounting data are from Compustat North-America Fundamentals Annual, 1950-2012; further information on bankruptcy are from UCLA LoPucki Bankruptcy Research Database, 1980-2012.

7.1. Functional Forms

The calibration requires more structure on both the uncertainty governing the model economy, and the restructuring process.
7.1.1. Uncertainty

The log-idiosyncratic productivity shock, $\ln x_t$, follows an AR(1) process

$$\ln x_{t+1} = (1 - \rho_{\ln x}) \cdot \bar{\ln x} + \rho_{\ln x} \ln x_t + \epsilon_{t+1}, \quad \epsilon_{t+1} \sim N\left(0, \sigma^2_{\epsilon}\right)$$ (66)

I approximate the process with a discrete-state Markov chain, by using Gauss-Hermite nodes and weights and by applying the Tauchen and Hussey [1991] weights correction in order to account for the persistency. I discretize the support\(^{51}\) of the idiosyncratic productivity shock using 9 points.

For what concerns the uncertainty at entry, $G_{r,k,z,x}$, I make the following assumptions: the permanent and persistent idiosyncratic productivity shocks are drawn from log-normal distributions, $G_z(\mu_{G(z)}, \sigma_{G(z)})$ and $G_z(\mu_{G(x)}, \sigma_{G(x)})$; the fixed capital scale is drawn from a pareto distribution $G_k(\kappa_k, k_{\text{min}})$. In conclusion entrants are born with probability $p_{\theta_U(H)}$ in the highly unionized region (formally $G_r = \{1, 0; p_{\theta_U(H)}, 1 - p_{\theta_U(H)}\}$). By assuming independence across these dimensions, I have $G_{r,k,z,x} = G_r \cdot G_k \cdot G_z \cdot G_x$.

7.2. The Restructuring Effort Problem

I need to specify functional forms for the effort cost function, $c(p, s, e)$, and the likelihood of a success of Ch 11, $\alpha^R(e; \theta_U(r))$ (Section 6.8.3).

I assume $c(p, s, e)$ is linear in the surplus, $c(p, s, e) = c(e) \cdot \iota \cdot S^R(p, s)$, as in the static model; differently, I set $c(e) = c_{11} \cdot e$.

Then, I set $\alpha^R(e; \theta_U(r)) = s^r_{11, \iota} \cdot (1 - \exp(-e) \cdot \theta_U(r))$, with $r = L, H$. An interpretation is in order. As explained in the static model, this specification formalizes the intuition that without a formal attempt to restructure labour contracts, $e = 0$, the probability of success of the reorganization procedure decreases with the bargaining power of workers, $1 - \theta_U(r)$. By

\(^{51}\)Following standard practice, I determine the bounds of the support using a trimming parameter $m = 20.$
exerting restructuring effort, shareholders can temper this negative effect and increase the likelihood of success, $1 - \exp(-\epsilon) \cdot \theta_U(r)$. In this context, $\theta_U(r)$ proxies for the reluctance of workers to accept changes in labour conditions, namely the reduction in the wage $w^R$. Lastly, I scale the likelihood of success of Ch 11 in the two regions by a different factor $s_{11,p}$ with $r = L, H$, to let the U.S. data say where the scope of restructuring labour contracts is stronger.

### 7.3. Calibration

The economy is calibrated over the period 1979-1998\(^\text{52}\). One period in the model corresponds to one year. The model has 28 parameters: physical technology ($\alpha, \eta, \delta, \chi_0$), labour market ($\theta_U(L), \theta_U(H), p_{\theta_U(H)}$), financing technology ($\iota_I, \psi, \theta_C$), restructuring technology ($c_{11}, s_{11,p}^L, s_{11,p}^H$), entrants ($\chi_E, \iota_E$), discounting ($\beta, r$), labour supply, $N$, and uncertainty $\{\ln(x), (\mu_G(x), \sigma_G(x)), (\mu_G(z), \sigma_G(z)), (\kappa_k, k_{\min}), p_X\}$, whose parameters are discussed, in details, in the next section.

I use estimates or impose restrictions on 12 parameters and structurally estimate the rest.

### 7.4. Parameters Restrictions

I start by imposing restrictions on the uncertainty governing the model economy.

First of all, I set the unconditional mean of the log-idiosyncratic productivity shock to 0, $\mu_{\ln x} = 0$. Following, I impose restrictions on $(\mu_G(x), \sigma_G(x))$. In particular, I assume the initial idiosyncratic productivity shocks $x'$ are drawn from the long-run log normal distribution, $G_x(0, \sigma_\epsilon/\sqrt{1 - \rho_{\ln x}^2})$. Hence, I assume $G_z = G_x$, and I discretize the permanent idiosyncratic productivity into 3 levels associated to the conditional expectation of $z$ falling in one of the following intervals: $[0, x_{20th}]$, $[x_{20th}, x_{80th}]$, $[x_{80th}, \infty]$, where $x_{qth}$ denotes the $qth$ percentiles. By so doing I tie the cross-sectional distribution properties of

\(^{52}\) In 1978 the U.S. Congress enacted the Bankruptcy Reform Act, which became effective on October 1, 1979.
the permanent efficiency with the long-run property of the efficiency process estimated in the data.

<table>
<thead>
<tr>
<th>Physical Technology</th>
<th>Value-added share of labour</th>
<th>Gilchrist et al. [2013]</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\alpha$</td>
<td>0.70</td>
<td></td>
</tr>
<tr>
<td>$\eta$</td>
<td>0.85</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Financing Technology</th>
<th>Equity issuance cost entrants</th>
<th>Restriction</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\iota_E$</td>
<td>$\iota_I$</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Bankruptcy Technology</th>
<th>Scope of restructuring in highly unionized region</th>
<th>Normalization</th>
</tr>
</thead>
<tbody>
<tr>
<td>$s_{11,p}^H$</td>
<td>1.00</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Economy</th>
<th>Subjective Discount Factor</th>
<th>FOC</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta$</td>
<td>0.96</td>
<td></td>
</tr>
<tr>
<td>$r^F$</td>
<td>0.04</td>
<td>FRED</td>
</tr>
<tr>
<td>$N^s$</td>
<td>1.00</td>
<td>Normalization</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Uncertainty</th>
<th>Unconditional mean of $\ln x_t$</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\bar{\rho}_{\ln x}$</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>$\mu_{G(x)}$</td>
<td>0</td>
<td>Restriction</td>
</tr>
<tr>
<td>$\sigma_{G(x)}$</td>
<td>$\sigma_e/\sqrt{1-\rho^2_{\ln x}}$</td>
<td>Restriction</td>
</tr>
<tr>
<td>$\sigma_{G(z)}$</td>
<td>$\sigma_e/\sqrt{1-\rho^2_{\ln x}}$</td>
<td>Restriction</td>
</tr>
</tbody>
</table>

Table 2: Parameters Restrictions

Next I move to the physical technology. Following Gilchrist et al. [2013], I set the value-added share of labour in the production function $\alpha = 0.7$, and the estimated decreasing return to scale parameter $\eta = 0.85^{53}$. The real risk-free rate and the annual firm discount factor are set to $r = 0.04$. By (58), the steady-state household annual discount rate is

---

53 These parameters are consistent with the literature (e.g. Barseghyan and DiCecio [2011]). In turn, this parameters specification imply a decreasing returns to scale parameter over physical capital $\gamma = 0.63$ consistent with the lower bound of reasonable parameters for the class of Cobb-Douglas production function (e.g. Arellano et al. [2012]).
\[ \beta = \frac{1}{1 + r_F} = 0.9615. \] Hence, I normalize the labour supply \( N^* = 1. \)

For what concerns the **financing technology**, I assume that entrants and incumbents face the same equity issuance cost, \( \iota_I = \iota_E. \)

I conclude by normalizing the scope of restructuring parameter in the highly unionized region to \( s_{11,p}^H = 1. \) Table 2 summarizes parameters and restrictions.

7.5. Estimation Strategy

I estimate 16 parameters by minimizing the weighted sum of squared residual between a set of moments computed in the model, \( m(\bar{\theta}) \), and in the data, \( \hat{m} \). I choose 34 moments that are a priori informative\(^{54}\) about the firms distribution and the phenomenon of corporate bankruptcy default.

Since some moments are more sensitive to changes in some parameters, to illustrate the tightest links, I partition the set of estimated parameters in two: the one responsible for the default/exit phenomenon, and the one responsible of the firm distribution. For what concern the parameters responsible to match the default/exit phenomenon: \( p_X \) targets the aggregate exit rate (by default and not); \( \chi_o \) is used to match the aggregate default rate; \( \psi \) matches the Ch 7 default rate; \( \theta_U(L), \theta_U(H) \) match Ch11 default rates in the lowly and highly unionized regions; \( c_{11} \) and \( s_{11,p}^L \) match the fraction of Ch 11 that are converted to Ch 7 in the highly and lowly unionized region, respectively; \( p_{\theta_U(H)} \) targets the fraction of firms in highly unionized states; \( \theta_C \) targets the aggregate median recovery value under Ch 11. For what concerns the firm distribution, I devote a set of parameter to capture information about the size of the firms and another set of parameters to capture moments related to the leverage: the equity issuance cost \( \iota_I \) is used to match the expected leverage of the incumbents; the entry cost \( \chi_E \) targets the Tobin-q statistics of incumbents; \( k_{\min} \) targets the median leverage at entry; \( \kappa_k \)

\(^{54}\) Heuristically speaking the moments are informative about the unknown parameter if they are sensitive to its changes.

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<table>
<thead>
<tr>
<th>Target</th>
<th>Data</th>
<th>Model</th>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$E_i$ [Exit Rate]</td>
<td>0.0639</td>
<td>0.0192</td>
<td>$p_X$</td>
<td>0.0148</td>
</tr>
<tr>
<td>$E_i$ [Default Rate]</td>
<td>0.0077</td>
<td>0.0075</td>
<td>$\chi_o$</td>
<td>6.4215</td>
</tr>
<tr>
<td>$E_i$ [Ch 7 Default Rate]</td>
<td>0.0023</td>
<td>0.0019</td>
<td>$\psi$</td>
<td>0.7672</td>
</tr>
<tr>
<td>$E_i$ [Ch 11 Default Rate]</td>
<td>0.0020</td>
<td>0.0015</td>
<td>$\theta_U(L)$</td>
<td>0.1192</td>
</tr>
<tr>
<td>$E_i$ [Ch 11 Default Rate]</td>
<td>0.0034</td>
<td>0.0041</td>
<td>$\theta_U(H)$</td>
<td>0.3741</td>
</tr>
<tr>
<td>$E_i[\alpha^R(e^*)]</td>
<td>r = H$</td>
<td>0.9440</td>
<td>0.9440</td>
<td>$c_{11}$</td>
</tr>
<tr>
<td>$E_i[\alpha^R(e^*)]</td>
<td>r = L$</td>
<td>0.9661</td>
<td>0.9661</td>
<td>$s_{11,p}^L$</td>
</tr>
<tr>
<td>$E_i[|r = H]$</td>
<td>0.6536</td>
<td>0.6224</td>
<td>$p_{10_u(H)}$</td>
<td>0.7113</td>
</tr>
<tr>
<td>$q_{i,50}[\alpha^R \cdot \alpha^C + (1 - \alpha^R) \cdot \gamma^C(k)/b]$</td>
<td>0.5309</td>
<td>0.2730</td>
<td>$\theta_C$</td>
<td>0.4824</td>
</tr>
</tbody>
</table>

**Firms Distribution**

<table>
<thead>
<tr>
<th>Target</th>
<th>Data</th>
<th>Model</th>
<th>Parameter</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$q_{50,i}[B/A]$ [Incumbents]</td>
<td>0.1360</td>
<td>1.2551</td>
<td>$\iota_I$</td>
<td>1.0985</td>
</tr>
<tr>
<td>$E_i[V/A]$ [Incumbents]</td>
<td>1.6140</td>
<td>0.2561</td>
<td>$\chi_E$</td>
<td>0.2531</td>
</tr>
<tr>
<td>$q_{50,i}[B/A]$ [Entry]</td>
<td>0.1190</td>
<td>1.2551</td>
<td>$k_{min}$</td>
<td>0.7054</td>
</tr>
<tr>
<td>$\sigma_i[B/A]$ [Incumbents]</td>
<td>0.1859</td>
<td>0.4494</td>
<td>$r_k$</td>
<td>0.3633</td>
</tr>
<tr>
<td>$\sigma_i[V/A]$ [Incumbents]</td>
<td>2.1469</td>
<td>0.3765</td>
<td>$\delta$</td>
<td>0.2208</td>
</tr>
<tr>
<td>$\sigma_i[B/A]$ [Entry]</td>
<td>0.2137</td>
<td>0.2049</td>
<td>$\sigma_e$</td>
<td>0.0943</td>
</tr>
<tr>
<td>$q_{50,i}[Y/Employee]$</td>
<td>1.4255</td>
<td>0.5121</td>
<td>$\rho_{ln_x}$</td>
<td>0.9657</td>
</tr>
</tbody>
</table>

Note: The first and second column report the structural parameters of the model and their description. The third column reports the targeted statistics: $E[\cdot]$ denotes time series averages, while $E_i[\cdot]$, $\sigma_i[\cdot]$ and $q_{x,i}[\cdot]$ denote the time series averages of, respectively, cross-sectional averages, standard deviations and cross-sectional $x$-percentiles. The Data column reports the moment computed in the data (firms ratios are trimmed at 1 and 99 percentiles). Source: Compustat North-America Fundamentals Annual, 1979-1998. The sample excludes: utilities (NAICS 22) financial (NAICS 52) and public administration (NAICS 92) corporations, American Depository Receipts (ADR).
and δ matches the cross-section standard deviation of leverage and Tobin-q of incumbents. In conclusion ρ, σ and σ_e have major effects on all the statistics in the model. In particular, I use them to match 10th, 20th, 50th, 70th, 90th percentiles of the distribution of leverage (incumbents and entrants) and Tobin-Q. Table 3 reports the results of the estimation.

8. The Shift in Creditor Rights Protection Regime

How did the shift in creditor rights protection regime affect the U.S. economy and the firms financial structure? In this section I use the calibrated model economy to answer this question. To discipline the exercise, I increase the bargaining power of creditors, θ_C, to match the 1999-2012 fraction of Ch 11 filings that are converted to Ch 7, keeping all the other parameters fixed at their 1979-1998 levels. Table 4 reports the fit.

Table 4: Discipline of the increase in creditors rights protection

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.4824</td>
<td>0.9601</td>
<td>0.9201</td>
<td>0.9129</td>
</tr>
</tbody>
</table>

Note: The table reports the likelihood of success (row 2) in the Data and in the Model for the pre (1979-1998) and post (1999-2012) shift period for different values of θ_C (row 1).

Table 5 compares the steady-states outcomes at region and aggregate level. As main result, it validates the mechanism. Let me start with the trigger. An increase in creditor rights depresses the restructuring effort, reducing the likelihood of success of the Ch 11 procedure (−3.5%). The effect is stronger in highly unionized states (−3.8% against −2.7%), where the scope of restructuring is stronger (see Figure 3).

Thereby, reorganization becomes less attractive than its liquidation alternative (−0.5%), especially for firms where workers extract many rents (−0.7%). Accordingly, the recovery
rate upon default drops (−3.3%), driven by the drop in the recovery rates in Ch 11 (−4.88%). The cost of debt service raises and hinders firms’ ability to use debt to smooth out shocks, reducing their profitability especially in highly unionized states. Firms are less likely to enter in the highly unionized region (−0.01%), and when they enter they ought to be smaller (−0.22%) and more productive. TFP increases by (0.02%) and the productivity distribution becomes more positively skewed (2.01%). Firms substitute retained earning for debt, which explains the drop in the dividend price ratio (−2.1%).

Since debt is more expensive for unit of collateral, the model captures a country level deleverage −0.22% (as in the data), but does not match the across regions dynamics. The reason is that smaller amount of debt together with more productive firms, reduces the likelihood of default (−0.33%) on a given loan, especially in lowly unionized regions. As in the data, the model predicts an increase in the Tobin-Q volatility 0.24%, but fail to produce the across-region. The model replicates qualitatively the country-wise and regional drop in
Table 5: Effect of the Shift in Creditor Rights Protection Regime

<table>
<thead>
<tr>
<th>Effect of the Shift in Creditor Rights Protection Regime</th>
<th>Lowly Unionized %</th>
<th>Highly Unionized %</th>
<th>Aggregate %</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bankruptcy Composition</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fraction of Ch 11 which are successful</td>
<td>-3.8566</td>
<td>-5.3032</td>
<td>-4.9218</td>
</tr>
<tr>
<td>Fraction of defaulters which file for Ch 11</td>
<td>-0.2207</td>
<td>-0.9863</td>
<td>-0.7591</td>
</tr>
<tr>
<td><strong>Firms Distribution</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assets per firm</td>
<td>-0.1540</td>
<td>-0.3124</td>
<td>-0.2553</td>
</tr>
<tr>
<td>Employee per firm</td>
<td>-0.0974</td>
<td>-0.1761</td>
<td>-0.1512</td>
</tr>
<tr>
<td>Total Factor Productivity</td>
<td>0.0109</td>
<td>0.0334</td>
<td>0.0238</td>
</tr>
<tr>
<td>Total Factor Productivity Skewness</td>
<td>1.2626</td>
<td>2.8426</td>
<td>2.2483</td>
</tr>
<tr>
<td>Leverage</td>
<td>-0.4831</td>
<td>-0.1270</td>
<td>-0.3413</td>
</tr>
<tr>
<td>Labour Productivity</td>
<td>-0.0000</td>
<td>-0.0000</td>
<td>-0.0000</td>
</tr>
<tr>
<td>Tobin Q</td>
<td>0.9025</td>
<td>0.9848</td>
<td>1.3950</td>
</tr>
<tr>
<td>Tobin Q Standard Deviation</td>
<td>-0.3377</td>
<td>0.6012</td>
<td>0.3678</td>
</tr>
<tr>
<td>Dividend Price Ratio</td>
<td>-2.4878</td>
<td>-3.1062</td>
<td>-1.9599</td>
</tr>
<tr>
<td><strong>National Income Accounting</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output (Y)</td>
<td>0.8439</td>
<td>-0.5062</td>
<td>0.0000</td>
</tr>
<tr>
<td>Consumption (C=NY-I)</td>
<td>0.8298</td>
<td>-0.5490</td>
<td>-0.0307</td>
</tr>
</tbody>
</table>
the dividend-price ratio observed in the data.

In aggregate, output does not fall, but the economy records significant regional effects.

9. The Economic Value of the Bankruptcy Reorganization Procedure

What is the economic value of Ch 11? This question traces its roots back to 1979 - year of the enactment of the Bankruptcy Code - when Ch 11 was for the first time introduced. I address this question by investigating what would have happened if Ch 11 had never been introduced. Table 6 compares the 1979-1998 U.S. model economy with what it would have been without Ch 11.

Table 6: Effect of Shutting Down Ch 11

<table>
<thead>
<tr>
<th></th>
<th>Lowly Unionized</th>
<th>Highly Unionized</th>
<th>Aggregate</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bankruptcy Composition</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fraction of Ch 11 which are successful</td>
<td>-0.0000</td>
<td>0.0000</td>
<td>-100.0000</td>
</tr>
<tr>
<td>Fraction of defaulters which file for Ch 11</td>
<td>-100.0000</td>
<td>-100.0000</td>
<td>-100.0000</td>
</tr>
<tr>
<td><strong>Firms Distribution</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assets per firm</td>
<td>-0.5169</td>
<td>-5.2130</td>
<td>-3.1409</td>
</tr>
<tr>
<td>Employee per firm</td>
<td>-0.0732</td>
<td>-2.6724</td>
<td>-1.6160</td>
</tr>
<tr>
<td>Total Factor Productivity</td>
<td>-0.0370</td>
<td>0.5257</td>
<td>0.2383</td>
</tr>
<tr>
<td>Total Factor Productivity Skewness</td>
<td>-4.3795</td>
<td>48.5853</td>
<td>23.0546</td>
</tr>
<tr>
<td>Leverage</td>
<td>-47.7650</td>
<td>-1.0651</td>
<td>-19.7417</td>
</tr>
<tr>
<td>Labour Productivity</td>
<td>-0.1185</td>
<td>-0.1185</td>
<td>-0.1185</td>
</tr>
<tr>
<td>Tobin Q</td>
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<td>84.8176</td>
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<td>Tobin Q Standard Deviation</td>
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<td>25.3063</td>
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<td>Dividend Price Ratio</td>
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<td>65.3641</td>
<td>-82.1180</td>
</tr>
<tr>
<td><strong>National Income Accounting</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Output (Y)</td>
<td>23.3297</td>
<td>-14.1846</td>
<td>-0.1184</td>
</tr>
<tr>
<td>Consumption (C=NY-I)</td>
<td>24.3028</td>
<td>-14.8402</td>
<td>-0.1263</td>
</tr>
</tbody>
</table>

The results are striking, and this is the logic. The closure of Ch 11 pushes expected
recovery values down and makes debt more expensive. An increase in the debt cost has two countervailing effects: 1) it makes more difficult for firms to smooth out shocks; 2) it reduces the value of being an incumbent (in both regions) pushing the FEC-wage down (−0.12%). Firms in different regions are more sensitive to one or the other effect. An increase in the debt cost washes out, unproductive firms, increasing aggregate TFP (0.24%). TFP increases in highly unionized states by half a percentage point while it drops in lowly unionized states (−0.03%). The reason is that highly unionized firms suffer disproportionally more the loss of Ch 11. They experience a significant reduction in size (−5.2%) and need to be more productive to stay. The lowly unionized firms benefit more from the drop in the FEC-wage, allowing more unproductive firms to stay. This drives up the debt cost (−2.11% drop in the price), decreases their leverage, and yields a significant change in the dividend distribution policy (drop in dividend price ratio). The equity issuance becomes more attractive than the debt alternative (44%), especially for entry firms (153%). Through entry, firms relocate in the lowly unionized region. Fixing the mass of firms at entry, because of the churning effect there will be less firms, more productive, producing a greater amount of output. Then, to maintain labour demand equal to labour supply the mass of firms has to increase. Consumption and output sensibly falls by 0.1% in aggregate but with a strong asymmetric impact on the economy: it drops by 14% in the highly unionized region and increase by 24% in the lowly unionized one.

On the top of that, there are significant changes in the corporate structure of firms. The increase in the debt price comports a significant deleveraging, extremely pronounced in lowly unionized regions (−48% vs −1%). Per unit of assets, firms are more valuable (84% increase in Tobin-Q), especially in lowly unionized regions (78%). Besides, the dividend yield drops by 80%, led by lowly unionized firms (−100%). Conversely, firms in highly unionized states experience a 65% increase.
10. Conclusions

In this paper I study from a positive and normative point of view the macroeconomic implications of bankruptcy reforms when workers extract rents. By doing so, I make four contributions.

First, I foreground a channel through which pro-creditor bankruptcy reforms can backfire, which does not appeal to agency frictions. Firms file for bankruptcy reorganization not only to restructure debt but also to restructure labour contracts. An increase in creditor rights suffocate the incentives of the shareholders to bargain with the workers, making the procedure more likely to fail. When workers extract many rents - and restructuring labour contracts is required to re-establish the economic soundness - the drop in the likelihood of success can offset the increase in recovery values upon success, and make the reform backfire.

Second, I embed the restructuring channel into a static model - where I use the bankruptcy law to microfound the enforcement constraint - and show how the optimal (output maximizing) level of creditor rights decreases with the bargaining power of workers. The exercise sheds some light on why more unionized countries - as Italy, France - have lower creditor rights protection than less unionized ones - say, U.S.

Third, I establish the mechanism in the U.S. data. To do that, I exploit two sources of variation: historical differences in the degree of unionization across states, and a shift in the creditor rights protection regime. As a result, I document a break in the relative use of Ch 11 in 1998, associated with a drop in the likelihood of success of Ch 11, a significant deleveraging (~27%), drop in the dividend yields (46%), a three-fold increase in Tobin-Q dispersion. The theory rationalizes the different response of highly and lowly unionized firms.

Fourth, I perform a positive analysis. First of all, I build a general equilibrium firm dynamic model, where the default option captures salient features of the U.S. corporate bankruptcy law. The novel ingredient is the restructuring problem among the stakeholders: shareholders, bondholders and workers. Second, I calibrate the model to the U.S. economy from 1979-1998,
using firm level accounting data from Compustat North-America Fundamentals Annual, bankruptcy information from UCLA LoPucki Bankruptcy Research Database, and a proxy for the bargaining power of workers from Union Membership and Coverage database (CPS).

Then, I perform two policy experiments. In the first experiment, I use the model economy to assess the effect of the observed increase in creditor rights protection. An increase in creditor rights tempers the shareholder incentives to restructure labour contract, reducing the likelihood of success of Ch 11. In turn, it makes Ch 11 less attractive than Ch 7, causing the inefficient liquidation of viable firms. The reduction in the expected recovery rates upon default, yields an increase in the cost of debt service and a decrease in the leverage. These effects are stronger in highly unionized regions, where restructuring labour contract is more crucial for the success of the reorganization process. In a second policy experiment, I try to attach an economic value to Ch 11 gauging the losses of shutting it down. Indeed, the reorganization procedure was a novelty of the 1979 bankruptcy code. What would have happened if Ch 11 had never been introduced? Despite output and consumption do not show significant changes in aggregate (−0.11% and −0.12%), the regional effects are economically significant. Highly unionized firms suffer disproportionally from the loss of the Ch 11 procedure, as summarized by a 15% drop in output and consumption. Since there are more highly unionized firms in the economy the wage that clears the free entry conditions drops. Firms in lowly unionized states benefit significantly from the drop in the wage, bringing about a significant restructuring of their financial structure (43% drop in leverage, associated with a huge decrease in dividend yield). All together the lowly unionized region records a significant increase in consumption and output (around 24%).

The quantitative results are a conservative measure of the macroeconomic implications of changes in the corporate bankruptcy law. Bankruptcy reforms affect directly extensive margin decisions (entry and form of exit), and only indirectly - through prices - firms’ intensive margin choices (leverage,hirings, . . . ).
In my future work, I plan to fill this gap by exploring the following extensions. On one side, by assuming that in reorganization share-holders can reduce the bargaining power of workers for a stochastic number of periods, we will observe a strategic use of leverage to enter Ch 11 default and restructure labour contracts. This mechanism would provide an alternative explanation of the strategic use of capital structure to lower hiring cost (complementing the bargaining channel of Quadrini and Sun [2015]). On the other side, by assuming hiring and firing costs, I can explore the interaction between my restructuring channel and the bargaining channel of Quadrini and Sun [2015]. I expect both these extensions to amplify the real effects of bankruptcy reforms.
References


Appendix A. Appendix: Data

The firm level accounting information is from COMPUSTAT North America fundamentals annual data. The cleansing of the database is conducted at several layers. Firstly, I purge the sample from utilities (NAICS 22), financial (NAICS 52) and public administration corporations (NAICS 92). Secondly, I drop CUSIPs for American Depository Receipts (ADRs).55

Appendix A.1. Description

The description of the variable is organized in three layers: firm \((t,i)\), state \((t,s)\) and aggregate level \(t\). In case of user-defined variables (as instance, real debt \(b_{t,i} = l_{t,i}/P_t\)) the reader can find the definition of the variables in the relative subsections.

Appendix A.1.1. Firm Level

Sales \(sale_{t,i}\). This item represents gross sales (the amount of actual billings to customers for regular sales completed during the period) reduced by cash discounts, trade discounts, and returned sales and allowances for which credit is given to customers, for each operating segment. Variable name in Compustat: sale.

Website: http://wrds-web.wharton.upenn.edu/wrds/.

Firms real output \(y_{t,i} = sale_{t,i}/P_t\).
Website: http://wrds-web.wharton.upenn.edu/wrds/.

Long-term debt \(l_{t,i}\). (U.S. and Canadian GAAP Definition) The item represents debt obligations due more than one year from the company’s balance sheet date. This item is a component of Total Liabilities (LT). This item includes: Purchase obligations and payments to officers, when listed as long-term liabilities; Notes payable, due within one year and to be refunded by long-term debt when carried as a non-current liability; Long-term lease obligations (capitalized lease obligations); Industrial revenue bonds; Advances to finance construction; Loans on insurance policies; Indebtedness to affiliates; Bonds, mortgages, and similar debt; All obligations that require interest payments; Publishing companies’ royalty contracts payable Timber contracts for forestry and paper; Extractive industries’ advances for exploration and development; Production payments and advances for exploration and development. This item excludes: Subsidiary preferred stock, included in Minority Interest; The current portion of long-term debt, included in Current Liabilities; Accounts payable due after one year, included in Liabilities Other; Accrued interest on long-term debt, included in Liabilities Other; Customers’ deposits on bottles, kegs, and cases, included in Liabilities Other; Deferred compensation; Long-term debt should be reported net of premium or discount. Standard & Poor’s will collect the net figure. Variable name in Compustat: dlt.

Website: http://wrds-web.wharton.upenn.edu/wrds/.

Real debt \(b_{t,i} = l_{t,i}/P_t\).
Website: http://wrds-web.wharton.upenn.edu/wrds/.

Total Asset \(at_{t,i}\). This item represents the total assets/liabilities of a company at a point in time. If the company does not report a useable amount, this data item will be left blank. Variable name in Compustat: at.

Website: http://wrds-web.wharton.upenn.edu/wrds/.

Real asset \(a_{t,i} = at_{t,i}/P_t\).

55 ADRs are securities created to permit the trading in U.S of stock listed on foreign stock exchanges.
Employee \( n_{t,i} \). This item represents the actual number of people employed by the company and its consolidated subsidiaries. Variable name in Compustat: emp.

Output per Worker \( y_{t,i}/n_{t,i} = y_{t,i}/n_{t,i} \).

Probability that a Ch 11 case is converted to Ch 7, \( 1 - \hat{\alpha}_R = \frac{\#(\text{Ch 11 to Ch7})}{\#\text{Ch 11}} \). It is ratio of the Ch 11 filings which are converted to Ch 7 over the total number of Ch 11 filings which are not dismissed. The numerator includes Ch 11 cases which are confirmed and eventually converted. The sample includes all the Ch 11 cases which have been disposed\(^{56} \) before the end of 1998. The data-set is purged by involuntary filings, prepackaged cases, dismissals, and missing data. The Lopucki variables involved in the computation are: Disposition, Chapter, Voluntary, Prepackaged, YearDisposed.

Average Recovery Rate under Ch 11, \( E[\alpha_R \cdot C + (1 - \alpha_R) \cdot C_7(k)] \). I compute the recovery rate under Ch 11 for each case as the ratio between: a) numerator: the sum between the distribution to all classes of secured and unsecured creditors, and b) denominator: secured and unsecured creditors claims, as reported in the disclosure statement. Hence I average this statistic across cases in the same year, and compute the final statistic as time-series average of the cross-sectional first moments. The sample includes all the Ch 11 cases which have been disposed before the end of 1998. The data-set is purged by involuntary filings, prepackaged cases, dismissals, and missing data. On the top of that I trim all the observations for which any of the secured/unsecured claims and dispositions were missing. The Lopucki variables involved in the computation are: Chapter, Voluntary, prepackpreg, YearDisposed, DistribUnsec, DistribSecDiscloState, ClaimsSecDiscloState, ClaimsUnsec.

Fraction of firms in highly unionized states, \( E[\hat{\mu}(\rho_{\theta_U}(H))] \). The statistic is computed as the 1979-1998 time series average of the percentage firms in highly unionized states.

Fraction of Ch 11 cases over total default, by region, \( E[\hat{\mu}(\theta_U(L))] \), \( E[\hat{\mu}(\theta_U(H))] \). The statistic is the 1979-1998 time series average of the ratio between the number of Ch 11 cases and the total default (Ch 7 + Ch 11), by region.

Appendix A.1.2. Sector Level

**Sector** \( j \). NAICS classification sectors. Excluded: utilities (22), financial (52) and public administration corporations (92). Variable name in Compustat: naics.

Employment Share \( \text{Empshare}_{t,s,j} = \int_{J(i)=j,S(i)=s} \frac{n_{i,s}}{N_{t,s}} di \), where \( J(i) \) and \( S(i) \) are the sector and state

\(^{56}\) Using the filing year produces insignificant changes.
Appendix A.1.3. State Level

**Union Coverage** \( Cov_{t,s} = \frac{N_{t,s}^{\text{Cov}}}{N_{t,s}^{\text{Tot}}} \).  
\( a) \) \( N_{t,s}^{\text{Tot}} \) represents the all employed civilian wage and salary workers, ages 16 and over in the Current Population Survey. Not included are employed 14-15-year-olds, self-employed workers, or a small number of unpaid family workers.  
\( b) \) \( N_{t,s}^{\text{Cov}} \) is the number of employed civilian wage and salary workers who has answered yes to one of these successive questions related to their principal job:  
A) ‘On this job, is . . . a member of a labor union or of an association similar to a union?’  
B) ‘On this job, is . . . covered by a union or employee association contract?’  
Hence, workers are counted as covered by a collective bargaining agreement if they are union members or if they are not members but say they are covered by a union contract.


**Number of Firms** \( I_{t,s} \). Total number of firms active at time \( t \) in state \( s \).

**Herfindhal Index** \( H_{t,s} = \int \text{Empshare}_{t,s,j}^2 \, dj \).

Appendix A.1.4. Country Level

**Aggregate Output** \( Y_{t,i} = \int y_{t,i} \, di \).

**Employment** \( N_{t,i} = \int n_{t,i} \, di \).

**Labour Productivity** \( Y_{t,i} / N_{t,i} \).
Appendix B. Appendix: Empirical Analysis

Appendix B.1. Identification of the break

Figure B.4 reports the relative use of Ch 11 procedure, computed as the ration between the annual filings for Ch 11 over the annual filings for bankruptcy by publicly listed firms. The figure suggests a break in the relative use of the reorganization procedure in 1998. The Quandt-likelihood-ratio test - for the presence of a structural break at an unknown date in the number of annual Ch 11 filings - corroborates the finding (Fig. B.5).

Figure B.4: Time series of default composition by bankruptcy procedure

Figure B.5: Quandt likelihood ratio over 1979-2012

Note: The shaded areas denote the share of annual bankruptcy filings by bankruptcy procedure: Ch 7 (red), Ch 11 (blue). Source: Compustat North-America Fundamentals Annual, 1950-2012. The sample excludes: utilities (NAICS 22) financial (NAICS 52) and public administration (NAICS 92) corporations, American Depository Receipts (ADR).

Appendix B.2. Stability of the unionization coverage ranking over time.

Figure B.6 reports the time series of the cross-sectional mean and standard deviation of the U.S. States unionization coverage, over the period 1983-2012. While the average unionization coverage has significantly decreased over time (red line), the standard deviation of coverage has remained stable (blue line). This empirical evidence suggests that the cross-sectional long-run unionization coverage rankings was preserved over time.

Appendix B.3. State-Level Analysis
See Online Appendix.

Appendix B.4. Firm-Level Analysis
See Online Appendix.
Table B.7: The Likelihood of Success of Ch 11

<table>
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<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
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<th>(5)</th>
<th>(6)</th>
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<td>$d_{&gt;1998}$</td>
<td>0.443</td>
<td>0.443</td>
<td>0.459</td>
<td>0.504*</td>
<td>0.610**</td>
<td>0.450*</td>
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<td></td>
<td>(0.303)</td>
<td>(0.434)</td>
<td>(0.324)</td>
<td>(0.297)</td>
<td>(0.292)</td>
<td>(0.254)</td>
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<tr>
<td>$d_{&gt;1998} \cdot d_U$</td>
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<td>-4.793***</td>
<td>-4.866***</td>
<td>-4.979***</td>
<td>-5.380***</td>
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<td></td>
<td>(0.276)</td>
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<td>(0.335)</td>
<td>(0.280)</td>
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<tr>
<td>$d_U$</td>
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<td>4.636***</td>
<td>4.692***</td>
<td>4.812***</td>
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<td>(0.405)</td>
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<td>$b_{i,t}/a_{i,t}$</td>
<td>0.063**</td>
<td>0.063***</td>
<td>0.061**</td>
<td>0.062**</td>
<td>0.083***</td>
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<td></td>
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<td>(0.029)</td>
<td>(0.028)</td>
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<td>(0.024)</td>
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<td>$\ln a_{i,t}$</td>
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<td>0.359***</td>
<td>0.354**</td>
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<td>0.386***</td>
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<td>(0.138)</td>
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<td>Replacement of CEO</td>
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<td></td>
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<tr>
<td>Filed away from headquarters</td>
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<td>0.268</td>
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<td>$d_{&gt;1998} \cdot d_U$</td>
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</table>

Regression coefficients, Standard error clustered at state level in parenthesis
* $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$

Note: The table contains the probit regression of the Ch 11 cases confirmed (=1) vs. Ch 11 converted to Ch 7 (=0) over: 1) Treatment variables: structural break, $d_{>1998}$, unionization dummy, $d_U$, interaction term, $d_{>1998} \cdot d_U$; 2) Firms level controls: log real total assets, $a_{i,t}/P_t$, leverage, $b_{i,t}/a_{i,t}$ under different specifications: (1) baseline model; (2) standard errors clustered at industry level; (3)-(6) inclusion of: (3) dummy variable that takes value 1 if the CEO is replaced at filings or 0 if not replaced; (4) Filing in courts different from headquarter court; (5) Days in bankruptcy from filing to disposition; (6) dummy variable that takes value 1 in presence of 363 sales. Source: UCLA LoPucki Bankruptcy Research Database, 1980-2012. The data-set includes voluntary filings for Chapter 11, for which at disposition date either the reorganization plan is confirmed and the corporation emerge or the case in converted to Chapter 7. The data-set is purged by bankruptcy cases disposed in 2000 and 2001.
Appendix B.4.1. Testable Implications of the Restructuring Channel: Bankruptcy Choices

How did the shift in creditor rights affect the bankruptcy phenomenon of firms facing different bargaining power of workers? I answer this question in two steps. First, I restrict the attention to the population of publicly listed firms in bankruptcy reorganization (UCLA LoPucki Bankruptcy Research Database).

Table B.8: Share of Successful Reorganizations Ch 11

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate</td>
<td>0.9511</td>
<td>0.9201***</td>
<td>0.9296</td>
</tr>
<tr>
<td>Highly Unionized region</td>
<td>0.9661</td>
<td>0.9191 **</td>
<td>0.9310</td>
</tr>
<tr>
<td>Lowly Unionized region</td>
<td>0.9440</td>
<td>0.9208 **</td>
<td>0.9288</td>
</tr>
</tbody>
</table>

* p < 0.1, ** p < 0.05, *** p < 0.01, one-sided mean-comparison t test (Welch)

Note: The two-way table reports the ratio of the Ch 11 filings that are not converted to Ch 7 over the total number of Ch 11 filings for different regions (rows) and time periods (columns). Regions: the aggregate economy (row 1), highly unionized region (row 2), lowly unionized region (row 3); Time periods: Ch 11 cases that have been disposed in the pre-shift period (Column 1), post-shift period (Column 2) and the whole analysis period (Column 3). Source: UCLA LoPucki Bankruptcy Research Database, 1980-2012. The data-set is purged by involuntary filings, prepackaged cases, dismissals, and missing data.

The restructuring channel predicts that an increase in creditor rights reduces the incentives of shareholders to restructure labour contracts and makes more likely that reorganizations fail (H1: intensive margin channel). In addition, the likelihood of success of Ch 11 should drop more as the bargaining power of worker increase, and a successful restructuring of labour contracts is required for the reorganization to succeed. To test these

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Figure B.6: Time series of cross-sectional mean and standard deviation of Coverage
implications, I report the fraction of Ch 11 cases that are not converted to Ch 7 before and after the break, in aggregate and by unionization region (Table B.8). In line with the literature, I document an economy-wide decrease in the likelihood of success of the Ch 11 procedure. I then complement the existing evidence, by documenting a larger drop in the likelihood of success of Ch 11 in the highly unionized region.

Second, I restrict the attention to the population of publicly listed firms in bankruptcy reorganization and liquidations (Compustat).

The restructuring channel predicts that an increase in creditor rights makes Ch 11 less attractive than Ch 7 (H2: extensive margin channel), especially when workers extract a lot of rents, and restructuring labour contracts is key to regain economic soundness. In line with the theory, Figure Appendix B.4.1 shows that after the break the relative use of Ch 11 drops significantly more for firms in the highly unionized region (red line).

Figure B.7: Fraction of Ch 11 cases over total default, by unionization region

Note: Ratio of Ch 11 cases over total default (Ch 7 + Ch 11), in the lowly unionized region (blue), and highly unionized region (red). Source: Compustat North-America Fundamentals Annual, 1979-2012. The sample excludes: utilities (NAICS 22) financial (NAICS 52) and public administration (NAICS 92) corporations, American Depository Receipts (ADR).

Appendix B.4.2. Testable Implications of the Restructuring Channel: Firms’ Financing Decisions

Table B.9 takes a snapshot of the firms’ distribution by unionization region, in aggregate, and for the time-windows of interest: pre-shift, post-shift and 1979-2012. Few facts emerge. The median leverage decreased by 27% in the U.S., led by firms in highly unionized states (-43%). If any, leverage slightly increases in the lowly unionized area (1.3%). Similar behaviour for the dividend price ratio, that experienced a 46% drop at the country level, with firms in the highly unionized region on the driving seat (51% drop).

Appendix B.5. How are results sensitive to the structural break date?

The bankruptcy literature agrees that Ch 11 looks nowadays more creditor-friendly than it did 30 years ago. Nonetheless, the shift in creditor rights protection did not arise from an amendment to the Bankruptcy Code, but from a series of causes. Warren [1999] and Miller [2007] point at financial institutions lobbying for their bankruptcy agenda. Adlera et al. [2010] identify a break in 2001, with a change in the Uniform Commercial Code ("UCC") and the adoption of UCC §9-104, that sanctioned the practice of writing control provisions
Table B.9: Firm balance-sheets, by unionization region

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<tr>
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<th></th>
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<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Median</td>
<td>Std</td>
<td>Mean</td>
<td>Median</td>
<td>Std</td>
</tr>
<tr>
<td>Leverage</td>
<td>0.1853</td>
<td>0.1360</td>
<td>0.1859</td>
<td>0.1865</td>
<td>0.0985</td>
<td>0.2321</td>
</tr>
<tr>
<td>Lowly Unionized</td>
<td>0.2054</td>
<td>0.1635</td>
<td>0.1939</td>
<td>0.2263</td>
<td>0.1657</td>
<td>0.2410</td>
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<tr>
<td>Highly Unionized</td>
<td>0.1745</td>
<td>0.1232</td>
<td>0.1799</td>
<td>0.1665</td>
<td>0.0702</td>
<td>0.2224</td>
</tr>
<tr>
<td>Dividend Price Ratio</td>
<td>0.0082</td>
<td>0.0013</td>
<td>0.0140</td>
<td>0.0044</td>
<td>0.0000</td>
<td>0.0120</td>
</tr>
<tr>
<td>Lowly Unionized</td>
<td>0.0078</td>
<td>0.0010</td>
<td>0.0143</td>
<td>0.0054</td>
<td>0.0000</td>
<td>0.0143</td>
</tr>
<tr>
<td>Highly Unionized</td>
<td>0.0086</td>
<td>0.0016</td>
<td>0.0141</td>
<td>0.0042</td>
<td>0.0000</td>
<td>0.0111</td>
</tr>
</tbody>
</table>

Note: The table reports values of the panel average, median and standard-deviation of the statistic reported in the row at different geographical level (Aggregate, Lowly Unionized, and Highly Unionized Region) for the pre-shift period (1979-1998), post-shift period (1999-2012), and the whole period (1979-2012). Source: Compustat North-America Fundamentals Annual, 1979-2012. Union Membership and Coverage database (CPS). The sample excludes: utilities (NAICS 22) financial (NAICS 52) and public administration (NAICS 92) corporations, American Depository Receipts (ADR). It also excludes observations with missing State field.

into debt instruments, allowing in case of distress to shift control over a debtor’s financial decisions from equity-appointed management to the creditor. Adlera et al. [2010] and Gennaioli and Rossi [2010] also suggests a shift in the judicial attitude. The enactment in 2004 of the Bankruptcy Abuse Prevention and Consumer Protection Act (BAPCPA) contains several pro-creditor provisions relating to Ch 11 reorganizations\(^{57}\). For this reason Figure B.8 reports the main coefficients of interest (break \(\beta_{>1998}\) and interaction term \(\beta_{>1998,U}\) in Table (?)) when the break date ranges between 1998 and 2004. Broadly speaking, results hold through.

Appendix B.6. How are results sensitive to the partition of firms in highly and lowly unionized?
In order to answer this question, Figure B.9 reports the main coefficients of interest (break \(\beta_{>1998}\) and interaction term \(\beta_{>1998,U}\) in Table (?)) under different percentiles of the unionization coverage distribution separating lowly from highly unionized states: 20%, 25%, 33.33%, 50%, 66.66%, 75%, 80%. Broadly speaking, results hold through.

\(^{57}\) Among others, the mandatory cap on a debtor’s exclusive period to file a plan of reorganization; enhanced protections for reclamation and trade creditors; a mandatory cap on the period to assume or reject unexpired leases of non-residential real property; expanded protection of utilities; mandatory appointment of a chapter 11 trustee in certain circumstances and relaxation of the ability to recover preferences.
Figure B.8: $\beta_{\geq 1998, U}$, and $\beta_{\geq 1998}$ for different definitions of $d_{\geq t}$

Note: Coefficient estimates and 95% c.i. on $\beta_{\geq 1998, U}$, $\beta_{\geq 1998}$ where $d_{\geq t}$ is computed at structural break dates, $t$: 1998, 1999, 2000, 2001, 2002, 2003, 2004. The results are displayed in 4 panels. Each panel reports - in order / by colour - the pair of coefficient estimates of $\beta_{\geq 1998}$ (on the left) and $\beta_{\geq 1998, U}$ (on the right) coming from the same regression. In a panel, regressions differ by the assumption on the break date. In order (by colour): 1998 (blue), 1999 (purple), 2000 (green), 2001 (orange), 2002 (light-green), 2003 (red), 2004 (violet). The 4 panels report clockwise and starting from the north-west corner coefficients estimates from: I. State-Level Labour Productivity Blundell-Bond two-steps regression of state level labour productivity, $\ln Y_{t,s}/N_{t,s}$ over: 1) Treatment variables: structural break, $d_{\geq 1998}$, unionization dummy, $d_{U}$, interaction term, $d_{\geq 1998} \cdot d_{U}$; 2) State level controls: Herfindhal index of sectoral concentration (sector real sales shares unit). Time and states fixed effects are reported. Instruments: a) GMM type: up to 3 lags of the dependent variable and continuous covariates; b) iv-type: $d_{U}$, $d_{\geq 1998}$, and $d_{\geq 1998} \cdot d_{U}$. II. Bankruptcy Choice Multinomial logit regressions of firms continuation choice $\phi = \{\text{Continuation, Ch 7, Ch 11}\}$ over: 1) Treatment variables: structural break, $d_{\geq 1998}$, unionization dummy, $d_{U}$, interaction term, $d_{\geq 1998} \cdot d_{U}$; 2) Country level controls: level of union coverage, $\text{Cov}_U$; 3) State level controls: aggregate real sales, $Y_{1,s}$, Herfindhal index of sectoral concentration (sector real sales shares unit), employment shares by sector (naics), level of union coverage, $\text{Cov}_U$, interaction terms: $d_{U} \cdot \text{Cov}_U$, $d_{\geq 1998} \cdot \text{Cov}_U$, $d_{\geq 1998} \cdot d_{U} \cdot \text{Cov}_U$; 4) Firms level controls: real sales, $y_{t,i}/P_t$, leverage, $b_{t-1,i}/a_{t-1,i}$, real total assets, $a_{t-1,i}/P_t$; 5) Fixed effect controls: time, states, and sector fixed effects are reported. Ch 7 and Ch 11 denote the relative bankruptcy choices (the baseline case Continuation is omitted). III. Leverage Fixed effect regression of $\ln b_{t,i}/a_{t,i}$ over: 1) Treatment variables: structural break, $d_{\geq 1998}$, unionization dummy, $d_{U}$, interaction term, $d_{\geq 1998} \cdot d_{U}$; 2) State level controls: Herfindhal index of sectoral concentration (sector real sales shares unit); 3) Sector level controls: aggregate amount of debt over aggregate amount of assets by sector in the state of consideration, $B_{t,s} \cdot A_{t,s}$; 4) Firms level controls: real total assets, $a_{t,i}/P_t$, log real total assets, $\ln a_{t-1,i}/P_t$; 5) Other: linear trend, $t$, and interaction term $t \cdot d_{U}$. Leverage is measured as total liabilities over total assets (compustat identifiers: lt, at). IV. Labour Productivity Fixed effect regression of $\ln y_{t,i}/n_{t,i}$ over: 1) Treatment variables: structural break, $d_{\geq 1998}$, unionization dummy, $d_{U}$, interaction term, $d_{\geq 1998} \cdot d_{U}$; 2) State level controls: Herfindhal index of sectoral concentration (sector real sales shares unit); 3) Sector level controls: aggregate amount of debt over aggregate amount of assets by sector in the state of consideration, $B_{t,s} \cdot A_{t,s}$; 4) Firms level controls: log labour productivity, $\ln y_{t-1,i}/n_{t-1,i}$, log real total assets, $\ln a_{t-1,i}/P_t$; 5) Other: linear trend, $t$, and interaction term $t \cdot d_{U}$. Source: Compustat North-America Fundamentals Annual, 1979-2012. Union Membership and Coverage database (CPS), 1983-2014.
Treatment variables (sector real sales shares unit). Time and states fixed effects are reported.

Instruments: level controls 25% (purple), 30% (green), 50% (orange), 70% (light-green), 75% (red), 80% (violet). The 4 panels report clockwise and starting from the north-west corner coefficients estimates from: I. State-Level Labour Productivity Blundell-Bond two-steps regression of state level labour productivity, ln $Y_{t,s}/N_{t,s}$ over: 1) Treatment variables: structural break, $d_{1998}$; unionization dummy, $d_U$; interaction term, $d_{1998} \cdot d_U$; 2) State level controls: Herfindhal index of sectoral concentration (sector real sales shares unit). Time and states fixed effects are reported. Instruments: a) GMM type: up to 3 lags of the dependent variable and continuous covariates; b) iv-type: $d_U$, $d_{1998}$, and $d_{1998} \cdot d_U$.

II. Bankruptcy Choice Multinomial logit regressions of firms continuation choice $\phi = \{\text{Continuation, Ch 7, Ch 11}\}$ over: 1) Treatment variables: structural break, $d_{1998}$; unionization dummy, $d_U$; interaction term, $d_{1998} \cdot d_U$; 2) Country level controls: level of union coverage, $Cov_U$; 3) State level controls: aggregate real sales, $Y_{t,s}$, Herfindhal index of sectoral concentration (sector real sales shares unit), employment shares by sector (naics), level of union coverage, $Cov_{t,s}$, interaction terms: $d_U \cdot Cov_{t,s}$, $d_{1998} \cdot Cov_{t,s}$, $d_{1998} \cdot d_U \cdot Cov_{t,s}$; 4) Firms level controls: real sales, $y_{t,i}/P_{t,i}$; leverage, $b_{t-1,i}/a_{t-1,i}$; real total assets, $a_{t,i}/P_{t,i}$; 5) Fixed effect controls: time, states, and sector fixed effects are reported.. Ch 7 and Ch 11 denote the relative bankruptcy choices (the baseline case Continuation is omitted). III. Leverage Fixed effect regression of ln $b_{t,i}/a_{t,i}$ over: 1) Treatment variables: structural break, $d_{1998}$; unionization dummy, $d_U$; interaction term, $d_{1998} \cdot d_U$; 2) State level controls: Herfindhal index of sectoral concentration (sector real sales shares unit); 3) Sector level controls: aggregate amount of debt over aggregate amount of assets by sector in the state of consideration, ln $B_{s,j,t}/A_{s,j,t}$, employment share of labour by sector in the state of consideration; 4) Firms level controls: lagged value, ln $b_{t-1,i}/a_{t-1,i}$, log labour productivity, ln $y_{t,i}/n_{t,i}$, log real total assets, ln $a_{t-1,i}/P_{t,i}$; 5) Other: linear trend, $t$, and interaction term $t \cdot d_U$. Leverage is measured as total liabilities over total assets (Compustat identifiers: lt, at).

IV. Labour Productivity Fixed effect regression of ln $y_{t,i}/n_{t,i}$ over: 1) Treatment variables: structural break, $d_{1998}$; unionization dummy, $d_U$; interaction term, $d_{1998} \cdot d_U$; 2) State level controls: Herfindhal index of sectoral concentration (sector real sales shares unit); 3) Sector level controls: aggregate amount of debt over aggregate amount of assets by sector $y_{t,i}n_{t,i}$ the state of consideration, ln $B_{s,j,t}/A_{s,j,t}$, employment share of labour by sector in the state of consideration; 4) Firms level controls: log labour productivity, ln $y_{t,i}n_{t,i}$, log real total assets, ln $a_{t-1,i}/P_{t,i}$; 5) Other: linear trend, $t$, and interaction term $t \cdot d_U$. Source: Compustat North-America Fundamentals Annual, 1979-2012. Union Membership and Coverage database (CPS), 1983-2014.

Note: Coefficient estimates and 95% c.i. on $\beta_{>1998}$, $\beta_{1998}$ for different percentiles of the unionization coverage distribution separating lowly from highly unionized states: 20%, 25%, 33.33%, 50%, 66.66%, 75%, 80%. The results are displayed in 4 panels. Each panel reports - in order / by color - the pair of coefficient estimates of $\beta_{1998}$ (on the left) and $\beta_{>1998}$ (on the right) coming from the same regression. In a panel, regressions differ by the assumption on the percentile of the unionization coverage distribution separating lowly from highly unionized states. In order (by colour): 20% (blue), 25% (purple), 30% (green), 50% (orange), 70% (light-green), 75% (red), 80% (violet). The 4 panels report clockwise and starting from the north-west corner coefficients estimates from: I. State-Level Labour Productivity Blundell-Bond two-steps regression of state level labour productivity, ln $Y_{t,s}/N_{t,s}$ over: 1) Treatment variables: structural break, $d_{1998}$; unionization dummy, $d_U$; interaction term, $d_{1998} \cdot d_U$; 2) State level controls: Herfindhal index of sectoral concentration (sector real sales shares unit). Time and states fixed effects are reported. Instruments: a) GMM type: up to 3 lags of the dependent variable and continuous covariates; b) iv-type: $d_U$, $d_{1998}$, and $d_{1998} \cdot d_U$.

II. Bankruptcy Choice Multinomial logit regressions of firms continuation choice $\phi = \{\text{Continuation, Ch 7, Ch 11}\}$ over: 1) Treatment variables: structural break, $d_{1998}$; unionization dummy, $d_U$; interaction term, $d_{1998} \cdot d_U$; 2) Country level controls: level of union coverage, $Cov_U$; 3) State level controls: aggregate real sales, $Y_{t,s}$, Herfindhal index of sectoral concentration (sector real sales shares unit), employment shares by sector (naics), level of union coverage, $Cov_{t,s}$, interaction terms: $d_U \cdot Cov_{t,s}$, $d_{1998} \cdot Cov_{t,s}$, $d_{1998} \cdot d_U \cdot Cov_{t,s}$; 4) Firms level controls: real sales, $y_{t,i}/P_{t,i}$; leverage, $b_{t-1,i}/a_{t-1,i}$; real total assets, $a_{t,i}/P_{t,i}$; 5) Fixed effect controls: time, states, and sector fixed effects are reported.. Ch 7 and Ch 11 denote the relative bankruptcy choices (the baseline case Continuation is omitted). III. Leverage Fixed effect regression of ln $b_{t,i}/a_{t,i}$ over: 1) Treatment variables: structural break, $d_{1998}$; unionization dummy, $d_U$; interaction term, $d_{1998} \cdot d_U$; 2) State level controls: Herfindhal index of sectoral concentration (sector real sales shares unit); 3) Sector level controls: aggregate amount of debt over aggregate amount of assets by sector in the state of consideration, ln $B_{s,j,t}/A_{s,j,t}$, employment share of labour by sector in the state of consideration; 4) Firms level controls: lagged value, ln $b_{t-1,i}/a_{t-1,i}$, log labour productivity, ln $y_{t,i}/n_{t,i}$, log real total assets, ln $a_{t-1,i}/P_{t,i}$; 5) Other: linear trend, $t$, and interaction term $t \cdot d_U$. Leverage is measured as total liabilities over total assets (Compustat identifiers: lt, at).

IV. Labour Productivity Fixed effect regression of ln $y_{t,i}/n_{t,i}$ over: 1) Treatment variables: structural break, $d_{1998}$; unionization dummy, $d_U$; interaction term, $d_{1998} \cdot d_U$; 2) State level controls: Herfindhal index of sectoral concentration (sector real sales shares unit); 3) Sector level controls: aggregate amount of debt over aggregate amount of assets by sector $y_{t,i}n_{t,i}$ the state of consideration, ln $B_{s,j,t}/A_{s,j,t}$, employment share of labour by sector in the state of consideration; 4) Firms level controls: log labour productivity, ln $y_{t,i}n_{t,i}$, log real total assets, ln $a_{t-1,i}/P_{t,i}$; 5) Other: linear trend, $t$, and interaction term $t \cdot d_U$. Source: Compustat North-America Fundamentals Annual, 1979-2012. Union Membership and Coverage database (CPS), 1983-2014.
Appendix C. The Restructuring Channel Mechanism

Appendix C.0.1. The Debt Restructuring

Given \((e, v, \psi)\), solving the debt restructuring problem \((1)\) by backward induction, we have that recovery values are

\[
R_{e}^{11}(v)(\psi) = \begin{cases} 
\psi + \theta C(1 - v - \psi) & \psi < 1 - v \\
\psi & \psi \geq 1 - v 
\end{cases}
\]

the shareholder’s surplus is

\[
S_{e}^{F}(v)(\psi) = \begin{cases} 
(1 - \theta C)(1 - v - \psi) & \psi < 1 - v \\
0 & \psi \geq 1 - v 
\end{cases}
\]

worker surplus

\[
S_{e}^{W}(v)(\psi) = \begin{cases} 
v & \psi < 1 - v \\
0 & \psi \geq 1 - v 
\end{cases}
\]

Substituting in the objective function is easy to show that, for a given \((v, e)\), the expected surplus of the shareholders is

\[
S_{e}^{E}(v) = E_{\psi}[(1 - \theta C)(1 - v - \psi)]
= P[\psi < 1 - v] \cdot E_{\psi}[V(v, \psi)|\psi < 1 - v] + (1 - P[\psi < 1 - v]) \cdot 0
= (1 - v) \cdot E_{\psi}[(1 - \theta C)(1 - v - \psi)|\psi < 1 - v]
= (1 - v) \cdot (1 - \theta C) \cdot (1 - v - E_{\psi}[\psi|\psi < 1 - v])
= (1 - \theta C) \cdot (1 - v) \cdot (1 - v - (1 - v)/2)
= (1 - \theta C) \cdot \frac{(1 - v)^2}{2}
\]

and the expected recovery value under Ch 11 is

\[
R_{e}^{11}(v) = P[\psi > 1 - v] \cdot E_{\psi}[\psi|\psi > 1 - v] + P[\psi < 1 - v] \cdot E_{\psi}[\psi|\psi < 1 - v] + \theta C(1 - v - E_{\psi}[\psi|\psi < 1 - v])
= \left\{P[\psi > 1 - v] \cdot E_{\psi}[\psi|\psi > 1 - v] + P[\psi < 1 - v] \cdot E_{\psi}[\psi|\psi < 1 - v]\right\}
+ P[\psi < 1 - v] \cdot \theta C(1 - v - E_{\psi}[\psi|\psi < 1 - v])
= E[\psi] + (1 - v) \cdot \theta C \cdot \left(1 - v - \frac{1 - v}{2}\right)
= \frac{1}{2} + (1 - v) \cdot \theta C \cdot \frac{1 - v}{2}
\]

Equations (3), (2) follows.
Appendix C.0.2. The Labour Restructuring

If we substitute the surplus of the firm (3) in (4), the labour restructuring problem reads

\[ NB'_e = \left( \frac{1 - \theta_C}{2} \right)^{1 - \alpha(e) \cdot \theta_U} \max_v \left[ (1 - v)^2 \right]^{1 - \alpha(e) \cdot \theta_U} \left( (1 - v) \cdot v \right)^{\alpha(e) \cdot \theta_U} \]

and we can derive the optimal wage compensation (5)

\[ w = \frac{\alpha(e) \cdot \theta_U}{2} \]

By substituting it in the objective function we get:

\[ R_{e11} = \frac{1}{P[\psi]} + \left( 1 - \frac{\alpha(e) \cdot \theta_U}{2} \right) \cdot \frac{\theta_C}{2} \cdot \left( 1 - \frac{\alpha(e) \cdot \theta_U}{2} \right) \cdot \frac{1}{P[\psi]} \]

\[ S_e^F = (1 - \theta_C) \cdot \frac{(1 - \frac{\alpha(e) \cdot \theta_U}{2})^2}{2} \]

\[ S_e^W = \left( 1 - \frac{\alpha(e) \cdot \theta_U}{2} \right) \cdot \frac{\alpha(e) \cdot \theta_U}{2} \]

The results (7), (8), and (9) follow.

Appendix C.1. The Restructuring Effort Problem

Appendix C.1.1. Proof Proposition 2

Proof. Let \( \alpha(e) = 1 - e \), and \( c(e) = \frac{e^2}{4} \cdot c_{11} \) we can rewrite the restructuring effort problem

\[ \max_e (1 - \theta_C) \cdot \left( \frac{1 - \theta_U}{2} + \frac{\theta_U}{2} e \right)^2 \cdot \frac{e^2}{4} \cdot c_{11} \]

Let \( \frac{\theta_U}{2} = \tilde{\theta}_U \). By taking FOC:

\[ \frac{(1 - \theta_C)}{2} \cdot \left( 1 - \frac{\theta_U}{2} + \frac{\theta_U}{2} e \right) \cdot \frac{\theta_U}{2} = \frac{e}{2} \cdot c_{11} \]

\[ (1 - \theta_C) \cdot \left( 1 - \frac{\theta_U}{2} + \frac{\theta_U}{2} e \right) \cdot \frac{\theta_U}{2} = e \cdot c_{11} \]

\[ (1 - \theta_C) \cdot \left( 1 - \tilde{\theta}_U + \tilde{\theta}_U e \right) \cdot \tilde{\theta}_U = e \cdot c_{11} \]

\[ e \left( c_{11} - (1 - \theta_C) \cdot \tilde{\theta}_U^2 \right) = (1 - \theta_C) \cdot (1 - \tilde{\theta}_U) \cdot \tilde{\theta}_U \]

\[ e = \frac{(1 - \theta_C) \cdot \tilde{\theta}_U \cdot (1 - \tilde{\theta}_U)}{c_{11} - (1 - \theta_C) \cdot (\tilde{\theta}_U)^2} \]
Property 1, follows immediately by taking derivative

\[
\frac{\partial e^*}{\partial \theta_U} = -\frac{\hat{\theta}_U \cdot (1 - \hat{\theta}_U)}{\left(c_{11} - (1 - \theta_U) \cdot (2\hat{\theta}_U)^2\right)^2} < 0
\]

The derivation of Property 2 is more convoluted:

\[
\frac{\partial^2 e^*}{\partial \theta_U \partial \theta_C} = -\frac{\partial}{\partial \theta_U} \frac{\hat{\theta}_U \cdot (1 - \hat{\theta}_U)}{\left(c_{11} - (1 - \theta_U) \cdot (2\hat{\theta}_U)^2\right)^2}
\]

\[
= -\frac{(1 - 2\hat{\theta}_U) \cdot D^2 + \hat{\theta}_U \cdot (1 - \hat{\theta}_U) \cdot 2 \cdot D \cdot 2 \cdot (1 - \theta_U) \cdot \hat{\theta}_U}{D^4}
\]

\[
= -\frac{(1 - 2\hat{\theta}_U) \cdot D + \hat{\theta}_U \cdot (1 - \hat{\theta}_U) \cdot 4 \cdot (1 - \theta_U) \cdot \hat{\theta}_U}{D^3}
\]

\[
= \frac{(1 - 2\hat{\theta}_U) \cdot D \cdot 2\hat{\theta}_U \cdot (1 - \hat{\theta}_U) \cdot (1 - \theta_U) \cdot 2\hat{\theta}_U}{D^3}
\]

\[
= D - 2\hat{\theta}_U \cdot \left\{1 - (1 - \theta_U) \cdot (2\hat{\theta}_U - (\hat{\theta}_U)^2) \cdot (1 - \theta_U)\right\}
\]

\[
= D - 2\hat{\theta}_U \cdot \left\{1 - (1 - \theta_U) \cdot \left[(\hat{\theta}_U)^2 + 2\hat{\theta}_U - 2(\hat{\theta}_U)^2\right]\right\}
\]

\[
= D - 2\hat{\theta}_U \cdot \left\{1 - (1 - \theta_U) \cdot 2\hat{\theta}_U - (\hat{\theta}_U)^2\right\}
\]

\[
= \frac{c_{11} - (1 - \theta_U) \cdot (\hat{\theta}_U)^2 - 2\hat{\theta}_U \cdot \left\{1 - (1 - \theta_U) \cdot [2\hat{\theta}_U - (\hat{\theta}_U)^2]\right\}}{D^3}
\]

\[
= \frac{c_{11} - (1 - \theta_U) \cdot (\hat{\theta}_U)^2 - 2\hat{\theta}_U \cdot \left\{1 - (1 - \theta_U) \cdot 2\hat{\theta}_U + (1 - \theta_U)(\hat{\theta}_U)^2\right\}}{D^3}
\]

\[
= \frac{c_{11} - (1 - \theta_U) \cdot (\hat{\theta}_U)^2 - (1 - 2\hat{\theta}_U) - 2\hat{\theta}_U \cdot \left\{1 - (1 - \theta_U) \cdot 2\hat{\theta}_U\right\}}{D^3}
\]

\[
= \frac{c_{11} + (1 - \theta_U) \cdot (\hat{\theta}_U)^2 - (2\hat{\theta}_U - 1) + 2\hat{\theta}_U \cdot \left\{(1 - \theta_U) \cdot 2\hat{\theta}_U - 1\right\}}{D^3}
\]

\[
= \frac{c_{11} + (1 - \theta_U) \cdot (\hat{\theta}_U)^2 - (2\hat{\theta}_U - 1) + 2\hat{\theta}_U \cdot \left\{(1 - \theta_U) \cdot 2\hat{\theta}_U - 1\right\}}{D^3}
\]

\[
< 0
\]

\[
\frac{\partial^2 e^*}{\partial \theta_U \partial \theta_C} = -\frac{c_{11} + (1 - \theta_U) \cdot (\hat{\theta}_U)^2 - (2\hat{\theta}_U - 1) + 2\hat{\theta}_U \cdot \left\{(1 - \theta_U) \cdot 2\hat{\theta}_U - 1\right\}}{\left(1 - (1 - \theta_U) \cdot (\hat{\theta}_U)^2\right)^3} < 0
\]

Since \(\hat{\theta}_U\) is a strictly increasing function of \(\theta_U\), by Chain rule it follows that \(\frac{\partial^2 e^*}{\partial \theta_U \partial \theta_C} < 0\).
Appendix D. The Static Model

Appendix D.0.1. The misallocation of resources

The output in the economy is given by

\[ Y = A \cdot k^* + [1 - k^*] \]
\[ = AL + [1 - L] \]
\[ = [A \cdot (1 - m) + 1 \cdot m] \]
\[ = [1 \cdot \frac{(1 - m)}{A} + \frac{1}{A} \cdot \frac{m}{L}] \cdot A \]

and (14) follows. Notice the misallocation of resources \( m = 1 - L \), is pinned down by the severity of the losses upon bankruptcy \( 1 - L \).

Appendix D.1. Normative Analysis

We can rewrite the problem of a social planner which chooses the optimal level of creditor rights by taking as given the bargaining power of workers (15) as

\[ \frac{1}{\theta_C} \cdot \max \ln \theta_C + 2 \ln[2 - \theta_U + \theta_U \cdot e^*(\theta_C, \theta_U)] \]

By taking FOC:

\[ \frac{1}{\theta_C} + \frac{2}{2 - \theta_U + \theta_U \cdot e^*(\theta_C, \theta_U)} \frac{\theta_U}{\theta_C} \cdot \frac{\partial e^*(\theta_C, \theta_U)}{\partial \theta_C} = 0 \]

Now let

\[ e^*(\theta_C, \theta_U) = \frac{(1 - \theta_C) \cdot \frac{\theta_U}{2} \cdot (1 - \frac{\theta_U}{2})}{c_{11} - (1 - \theta_C) \cdot (\frac{\theta_U}{2})^2} = \frac{N}{D} \]

and

\[ \frac{\partial e^*(\theta_C, \theta_U)}{\partial \theta_C} = \left( \frac{\theta_U \cdot (1 - \theta_U)}{c_{11} - (1 - \theta_C) \cdot (\hat{\theta}_U)^2} \right) = \frac{N}{(1 - \theta_C) \cdot D^2} \]

Then

\[ \frac{1}{\theta_C} = \frac{2\theta_U \cdot N}{2 - \theta_U + \theta_U \cdot \frac{N}{D}} \cdot \frac{1}{(1 - \theta_C) \cdot D^2} \]
\[ (1 - \theta_C) \cdot D = \frac{2\theta_U \cdot N}{(2 - \theta_U) \cdot D + \theta_U \cdot N \cdot \theta_C} \]

Noticing that

\[ (2 - \theta_U) \cdot D + \theta_U \cdot N = c_{11} \cdot (2 - \theta_U) \]
\[(2 - \theta_U) \cdot D + \theta_U \cdot N = c_{11} \cdot (2 - \theta_U) \cdot (1 - \theta_C) \cdot (2 - \theta_U) \cdot \theta_U^2 \left( \frac{2}{4} \right) + \theta_U \cdot (1 - \theta_C) \cdot \left( \frac{\theta_U}{2} \right) \cdot (1 - \theta_U) \frac{2}{4} \]

\[= c_{11} \cdot (2 - \theta_U) - (1 - \theta_C) \cdot (2 - \theta_U) \cdot \theta_U^2 \left( \frac{2}{4} \right) + (1 - \theta_C) \cdot \left( \frac{\theta_U}{2} \right) \cdot (1 - \theta_U) \frac{2}{4} \]

\[= c_{11} \cdot (2 - \theta_U) - (1 - \theta_C) \cdot (2 - \theta_U) \cdot \theta_U^2 \left( \frac{2}{4} \right) + (1 - \theta_C) \cdot (2 - \theta_U) \cdot \theta_U^2 \left( \frac{2}{4} \right) \]

we have

\[c_{11} \cdot (2 - \theta_U) \cdot (1 - \theta_C) \cdot D = 2 \theta_U \cdot N \cdot \theta_C \]

Substituting

\[\theta_U \cdot N = (1 - \theta_C) \cdot (2 - \theta_U) \cdot \theta_U^2 \left( \frac{2}{4} \right) \]

and manipulating:

\[c_{11} \cdot (2 - \theta_U) \cdot (1 - \theta_C) \cdot D = 2 \cdot \theta_C \cdot (1 - \theta_C) \cdot (2 - \theta_U) \cdot \theta_U^2 \left( \frac{2}{4} \right) \]

\[c_{11} \cdot D = 2 \cdot \theta_C \cdot \theta_U^2 \left( \frac{2}{4} \right) \]

\[c_{11} \cdot \left[ c_{11} - (1 - \theta_C) \cdot \theta_U^2 \left( \frac{2}{4} \right) \right] = 2 \cdot \theta_C \cdot \theta_U^2 \left( \frac{2}{4} \right) \]

\[c_{11} \cdot \left[ c_{11} - \theta_U^2 \left( \frac{2}{4} \right) \right] = 2 \cdot \theta_C \cdot \theta_U^2 \left( \frac{2}{4} \right) \]

\[\theta_C^*(\theta_U) = \frac{c_{11} \cdot \left[ c_{11} - \theta_U^2 \left( \frac{2}{4} \right) \right]}{2 - c_{11} \cdot \theta_U^2 \left( \frac{2}{4} \right)} \]

from which we derive (16).

\[\theta_C^*(\theta_U) = \frac{c_{11} \cdot \left[ c_{11} - \theta_U^2 \left( \frac{2}{4} \right) \right]}{2 - c_{11} \cdot \theta_U^2 \left( \frac{2}{4} \right)} \]

**Appendix E. Dynamic Model**

**Appendix E.1. Proof of Theorem 1, 2, 3**

**Appendix E.1.1. Existence of unique continuous function**

Without loss of generality, let us express the nash bargaining problems (23), (34), and (38) as

\[(Tf)(p, s) = \arg \max_{c \in C} \left\{ A(p, s, c)^{(1 - \theta)} \cdot B(p, s, c)^{\theta} \right\} \]

s.t. \( A(p, s, c) \geq 0, \quad B(p, s, c) \geq 0 \) \quad (E.1)

where \( c \in C \) reads \( v \in W \) in (23), and (38), and reads \( a \in [0, 1] \) in (34). \( A(\cdot), B(\cdot) \) are continuous; I will be more precise about their functional forms when needed.

**Proof.** The proof proceeds in 3 steps.
1. For any \( f \in \mathcal{C}(P \times S) \) and \( (p, s) \in P \times S \), \((T_f)(p, s) \subset \mathbb{R}\) is i) not-empty, ii) compact valued, iii) upperhemicontinuous and \((T_f)(p, s) : C \rightarrow C\).

Proof. Since \( C \) is a not-empty, compact valued, continuous feasible correspondence, and the objective function is continuous (product of continuous functions), then by direct application of the Berge’s Maximum Theorem the optimal correspondence is not-empty compact-valued, uhc and is contained in the feasible correspondence \( C \). Noticing that \( s \) was arbitrary the result follows.

2. For any \( f \in \mathcal{C}(P \times S) \), the product correspondence

\[
(T_f)(p, s) = \Pi_{(p, s) \in P \times S}(T_f)(p, s) \subset C
\]

is not empty, compact valued, uhc and \((T_f)(p, s) : C \rightarrow C\).

Proof. The result follows from the fact that: 1) by point 1, \((T_f)(p, s)\) is not empty, compact valued, uhc, included in \( C \); 2) the product correspondence preserves these properties (Aliprantis and Border, 1999: Thm 16.28).

3. Since \( \theta \in \Theta \subset [0, 1] \), then \((T_f)(p, \bar{s})\) is a not-empty, compact and convex-valued uhc correspondence with \((T_f)(p, \bar{s}) : C \rightarrow C\).

Proof. Lemma (1) shows that the solution is unique. In particular if \( \theta \in \Theta \subset [0, 1] \), by strict concavity of the objective function over \([0, 1]\), the Nash Bargaining Problem is well defined with a unique continuous solution.

This implies that the product correspondence \((T_f)(p)\) is a single-valued, continuous function.

Hence by Kakutani-Fan-Glicksberg FPT there exists a continuous \( f^*(p, s) \in C \) such that \( f(p, s)^* = (T_f)(p, s) \). Because of Lemma 1 we know also that the solution is unique (which completes the proof).

**Appendix E.1.2. Uniqueness**

**Lemma 1.** If \( \theta \in \Theta \subset [0, 1] \), for a given \( p \) there exists a **unique** \( f(p, s) \in \mathcal{C}(P \times S) \) which solves the Nash Bargaining Problem.

Proof. Since the proof require to specify the functional forms of \( A(\cdot) \), \( B(\cdot) \) I will proceed theorem-wise. I start first with the restructuring problems (34) and (38), which are differentiable on the whole support, and move eventually to the continuation problem (23), which is differentiable almost everywhere, except in \( d = 0 \). For simplicity, let \( h(\cdot) = A(\cdot)^\theta B(\cdot)^{1-\theta} \) denote the objective function.

- **Theorem 2:** uniqueness of solution to the debt restructuring problem

  Taking derivative with respect to \( a \)

  \[
  \frac{\partial h(a)}{\partial a} = \alpha^R \left[ -(1 - \theta_C) \cdot \theta_C (S^F)^{-\theta_C} (S^C)^{\theta_C} + \theta_C (S^F)^{1-\theta_C} (S^C)^{\theta_C - 1} \right]
  \]

  Taking second derivative:

  \[
  \frac{\partial^2 h(a)}{\partial a^2} = -\alpha^R \left\{ \left[ \theta_C (1 - \theta_C) \cdot (\theta_C)^2 (S^F)^{-\theta_C - 1} (S^C)^{\theta_C} + \theta_C (1 - \theta_C) \cdot \theta_C (S^F)^{-\theta_C} (S^C)^{\theta_C - 1} \right] \right. \\
  \left. \left( (1 - \theta_C) \theta_C (S^F)^{-\theta_C} (S^C)^{\theta_C - 1} \theta_C - (1 - \theta_C) \theta_C (S^F)^{1-\theta_C} (S^C)^{\theta_C - 2} \right) \right\} < 0
  \]

  which completes the proof.
Hence, (22) becomes separable.

Since labour is not a state variable, the choices reduce to $(n,b)$.

Taking derivative with respect to $w$

$$\frac{\partial h(v)}{\partial v} = \alpha^R \left[ - (1 - \theta_U) \cdot n(SF)^{-\theta_U} (SW)^{\theta_U} + \theta_U(SF)^{1-\theta_U} (SW)^{\theta_U-1} n \right]$$

Taking second derivative:

$$\frac{\partial^2 h(v)}{\partial v^2} = -\alpha^R \left\{ \frac{\theta_U(1 - \theta_U) \cdot (tn)^2 \cdot (SF)^{-\theta_U-1} (SW)^{\theta_U} + \theta_U(1 - \theta_U) \cdot tn^2 (SF)^{-\theta_U} (SW)^{\theta_U-1}}{\partial v} + \frac{(1 - \theta_U) \theta_U \cdot (SF)^{-\theta_U} (SW)^{\theta_U-1} tn^2 + (1 - \theta_U) \theta_U(SF)^{1-\theta_U} (SW)^{\theta_U-2} n^2}{\partial v} \right\} < 0$$

which completes the proof.

- **Theorem 1**: uniqueness of solution to the wage bargaining problem when the firm continues.

Taking derivative with respect to $w$

$$\frac{\partial h(v)}{\partial v} = - (1 - \theta_U) \cdot g'(\cdot) \cdot n(SF)^{-\theta_U} (SW)^{\theta_U} + \theta_U(SF)^{1-\theta_U} (SW)^{\theta_U-1} n$$

Taking second derivative:

$$\frac{\partial^2 h(v)}{\partial v^2} = - \left\{ \frac{\theta_U(1 - \theta_U) \cdot (g'(\cdot) \cdot n)^2 \cdot (SF)^{-\theta_U-1} (SW)^{\theta_U} + \theta_U(1 - \theta_U) \cdot g'(\cdot) \cdot n^2 (SF)^{-\theta_U} (SW)^{\theta_U-1}}{\partial v} + \frac{(1 - \theta_U) \theta_U \cdot (SF)^{-\theta_U} (SW)^{\theta_U-1} g'(\cdot) \cdot n^2 + (1 - \theta_U) \theta_U(SF)^{1-\theta_U} (SW)^{\theta_U-2} n^2}{\partial v} \right\} < 0$$

Since in an interior solution with $d \neq 0$ $g(\cdot) = 1$ if $d > 0$ and $g(\cdot) = \nu$ if $d < 0$, the result follows.

\[ \square \]

**Appendix E.2. The Continuation Problem**

Since firm’s preferences are monotonic in $d$, the budget constraint in (22) is binding, the firm’s ordinary choices reduce to $(n,b')$, and the continuation problem simplifies to

$$V^C(p, s) = \max_{(n,b') \in N \times B} g \left( y(p,x,n) - w(p,s,n) \cdot n - \chi_o - \delta k + q(p,x,b')b' - b \right) + \beta \cdot \mathbb{E}_{x' | x} \left[ V(p, s') \right]$$

s.t. $(p, s, n, w(p, s, n)) \in W(p, s, n)$

Since labour is not a state variable, the static size choice, $n$ - taken in order to maximize profits - does not alter the inter-temporal debt choice, $b'$ - taken to smooth dividends over time. Mathematically, since the two controls enter additively in the objective function and the derivative is a linear operator, the problems are separable.

Hence, (22) becomes

$$V^C(p, s) = \max_{n \in N} \max_{b' \in B} g \left( y(p,x,n) - w(p,s,n) \cdot n - \chi_o - \delta k + q(p,x,b')b' - b \right) + \beta \cdot \mathbb{E}_{x' | x} \left[ V(p, s') \right]$$

s.t. $(p, s, n, w(p, s, n)) \in W(p, s, n)$

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To simplify notation, let the operating profits net of investment and gross of the debt issuance be
\[ A(p, s, n, b') = y(p, x, n) - \chi_o + q(p, x, b')b' - \delta k \]
let the discounted markov operator be
\[ E(p, x, b') = \beta \cdot E_{x'}[V(p, s')] \]
and let omit the dependence of the bargaining power on the region, \( \theta_U \equiv \theta_U(r) \).

**Appendix E.2.1. Proposition 4 and 5**

By and large, for a given \( n \), we can rewrite (23)

\[ w(p, s, n) = \arg \max_{v \in W} \left[ \max_{b' \in B} \left[ g(A(p, s, n, b') - b - v \cdot n) + E(p, x, b') \right] \right] \]

s.t. \( V^C_{u, n}(p, s) \geq 0 \), \( v \geq w \)

Fix \( b' \). By taking first order condition with respect to \( v \)

\[
(1 - \theta_U) g'(\cdot) \left[ g(A(p, s, n, b') - b - v \cdot n) + E(p, x, b') \right] n = \theta_U \left[ \frac{1}{v - w} \right]
\]

\[
(1 - \theta_U) g'(\cdot) [v - w] n = \theta_U \left[ g(A(p, s, n, b') - b - v \cdot n) + E(p, x, b') \right]
\]

By definition of \( g(d) = \left[ \mathbb{I}_{d \geq 0} + \iota \cdot \mathbb{I}_{d < 0} \right] \cdot d \), we have \( g'[^1] = 1 \) if \( d > 0 \), \( g'[^0] = \iota \) if \( d < 0 \), and \( g'[^0] \) is not defined. Accordingly, Problem (23) might have an interior or corner solution.

An interior solution is the wage \( w_{\text{interior}}(p, s, n) \) which satisfies (E.2), for either \( d > 0 \) or \( d < 0 \).

The existence of an interior solution proceeds by guess and verify: first, I guess that \( d > 0 \), substitute it in (E.2) and check if for \( w_{d>0}(p, s) \) satisfies it. If not I proceed with \( d < 0 \).

Let us guess \( d > 0 \). Then solving (E.2) when \( g[^1] = 1 \), we get

\[
(1 - \theta_U) g'(\cdot) [v - w] n = \theta_U \left[ g(A(p, s, n, b') - b - v \cdot n) + E(p, x, b') \right]
\]

\[ vn = +w_n + \theta_U \left[ A(p, s, n, b') - b - w_n + E(p, x, b') \right] \]

and therefore
\[
w_{d>0}^{\text{interior}}(p, s, n) = w_n + \theta_U \left[ A(p, s, n, b') - b - w_n + E(p, x, b') \right]
\]

Then I verify that:
\[ d = A(p, s, n, b') - b - w(p, s, n) \geq 0 \]

If not, I guess \( d < 0 \). Then \( g[^1] = \iota \) and

\[
(1 - \theta_U) g'(\cdot) [v - w] n = \theta_U \left[ g(A(p, s, n, b') - b - v \cdot n) + E(p, x, b') \right]
\]

\[ vn = +w_n + \theta_U \left[ A(p, s, n, b') - b - w_n + \frac{1}{\iota} \cdot E(p, x, b') \right] \]

and therefore
\[
w_{d<0}^{\text{interior}}(p, s, n) = w_n + \theta_U \left[ A(p, s, n, b') - b - w_n + \frac{1}{\iota} \cdot E(p, x, b') \right]
\]

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Then I verify that

$$d = A(p, s, n, b') - b - w(p, s, n)n < 0$$

Let us denote the nash bargaining surplus of the firm

$$S(p, s, n) = \begin{cases} 
\max_{b' \in B} A(p, s, n, b') - b - wn + E(p, x, b') & d > 0 \\
\max_{b' \in B} A(p, s, n, b') - b - wn + \frac{1}{t} \cdot E(p, x, b') & d < 0 
\end{cases}$$

or more compactly

$$S(p, s, n) \equiv \max_{b' \in B} A(p, s, n, b') - b - wn + \beta \cdot \frac{1}{I\{d \geq 0\} + \iota \cdot I\{d < 0\}} + E(p, x, b')$$

Then we can rewrite the interior solutions

$$w^{\text{interior}}(p, s, n)n = wn + \theta S(p, s, n)$$

and the value of continuation for a given number of workers

$$V^C_n(p, s) = (1 - \theta)S(p, s, n)$$

Since the $b'$ which maximizes $V^C_n(p, s)$ coincides with the $b'$ which maximizes the nash bargaining surplus $S(p, s, n)$, then it maximizes both $w_d^{\text{interior}}$, $w_{d'}^{\text{interior}}$. Equations (24), (25) follows. The firm chooses $n$ to maximize

$$\max_{n \in N} (1 - \theta)S(p, s, n)$$

and (26) follow.

Let $b'^*$ be the optimal choice of debt, manipulating and substituting

$$\max_{n \in N} A(p, s, n, b'^*) - b - wn + \frac{1}{I\{d \geq 0\} + \iota \cdot I\{d < 0\}} \cdot E(p, x, b'^*)$$

Since hiring is a static choice, by taking FOC and using (17):

$$\alpha \eta (z \cdot x)^{(1-\alpha \eta)} k^{(1-\alpha) \eta} n^{\alpha \eta - 1} = \frac{w}{w \eta}$$

$$n = z \cdot x \left( \frac{\alpha \eta k^{(1-\alpha) \eta}}{w} \right)^{\frac{1}{1-\alpha \eta}}$$

Equations (27) follows.

Hence substituting in (17)

$$y(p, x, n^*) = (z \cdot x)^{(1-\alpha \eta)} k^{(1-\alpha) n^{*, \eta} \eta}$$

$$= (z \cdot x) \left( \frac{\alpha \eta}{w} \right)^{\frac{\alpha \eta}{1-\alpha \eta}} k^{(1-\alpha) \eta}$$

and equation (28) follows.
Let me now turn to the corner solutions, i.e. the wage for which $d = 0$

$$w^{\text{corner}}(\bar{p}, \bar{s}, n) = \frac{A(\bar{p}, \bar{s}, n, b') - b}{n}$$

Given $n$, a solution to (23) is the wage which maximizes the nash-bargaining product.

$$\max \{ V^C_{w, \text{interior}, n}(\bar{p}, \bar{s})^{(1 - \theta_U(r))} \cdot [u_{\text{interior}, n - w, n}]^{\theta_U(r)} \cdot \max \{ V^C_{w, \text{corner}, n}(\bar{p}, \bar{s})^{(1 - \theta_U(r))} \cdot [w_{\text{corner}, n - w, n}]^{\theta_U(r)} \}$$

When $w^{\text{corner}}(\bar{p}, \bar{s}, n)$ solves (23), there is indeterminacy of $n$. To see this

$$V^C_{w, \text{corner}, n}(\bar{p}, \bar{s}) = \max_{b' \in B} g \left[ A(\bar{p}, \bar{s}, n, b'^*) - b - w^{\text{corner}} n \right] + E(\bar{p}, x, b')$$

$$= \max_{b' \in B} g \left[ A(\bar{p}, \bar{s}, n, b'^*) - b - (A(\bar{p}, \bar{s}, n, b'^*) - b) \right] + E(\bar{p}, x, b')$$

Hence only $w^{\text{corner}} \cdot n$ is determined. This is a computationally interesting case. How do I deal with it? Since

$$\lim_{d \to 0} n^* (\bar{p}, \bar{s}) = \lim_{d \to 0} n^* (\bar{p}, \bar{s}) = n^*(\bar{p}, \bar{s}) = z \cdot x \cdot \left( \frac{\alpha \eta}{w} \right)^{\frac{(1 - \alpha) \eta}{1 - \alpha \eta}}$$

to preserve continuity, I assume that $n^*_{d=0} = n^*$ as well. In words, since a firm $(\bar{p}, \bar{s})$ which distribute a small amount of dividends chooses the same amount of worker $n^*(\bar{p}, \bar{s})$, as if it were issuing a small amount of equity, than I assume it makes the same hiring choice when it does not distribute dividends. I do not have a counter-argument why the continuity should not hold, i.e. what is the rationale why a firm that distribute [issue] a small amount of dividends [equity] differ dramatically in its hiring choices than the same firm that does not distribute dividends.

**Appendix E.3. The Reorganization Problem**

Since firm’s preferences are monotonic in $d$, the budget constraint in (30) is binding, the firm’s ordinary choices reduce to $(n, b')$, and the reorganization problem simplifies to

$$V^R(\bar{p}, \bar{s}) = \max_{(n, b') \in \mathbb{R}^2} \alpha^R(e; \theta_U(r)) \cdot$$

$$\left[ \max_{(n, b') \in \mathbb{R}^2} \sum_{x \in B} y(p, x, n) - w^R(\bar{p}, \bar{s}, e, n) \cdot n - \delta k + q(p, x, b') \cdot b' - \alpha^C(\bar{p}, \bar{s}, e, n, w^R(\bar{p}, \bar{s}, e, n)) \cdot b \right] + \beta \cdot E_{x', x} \left[ V^C(\bar{p}, \bar{s}, x') \right] - c(e)$$

s.t. $y(p, x, n) - w^R(\bar{p}, \bar{s}, e, n) \cdot n - \delta k + q(p, x, b') \cdot b' - \alpha^C(\bar{p}, \bar{s}, e, n, w^R(\bar{p}, \bar{s}, e, n)) \cdot b < 0$ (Equity Issuance)

$(\bar{p}, \bar{s}, n, v, e, \alpha^C(\bar{p}, \bar{s}, e, n, v)) \in A^C(\bar{p}, \bar{s}, e, n, v)$

$(\bar{p}, \bar{s}, n, e, w^R(\bar{p}, \bar{s}, e, n)) \in W^R(\bar{p}, \bar{s}, e, n)$

Since labour is not a state variable, the static size choice, $n$ - taken in order to maximize profits - does not alter the inter-temporal debt choice, $b'$ - taken to smooth dividends over time. Mathematically, since the two controls enter additively in the objective function and the derivative is a linear operator, the problems are separable.

Hence, (22) becomes

$$V^R(\bar{p}, \bar{s}) = \max_{e \in \mathbb{R}^2} \alpha^R(e; \theta_U(r)) \cdot$$

$$\left[ \max_{(n, b') \in \mathbb{R}^2} \sum_{x \in B} y(p, x, n) - w^R(\bar{p}, \bar{s}, e, n) \cdot n - \delta k + q(p, x, b') \cdot b' - \alpha^C(\bar{p}, \bar{s}, e, n, w^R(\bar{p}, \bar{s}, e, n)) \cdot b \right] + \beta \cdot E_{x'} \left[ V^C(\bar{p}, \bar{s}, x') \right] - c(e)$$

s.t. $y(p, x, n) - w^R(\bar{p}, \bar{s}, e, n) \cdot n - \delta k + q(p, x, b') \cdot b' - \alpha^C(\bar{p}, \bar{s}, e, n, w^R(\bar{p}, \bar{s}, e, n)) \cdot b < 0$ (Equity Issuance)

$(\bar{p}, \bar{s}, n, v, e, \alpha^C(\bar{p}, \bar{s}, e, n, v)) \in A^C(\bar{p}, \bar{s}, e, n, v)$

$(\bar{p}, \bar{s}, n, e, w^R(\bar{p}, \bar{s}, e, n)) \in W^R(\bar{p}, \bar{s}, e, n)$

To simplify notation, let the operating profits net of investment and gross of the debt issuance be

$$A(\bar{p}, \bar{s}, n, b') \equiv y(p, x, n) - \delta k + q(p, x, b') b' - \delta k$$

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let the discounted markov operator be

$$E(p, x', b') \equiv \beta \cdot E_{x'|x} \left[ V(p, x') \right]$$

and let omit the dependence of the bargaining power on the region, $\theta_U \equiv \theta_U(r)$.

To simplify notation, let

$$A(p, x, n, b') = y(p, x, n) - \chi_o + q(p, x, b^*, b^*_{e,n,v}(p, x))b^*, b^*_{e,n,v}(p, x) - \delta k$$

and let

$$E(p, s) = \beta \cdot E_{x'|x} \left[ V(p, x') \right]$$

**Appendix E.3.1. Proposition 6**

By and large, for a given $(e, n, v)$ we can rewrite (34)

$$\alpha^C(p, z, e, n, v) \equiv \arg \max_{a \in [0, 1]} \left\{ \left[ \frac{S_{e,n,v}^F (p, s; a)}{\text{Surplus Firm}} \right]^{(1-\theta_C)} \cdot \left[ \frac{S_{e,n,v}^C (p, s; a)}{\text{Surplus Creditors}} \right]^{\theta_C} \right\}$$

s.t. $S_{e,n,v}^F (p, s; a) \geq 0$, $S_{e,n,v}^C (p, s; a) \geq 0$

Hence using the definition of firm surplus (32) and credit intermediary surplus (33), we rewrite (34)

$$\alpha^C(p, z, e, n, v) = \arg \max_{a \in A} \left[ \alpha^R \cdot \left[ \frac{\max_{\eta \in U_+} \left[ A(p, z, n, b') - vn + E(p, z) - ab \right]}{\text{Surplus Firm}} \right]^{(1-\theta_C)} \cdot \left[ \frac{\max \left\{ ab - R^7 (p, z) \right\}}{\text{Surplus Creditors}} \right]^{\theta_C} \right]$$

s.t. $S_{e,n,v}^F (p, z; a) \geq 0$, $S_{e,n,v}^C (p, z; a) \geq 0$, $d \leq 0$,

where $\alpha^R(e; \theta_U(r)) = \alpha^R$. By simplifying it further,

$$\alpha^C(p, z, e, n, v) = \alpha^R(e; \theta_U(r)) \cdot \arg \max_{a \in A} \left[ \max_{b \in B_+} \left[ \frac{\max_{\eta \in U_+} \left[ A(p, z, n, b') - vn + E(p, z) - ab \right]}{\text{Surplus Firm}} \right]^{(1-\theta_C)} \cdot \left[ ab - R^7 (p, z) \right]^{\theta_C} \right]$$

s.t. $S_{e,n,v}^F (p, z; a) \geq 0$, $S_{e,n,v}^C (p, z; a) \geq 0$, $d \leq 0$,

Since $a \in A \equiv [0, 1]$ and $b \in B$, I make the following change of variable $r = ab \in [0, b_{max}] \subseteq R_+$ and I get the equivalent representation

$$\alpha^C(p, z, e, n, v) = \alpha^R(e; \theta_U(r)) \cdot \arg \max_{r \in [0, b_{max}]} \left[ \max \left\{ \frac{\max_{\eta \in U_+} \left[ A(p, z, n, b') - vn + E(p, z) - r \eta \right]}{\text{Surplus Firm}} \right\}^{(1-\theta_C)} \cdot \left[ \max \left\{ r - R^7 (p, z) \right\} \right]^{\theta_C} \right]$$

Since the debt is chosen over a discrete finite set, $b' \in B \equiv \{b_{min}, \ldots, b_{max}\} \subseteq \mathbb{R}$, then we can solve the problem for any $b'$

$$\alpha^C(p, z, e, n, v; b') = \alpha^R(e; \theta_U(r)) \cdot \arg \max_{r \in \{0, b_{max}\}} \left[ \max \left\{ \frac{\max_{\eta \in U_+} \left[ A(p, z, n, b') - vn + E(p, z) - r \eta \right]}{\text{Surplus Firm}} \right\}^{(1-\theta_C)} \cdot \left[ \max \left\{ r - R^7 (p, z) \right\} \right]^{\theta_C} \right]$$

and then choose the optimal level of debt such that

$$b'^* = \arg \max_{b' \in B_+} \alpha^C(p, z, e, n, v; b')$$
Then for a given $b'$, by taking first order conditions

$$(1 - \theta_C) \cdot \frac{\ell}{\ell \cdot [A(p, s, n, b') - vn] + E(p, s) - \nu r} = \theta_C \cdot \frac{1}{r - R^7(p, s)}$$

$$r = R^7(p, s) + \theta_C \cdot \left[ A(p, s, n, b') - vn + \frac{1}{\ell} E(p, s) - R^7(p, s) \right]$$

Let the nash bargaining surplus in debt restructuring for a given $(e, n, v)$ be

$$S^R_{n,v,e}(p, s) = \max \{ A(p, s, n, b') - vn + \frac{1}{\ell} E(p, s) - R^7(p, s), 0 \}$$

Clearly, for an interior solution to exist the nash bargaining surplus has to be (strictly) greater than zero $S^R_{n,v,e}(p, s) > 0$. Then upon success, the recovery value under Ch 11 is

$$r^* = R^7(p, s) + \theta_C \cdot \max \left\{ A(p, s, n, b') - vn - R^7(p, s) + \frac{1}{\ell} E(p, s), 0 \right\}$$

**Lemma 2.** The optimal level of debt in possession financing $b^{'*}$ and the Ch 11 recovery value upon success $r^*$ do not depend on the level of effort exerted $e$.

**Proof.** The result comes by noticing that maximizing

$$\alpha^C(p, s, e, n, v) = \alpha^R(e; \theta_U(r)) \cdot \max_{r \in [0, b_{max}]} \left( \max \left\{ A(p, s, n, b') - vn + E(p, s) - \nu r, 0 \right\} \right)^{(1-\theta_C)} \cdot \left[ \max [r - R^7(p, s), 0] \right]^{\theta_C}$$

tantamounts to maximize

$$\alpha^C(p, s, e, n, v) = \max_{r \in [0, b_{max}]} \left( \max \left\{ A(p, s, n, b') - vn + E(p, s) - \nu r, 0 \right\} \right)^{(1-\theta_C)} \cdot \left[ \max [r - R^7(p, s), 0] \right]^{\theta_C}$$

Hence we can drop the dependence of the nash bargaining surplus on $e$, $S^R_{n,v,e}(p, s)$, and considering the optimal debt $b^{'*}$ equation (35) follows.

Substituting $r^*$ in (32) we get the expected reorganization value of a firm after debt restructuring for a given $(e, n, v)$

$$S^F_{e,n,v}(p, s) = \alpha^R(e; \theta_U(r)) \cdot \left( 1 - \theta_C \right) \cdot \frac{1}{\ell} \cdot \max \left\{ A(p, s, n, b') - vn + \frac{1}{\ell} E(p, s) - R^7(p, s), 0 \right\}$$

and equation (37) follows

$$S^F_{e,n,v}(p, s) = \alpha^R(e; \theta_U(r)) \cdot \left( 1 - \theta_C \right) \cdot \frac{1}{\ell} \cdot S^R_{n,v,e}(p, s)$$
Similarly, substituting $r^*$ we get the expected recovery value under Ch 11

$$R_{e,n,v}(p, \bar{s}) \equiv \alpha^R(e; \theta_U(r))r^* + (1 - \alpha^R(e; \theta_U(r)))R^7(p, \bar{s})$$

$$= \alpha^R(e; \theta_U(r)) \left[ R^7(p, \bar{s}) + \theta_C \cdot \max \left\{ A(p, \bar{s}, n, b') - vn + \frac{1}{r} E(p, \bar{s}) - R^7(p, \bar{s}), 0 \right\} \right] + (1 - \alpha^R(e; \theta_U(r)))R^7(p, \bar{s})$$

$$= R^7(p, \bar{s}) + \alpha^R(e; \theta_U(r)) \cdot \theta_C \cdot \max \left\{ A(p, \bar{s}, n, b') - vn + \frac{1}{r} E(p, \bar{s}) - R^7(p, \bar{s}), 0 \right\}$$

and (36) follows.

**Appendix E.3.2. Proposition 7**

Let us report the labour restructuring problem (38)

$$(W^Rw)(p, \bar{s}, e, n) = \arg \max_{v \in \mathbb{W}} [S^F_{e,n,v}(p, \bar{s})]^{1-\theta_U} \cdot [\alpha^R(e; \theta_U(r)) \cdot [v \cdot n - w \cdot n]^{\theta_U}}$$

s.t. $S^F_{e,n,v}(p, \bar{s}) \geq 0, \quad v \geq w$

Substituting (37)

$$(W^Rw)(p, \bar{s}, e, n) = \arg \max_{v \in \mathbb{W}} [\alpha^R(e; \theta_U(r)) \cdot (1 - \theta_C) \cdot S^R_{e,n,v}(p, \bar{s})]^{1-\theta_U} \cdot [\alpha^R(e; \theta_U(r)) \cdot [v \cdot n - w \cdot n]^{\theta_U}}$$

s.t. $S^F_{e,n,v}(p, \bar{s}) \geq 0, \quad v \geq w$

and simplifying

$$(W^Rw)(p, \bar{s}, e, n) = \alpha^R(e; \theta_U(r)) \cdot (1 - \theta_C)^{1-\theta_U} \cdot \max_{v \in \mathbb{W}} \left\{ \alpha(v \cdot n - w \cdot n) \right\}^{1-\theta_U} \cdot [v \cdot n - w \cdot n]^{\theta_U}$$

s.t. $S^F_{e,n,v}(p, \bar{s}) \geq 0, \quad v \geq w$

By taking first order conditions,

$$(1 - \theta_U) \cdot \frac{n \cdot l}{l \cdot [A(p, \bar{s}, n, b') - vn - R^7(p, \bar{s})] + E(p, \bar{s})} = \theta_U \cdot \frac{n}{v \cdot n - w \cdot n}$$

$$v \cdot n = w \cdot n + \theta_U \cdot A(p, \bar{s}, n, b') - R^7(p, \bar{s}) - w \cdot n + \frac{1}{r} E(p, \bar{s})$$

Let the labour restructuring nash bargaining surplus

$$S^R_{n}(p, \bar{s}) = \max \left\{ A(p, \bar{s}, n, b') + \frac{1}{r} E(p, \bar{s}) - R^7(p, \bar{s}) - w \cdot n, 0 \right\}$$

Clearly, for an interior solution to exist the nash bargaining surplus has to be (strictly) greater than zero $S^R_{n}(p, \bar{s}) > 0$. Equation (39) follows.

Then we get the wage compensation which maximizes the labour restructuring problem

$$w(p, \bar{s}, e, n) = w + \theta_U \cdot \left[ A(p, \bar{s}, n, b') - R^7(p, \bar{s}) - w \cdot n + \frac{1}{r} E(p, \bar{s}) \right]$$

as in equation (40), and the expected surplus of the workers is

$$S^W_{n} = \alpha^R(e; \theta_U(r)) \cdot \theta_U \cdot S^R_{n}(p, \bar{s})$$

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Similarly, substituting in (37) we get the expected reorganization value of a firm after restructuring the labour

\[ S_{e,n}^F(p, s) \]

\[ = \alpha^R(e; \theta_U(r)) \cdot (1 - \theta_C) \cdot \max \left\{ t \cdot [A(p, s, n, b') - R^7(p, s) - w(p, s, e, n)n + E(p, s), 0] \right\} \]

\[ = \alpha^R(e; \theta_U(r)) \cdot (1 - \theta_C) \cdot \max \left\{ t \cdot [A(p, s, n, b') - R^7(p, s) - R_1^7(p, s) - w_{n} - \theta_U \cdot \left[ A(p, s, n, b') - R^7(p, s) - w \cdot n + \frac{1}{\tau} E(p, s) \right] + E(p, s), 0] \right\} \]

\[ = \alpha^R(e; \theta_U(r)) \cdot (1 - \theta_C) \cdot \max \left\{ t \cdot \left[ (1 - \theta_U) \cdot [A(p, s, n, b') - R^7(p, s) - w_{n}] - \theta_U \frac{1}{\tau} E(p, s) \right] + E(p, s), 0 \right\} \]

\[ = \alpha^R(e; \theta_U(r)) \cdot (1 - \theta_C) \cdot (1 - \theta_U) \cdot t \cdot \max \left\{ A(p, s, n, b') - R^7(p, s) - w_{n} + \frac{1}{\tau} E(p, s), 0 \right\} \]

from which equation (42) follows

\[ S_{e,n}^F(p, s) = \alpha^R(e; \theta_U(r)) \cdot (1 - \theta_C) \cdot (1 - \theta_U) \cdot t \cdot \alpha^R(p, s) \]

Similarly, substituting in (36) we get the expected recovery value under Ch 11

\[ R_{e,n,v}(p, s) \]

\[ = R^7(p, s) + \alpha^R(e; \theta_U(r)) \cdot \theta_C \cdot \max \left\{ A(p, s, n, b') - w(p, s, e, n)n + \frac{1}{\tau} E(p, s) - R^7(p, s), 0 \right\} \]

\[ = R^7(p, s) + \alpha^R(e; \theta_U(r)) \cdot \theta_C \cdot \max \left\{ A(p, s, n, b') + \frac{1}{\tau} E(p, s) - R^7(p, s) - \left[ w + \theta_U \cdot \left[ A(p, s, n, b') - R^7(p, s) - w \cdot n + \frac{1}{\tau} E(p, s) \right] \right], 0 \right\} \]

\[ = R^7(p, s) + \alpha^R(e; \theta_U(r)) \cdot \theta_C \cdot (1 - \theta_U(r)) \cdot \max \left\{ A(p, s, n, b') + \frac{1}{\tau} E(p, s) - R^7(p, s) - w_{n}, 0 \right\} \]

and equation (41) follows

\[ R_{e,n}^R(p, s) = R^7(p, s) + \alpha^R(e; \theta_U(r)) \cdot \theta_C \cdot (1 - \theta_U(r)) \cdot S_n^R(p, s) \]

In conclusion the expected surplus of the workers

\[ S_{e,n}^W(p, s) = \alpha^R(e; \theta_U(r)) \cdot \theta_U \cdot \left[A(p, s, n, b') - R^7(p, s) - w \cdot n + \frac{1}{\tau} E(p, s)\right] \]

\[ = \alpha^R(e; \theta_U(r)) \cdot \theta_U \cdot S_n^R(p, s) \]

\[ = \alpha^R(e; \theta_U(r)) \cdot \theta_U \cdot S_n^R(p, s) \]

(E.3)

**Appendix E.3.3. Proposition 8**

The firm chooses \( n \) to maximize (42).

\[ \max_{n \in N} \alpha^R(e; \theta_U(r)) \cdot (1 - \theta_C) \cdot (1 - \theta_U(r)) \cdot t \cdot S_n^R(p, s) \]

or equivalently to maximize the nash bargaining surplus

\[ \alpha^R(e; \theta_U(r)) \cdot (1 - \theta_C) \cdot (1 - \theta_U(r)) \cdot t \max_{n \in N} S_n^R(p, s) \]

which since the hiring choice is a static decision, is equivalent in maximizing

\[ \max_{n \in N} A(p, s, n, b') - w \cdot n = \max_{n \in N} y(p, x, n) - \chi_o + q(p, x, b')b' - \delta k \]

and simplifying

\[ \max_{n \in N} y(p, x, n) - w \cdot n \]

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The firm chooses the number of workers which equates the marginal product of labour to the outside opportunity cost of workers.

Taking FOC and using (17) equation (44) follows.

\[ n = z \cdot x \left( \frac{\alpha \eta k^{(1-\alpha)\eta}}{w} \right)^{\frac{1}{1-\alpha}} \]

Hence substituting in (17)

\[ y(p, x, n^*) = (z \cdot x)^{(1-\alpha)\eta} \left( k^{1-\alpha} n^{*,(\alpha)\eta} \right) \]

\[ = (z \cdot x) \left( \frac{\alpha \eta}{w} \right)^{(1-\alpha)\eta} k^{(1-\alpha)\eta} \]

and equation (45) follows. Substituting the solution in (41), (42) and (E.3), then (47), (48) and (49) follows.