

# A Theory of U.S. Bankruptcy Chapters

## Contracting Externalities in Bankruptcy

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Nov 2013

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(Advice to PhD students:

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Pick coauthors that are better than you

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(Secret to Writing Good Papers:  
...and blame *them* if anything goes wrong.)

# Main Question

Can the U.S. code have advantages?

or

Why does the Government not allow firms and creditors to contract to whatever default resolution system they want?

# Clarification

This is *not* “why do firms reorganize?”

- We have good theories of reorganization [e.g., Shleifer-Vishny]
- If/when reorg is so good, why not let firms decide this for themselves? [Schwartz]
- We have no theories of the U.S. bankruptcy code (with no-opt-out Chapter choice).
  - We believe we are first.
  - More broadly, non-contractible no-opt-out is common. “Inalienable” rights.

# Legal Institutions, Background, Reality

(Don't ask me finer legal details.)

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# Scenarios To Consider

- Firms could be allowed by law to contract a-priori with their creditors what to do upon default:
  - They could contract to liquidate.
  - They could contract to reorganize.
  - They could contract to leave themselves or creditors to choose whether to liquidate or reorganize.

This is the “commercial law” approach. Freedom of Contract.

- Bankrupt Firms can be forced by law to liquidate. (— Sweden)
- Bankrupt Firms could be forced by law to reorganize.
- **Bankrupt Firms can be forced by law to have the choice whether to liquidate or reorganize (“menu”). — US**

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Can US law be “optimal” in some sense?

(not necessarily socially, but for firms as a group.)

# Broadest Answer

- Parties that can internalize *everything* a-priori are never better off with outside intervention.
- Outside intervention can help (only) when there are non-resolvable externalities. [intuitively, not exact]
- Specific Externality:
  - Simultaneous fire sales affect all liquidators.
  - Firms cannot internalize peer firms' behavior.
  - Left to their own devices, firms fall into an inferior eqbm and liquidate too much.
  - ➔ Despite a-priori endogenous debt choice, no-opt-out Ch11 option reduces in-equilibrium liquidations, and thus makes all firms better off.

# Simplest Model of Bankruptcy

What are the simplest ingredients for a model of bankruptcy to address Chapter-related questions?

- Endogenous Debt Choice
  - Atomistic Firm Behavior (uncoordinated RE)
  - Liquidation (“fire sale”)
  - Reorganization (will be costly in shortfall D-V)
- +
- Contract Choice: Endogenous or Exogenous

As conventional a bankruptcy model as we can think of.

# Plan of Attack

- ① Work out behavior under mandatory identical behavior for **all** firms:
  - Only Liquidation
  - Only Reorganization
  - Allowed to choose (non-repudiable “menu”)  
(will take some time to cover.)
- ② Consider the “meta-problem”: are firms better off if
  - free-to-contract ex-ante
  - being forced (to have choice menu ex-post)

# Simplest Model of Bankruptcy

Two Dates:

- Date 0: Many atomistic firms choose debt  $D$ .  
Get Benefit from Debt ( $\lambda = 10\%$ )  
Distress resolution system known (later choosable).
- Date 1:
  - Value  $V$  is determined. (random draw  $U[0, \gamma = 1]$ )
  - If  $V > D$ , firms repay debt unimpaired. World ends.
  - If  $V < D$ , distress.
    - If liquidation was mandated, liq.
    - If reorganization was mandated, reorg.
    - If reorg allowed, managers can decide.  
(Note: optional rule does not prevent liquidation!)

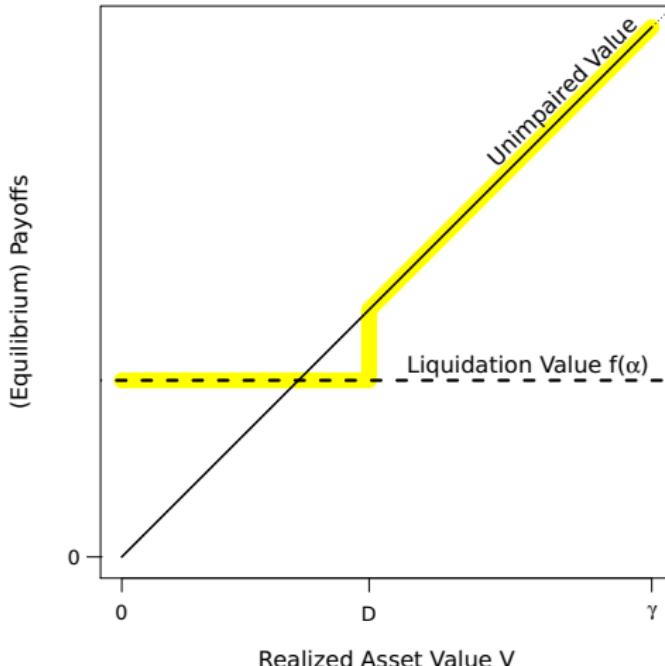
Optimal debt choice will depend on system.

# Liquidation-Only

Liquidation-Only

# Assumed Payoffs

- Liquidation: Independent of continuation value.
- Liq Val depends on other simultaneous fire sales.



# Liquidation Mechanics

- Fire-sale:

$$L - \kappa \cdot \alpha = \$0.5 - \$0.2 \cdot \alpha$$

$\alpha$  is fraction of firms liquidating.

- No other firm liquidates: Get \$0.5.
- All other firms liquidate: Get \$0.3.

- Firms cannot individually influence  $\alpha$ , but can anticipate it.
  - Firms set own debt, which in aggregate determines  $\alpha$
- ⇒  $\alpha$  determines D. Many D determine  $\alpha$ .
- (Law of Large Numbers: firms know this perfectly, a priori.)

# Liquidation-Only Equilibrium

Conjecture that  $\alpha = 0.5$ .

Claim (and check) that  $D = 0.5$  is optimal:

$$\max_D \underbrace{\int_0^D (\$0.5 - \$0.2 \cdot 0.5) dV}_{\$0.4} + \underbrace{\int_{V=D}^1 V dV}_{\text{not in distress}} + \underbrace{0.1 \cdot D}_{\text{debt benefit}}$$
$$= (\$0.4 + \$0.75)/2 + 0.1 \cdot (D=\$0.5) = \$0.625.$$

- Pick less D. Say \$0.4. Get \$0.16 + \$0.42 + \$0.04 = \$0.62.
- Pick more D. Say \$0.6. Get \$0.24 + \$0.32 + \$0.06 = \$0.62.

# Liquidation Equilibrium

(Correctly worry only about symmetric equilibria)

Is  $\alpha = 0.5$ ?

If every firm  $D = 0.5$  and  $V$  is uniform from 0 to 1, then yes.

This is the only equilibrium. If alpha were  $> 0.5$  ( $< 0.5$ ), each firm would be better off choosing less (more) debt.

# Reorganization

# Reorganization Mechanics

- Reorg is costly. If  $D > V$ :

$$V - \phi \cdot (D - V) = V - 2 \cdot (D - V)$$

- If Debt = \$0.6: If  $V = \$0.6$ , firm gets  $0.6 - 2 \cdot \$0.0 = \$0.6$ .
- If Debt = \$0.6: If  $V = \$0.5$ , firm gets  $0.6 - 2 \cdot \$0.1 = \$0.4$ .

- ⊕ Managers like to continue (too often).

# Reorganization-Only Scenario

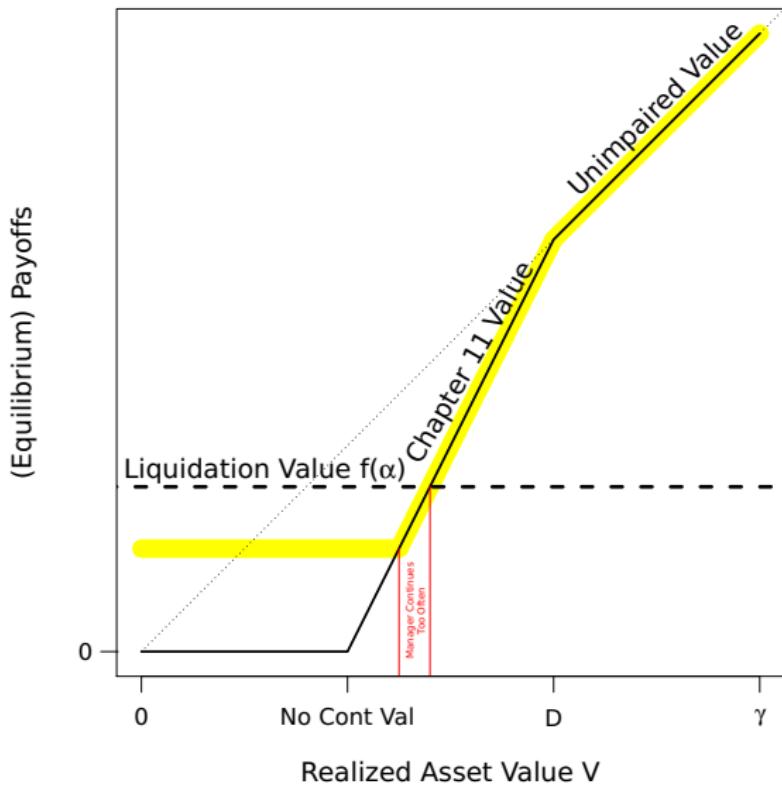
Uninteresting = skip:

- If managers want to liquidate, firm will always let them.
- Liquidation is better for owners than for managers.
- Instead, let's look at case where firms allow managers to choose whether to reorganize or liquidate

Every firm would get  $\gamma/2 \cdot (1 + \lambda^2/\phi) = 1/2 \cdot (1 + 0.1^2/2) = 0.5025$  if reorg was forced. pretty bad.

# With Optional Reorganization

# With (Optional) Reorganization



# With-Reorganization Equilibrium

Thought Experiment Now:

- All firms (are forced to) have a reorganization option in financial distress.
- No firm can opt out into the committed-liquidation procedure.
- However, managers can decide in distress to liquidate.

# All Firms Allow With-Reorganization

- Conflicted Manager ( $\beta = \$0.2$ ): Reorg when

$$\overbrace{V - 0.2 \cdot (D - V)}^{\text{Reorg Value}} + \overbrace{\beta}^{\text{Bias}} > \overbrace{\$0.5 - \$0.2 \cdot \alpha}^{\text{Liq Value}}$$

- (At this point,  $V$  and  $\alpha = \alpha(D)$  are known.)

$$V_i \geq \frac{\bar{V} - \beta + \phi \cdot D + \kappa \cdot \alpha}{1 + \phi} \equiv \frac{\$0.5 - \$0.2 + 2 \cdot D + \$0.2 \cdot \alpha}{1 + 2} \equiv \bar{V}$$

depends on  $D$  (chosen by firm) and  $\alpha$  (collective equilibrium).

- All firms with  $V < \bar{V}$  choose liq. All  $V > \bar{V}$  choose reorg.

# With-Reorganization Equilibrium

Equilibrium:

- 1  $D^* \Leftrightarrow \alpha$
- 2  $\bar{V}$

Claim:

- $D^* = \$0.5611.$        $> \$0.5$  than with only-liq. (More Distress)
- $\alpha^* = 4/9.$        $< 50\%$  with only-liq. (Fewer Liq)
- $\bar{V} = \$4/9.$
  
- $V = \$0.6265$        $> \$0.625$  higher val than with only-liq.

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# Confirming Optimal D

Assume  $\alpha = 4/9$ . Also  $\bar{V} = \$4/9$ .

Claim:  $D^* = \$0.5611$ .

$$\max_D V \equiv \int_0^{\bar{V}=\$4/9} (\$0.5 - \$0.2 \cdot 4/9) dV \quad \leftarrow \text{Liquidation}$$

$$+ \int_{\$4/9}^D V - 2 \cdot (D - V) dV \quad \leftarrow \text{Reorganization}$$

$$+ \int_D^{\$1} V dV \quad \leftarrow \text{Not in Default}$$

$$+ D \cdot 0.1 \quad \leftarrow \text{Debt Benefit}$$

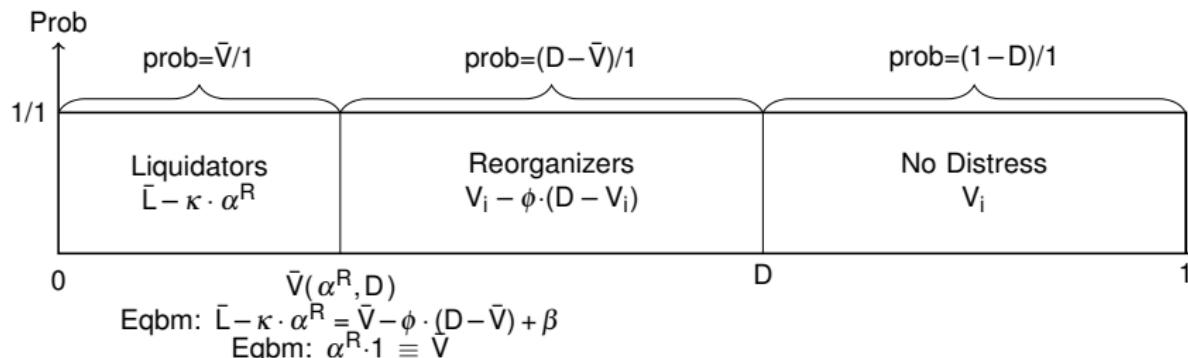
# With-Reorganization Equilibrium

- add some algebra and shake. Given  $\alpha = 4/9$  and  $\bar{V} = \$4/9$ ,

$$D^* = \$0.5611,$$

(Coincidentally,  $V(D^*) = \$0.6265$ .)

- Plug  $D^*$  and  $\alpha$  into  $\bar{V}$  to confirm that  $\bar{V} = \$4/9$  given  $\beta = \$0.2$ 
  - All firms from 0 to  $\$4/9$  liq, from  $\$4/9$  to  $\$0.5611$  reorg, and beyond =ok



- With  $\gamma = 1$ , a  $\bar{V} = 4/9$  also means  $\alpha = 4/9$ .

# Meta Problem

Prescribe No-Opt Out vs. Freedom-of-Contract?

# Meta Problem: Choice of Procedure

Are there parameter values where

- ① If all other firms liquidate, you want to liquidate, too.  
*(“Stability” Condition: Too much liquidation traps firms.)*
- ② If all other firms do with-reorg, you want to commit liq.  
*(“Instability” Condition: With-Reorg cannot hold firms.)*  
([1] and [2]: we require no asymmetric information. however, signaling “race to the bottom” could also accomplish this.)
- ③ Firms are collectively better off if all firms commit to with-reorg and not to liq-only.  
*(“Chamber of Commerce” Condition)*

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⇒ Firms prefer no-opt-out Chapter 11 reorg as code.

(The proofs actually are over all pure and mixed equilibria. Only pure equilibria work.)

# The Externality

- Ch11 possibility does not and cannot prevent liquidation.
- ...but its mandatory presence reduces in-equilibrium liquidations.
- ...and all firms benefit therefrom.

PS: and it's better than mandating reorganization to avoid all liquidation

note: for considering defection from equilibrium, if you consider opting out alone, you are still subject to the same fraction liquidating of peers that play other equilibrium. defecting to with-reorganization does not help you as much, relative to all with-reorganization.

# Algebraic Versions

- 1 If all other firms liquidate, you want to liquidate, too.  
*(“Stability” Condition: All-liquidation traps firms.)*

$$\left(\frac{\beta}{\gamma \cdot \lambda}\right)^2 < \left(\frac{1+\phi}{\phi}\right)$$

- 2 If all other firms reorganize, you still want to liquidate.  
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$$\left(\frac{\beta}{\gamma \cdot \lambda}\right)^2 < \left(\frac{1 + \phi}{\phi}\right)$$

Actual Proof: The all-liquidation equilibrium is the unique equilibrium. No mixed equilibria.

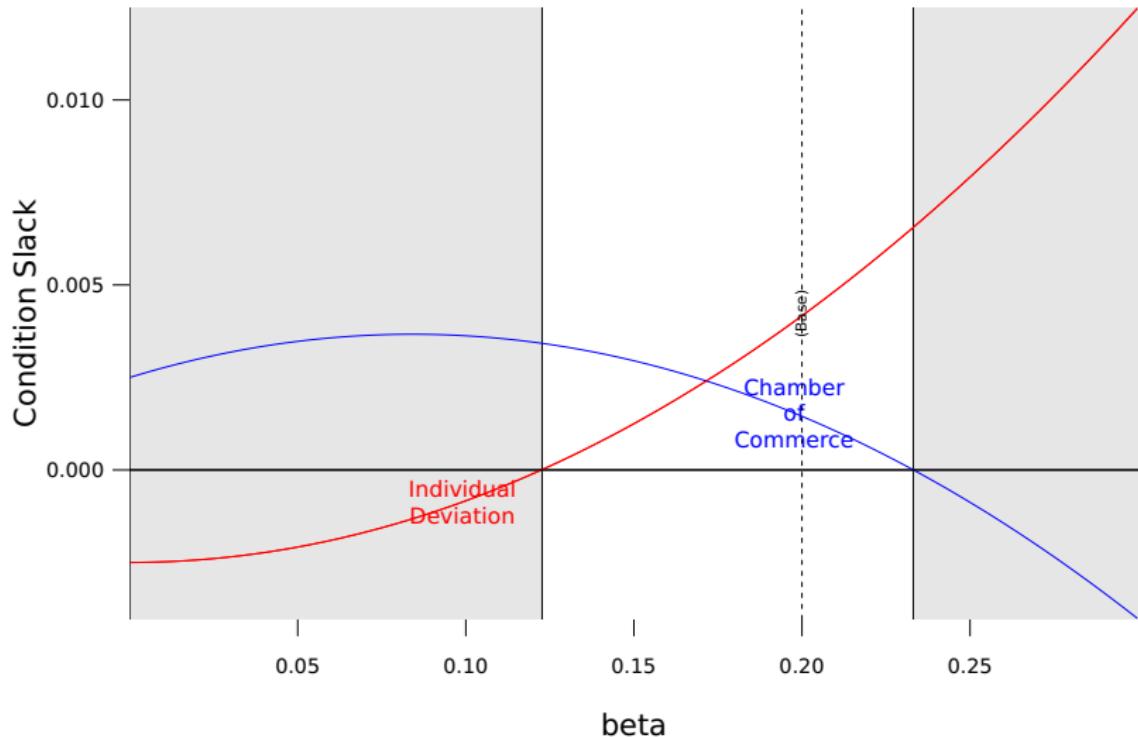
# Algebraic Versions

- ③ Firms are collectively better off if all firms commit to allow reorganization rather than to liquidation-only.  
*(“Chamber of Commerce” Condition)*

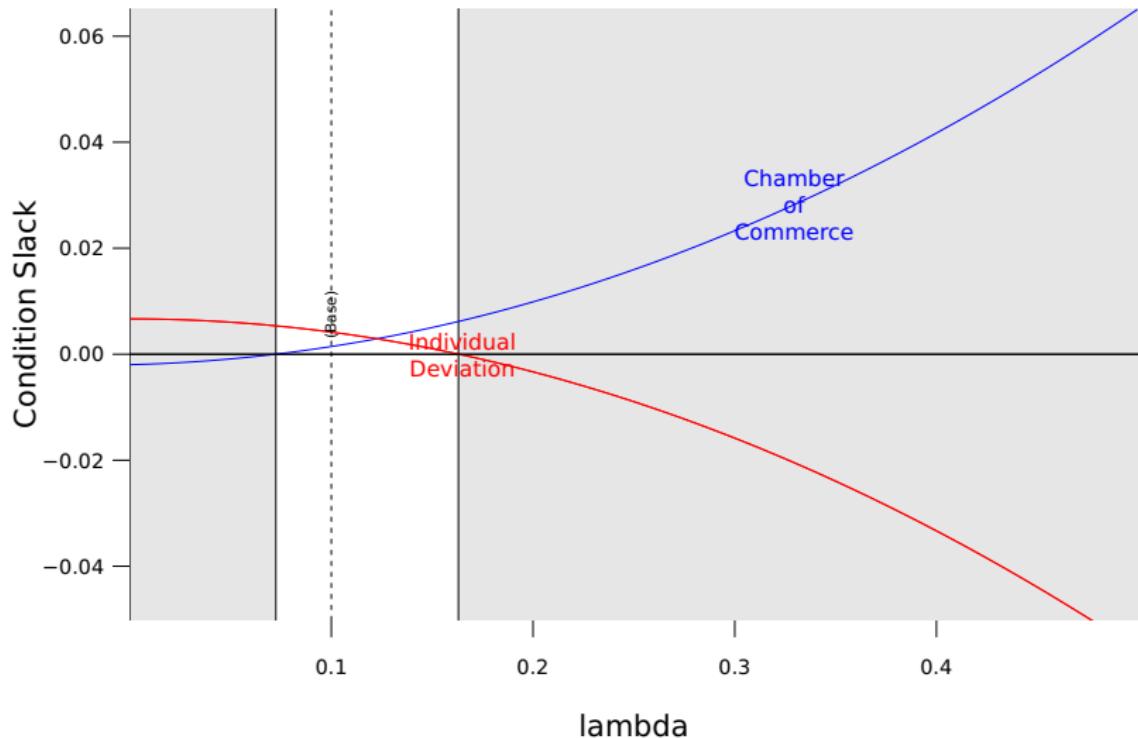
$$\begin{aligned} & \gamma^2 \cdot (\gamma + \kappa)^2 \cdot (1 + \phi)^2 \cdot \lambda^2 + 2 \cdot b \cdot \gamma \cdot \kappa \cdot \phi \cdot (1 + \phi) \cdot (\bar{L} + \gamma \cdot \lambda) \\ & - \beta^2 \cdot \phi \cdot [\kappa^2 \cdot \phi + \gamma^2 \cdot (1 + \phi) + 2 \cdot \gamma \cdot \kappa \cdot (1 + \phi)] > 0. \end{aligned}$$

A quadratic mess. Roughly, the condition is satisfied for intermediate values

# Pretty Picture: Managerial Bias (Agency)



# Pretty Picture: Debt Benefit (Capacity/Tax)



# Similar Applications

- When are optional choices and defaults better/worse than mandatory no-opt-out menus?
- Preferences — should we allow preferences? Should we allow firms to contract around them?
- On efficiency grounds, when do we want rights to be non-alienable? Should we allow opt-out and forced ex-ante contracting from
  - regular-cycle elections?
  - CEO-for-life? President-for-Life?
  - Marriage?
  - Labor (Slavery)?
  - Court Resolution?

(Good other legal and ethical arguments, but not here.)

# Welfare Analysis

- Model can explain why firms and creditors do not lobby strongly for “freedom-of-contract” here.
- But is Chapter 11 socially optimal?
  - Who knows?
  - Firms like debt, partly due to tax redistribution.
  - Reallocation of assets in fire-sales may be transfer, not destruction.
  - Reasonable to argue either way. Not important here.

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# Conclusion

## Model

- Atomistic choices aggregate into collective choices, which influence atomistic choices. It is an elegant way to model externalities.
- Presentation hid a lot of algebra. But this model is unusually pretty, and it has closed-form solutions!

## Economics

- Liquidation externalities naturally create large (intermediate) regions where firms are better off if they cannot contract to opt out from later menu choice.
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