

# How labor market frictions affect capital structure

Yasser Boualam, Marco Brianti, Tzuo Hann Law

UNC, BC, BC

September 6, 2017

Midwest Macro, Pittsburgh, 2017

# How does labor market frictions affect capital structure?

- ▶ Modigliani Miller 1958

## **Why does capital structure matter at all?**

Bankruptcy costs can be high(er) after accounting for stakeholders who might not be (fully) represented at the bargaining table.

- ▶ A firm's labor force is one such under-represented entity.
- ▶ **This paper:** How does adding capital structure to a workhorse labor market search model affect capital structure decisions?

# What we do

- ▶ Highlight empirical findings in the literature that call for the models we present.
- ▶ Present a simple three period model to highlight the channels.
- ▶ Present a fully dynamic model and do something...

# Main channels

- ▶ Absent any search frictions, owners of production utilize optimal quantities of debt.
- ▶ With labor market frictions, the firm partners with a risk averse worker who potentially has the option to quit the partnership.
- ▶ While this quitting in a partial equilibrium setting benefits workers ex-post, it leads to less entry, less-than-optimal debt use, lower equilibrium wages and ex-ante lower value to workers.

# Literature



# Empirical observations



# Model without Labor Market Frictions

- ▶ Debt is riskless. Borrowers pay interest rate  $r$  and return all borrowed capital.
- ▶ A single agent with initial wealth chooses debt to maximize payoffs in two periods. The output in the first period must be weakly positive.

$$\max_D \mathbb{E}u(c_1) + \beta \mathbb{E}u(c_2)$$

- ▶ where

$$c_t(\phi_t) = \phi_t(W + D)^\gamma - rD$$

is some decreasing returns production function. Productivity shock  $\phi_t \in U[0, 1]$  and  $c_2 = b$  for sure if  $c_1 < 0$ .

## Model without Labor Market Frictions: Solution

- In this setup the optimal choice for debt  $D$  is defined by

$$ads$$

where the trade-off is between producing a positive quantity in the second period in order to obtain a chance at producing in the last period where the minimum level of production is  $b$ .



# Model without Labor Market Frictions: Solution

- ▶ The first order condition from earlier yields

$$ads$$

where we how the incompleteness of markets drives a wedge in the typical solution for equation the expected return of capital to the interest rate  $r$ .

- ▶ Finally, note here that the owner of the firm can be the worker or the firm in a setting with both agents.

# Labor Market Frictions with Capital Structure

Next, we consider how labor market frictions affects debt choice.

- ▶ Mortensen and Pissarides style search frictions.
- ▶ Entrepreneurs/firms own wealth  $W$  and borrow at rate  $r$ . Debt is riskless.
- ▶ Debt choice is made before entry. No new debt or equity.
- ▶ Wage contracts are specified by *unconstrained wages*,  $\tilde{w}$ .
- ▶  $\tilde{w}$  is restricted to be identical in both periods.
- ▶ Perfect commitment assumed.
- ▶ No storage technology.

# Timing

1. **Period 0.** Firms with wealth,  $W$  choose debt  $D$  and enter.
  - ▶ All workers are unemployed.
  - ▶ Firm's post wage contracts, matching occurs.
  - ▶ Unmatched firms exit immediately.
2. **Period 1.** Draw productivity  $\phi_1$ .
  - ▶ If output is weakly negative, match is broken. Firm exits.
  - ▶ Production + consumption occurs.
  - ▶ Unmatched workers consume  $b$ .
3. **Period 2.** Draw productivity  $\phi_2$ .
  - ▶ Separation if output is below  $b$ .
  - ▶ Production + consumption occurs.
  - ▶ Unmatched workers consume  $b$ .

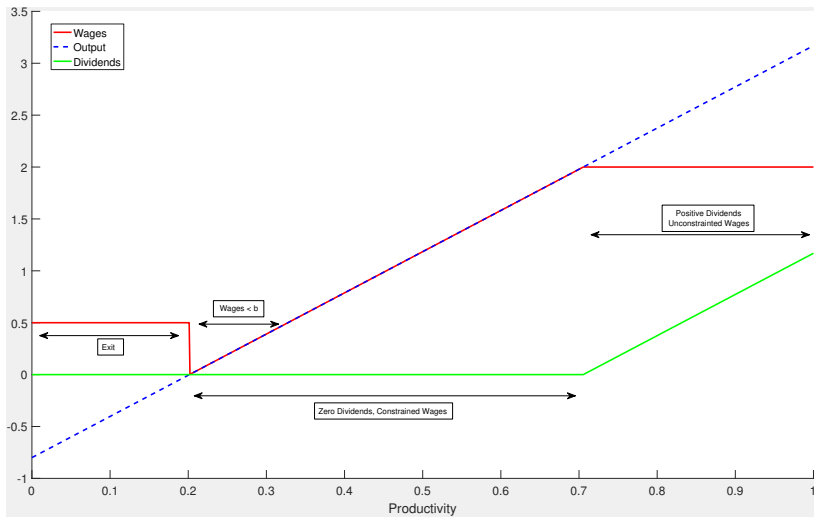
## Period production

- ▶ Period output is given by

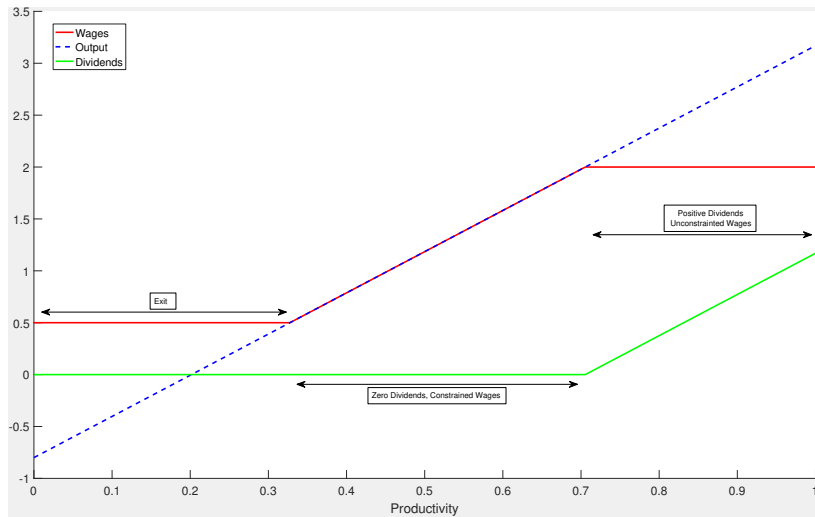
$$\phi_t(W + D)^\gamma - Dr$$

- ▶ If period output is negative, exit occurs.
- ▶ If output exceeds  $\tilde{w}$ , workers are paid  $\tilde{w}$ .
- ▶ Dividends are positive iff  $(W + D)^\gamma - Dr \geq \tilde{w}$
- ▶ Don't worry, we have pictures.

# Period 1 Wages



## Period 2 Wages



# Promised Value of a Contract

- $E(\tilde{w})$  is the promised value of contract  $\tilde{w}$ .

$$\begin{aligned}
 E(\tilde{w}) &= \underbrace{\phi_e(1 + \beta)u(b)}_{f(\phi_1) < 0, \text{ exit}} \\
 &+ \underbrace{\int_{\phi_e}^{\phi_{dw}} f(\phi_t) d\phi}_{\text{wage} = \text{output, zero div.}} + \underbrace{\int_{\phi_{dw}}^1 \tilde{w} d\phi}_{\text{wage} = \tilde{w}, \text{ positive div.}} \\
 &+ (1 - \phi_e) \underbrace{\left( \phi_b u(b) + \int_{\phi_b}^{\phi_{dw}} f(\phi_t) d\phi + \int_{\phi_{dw}}^1 \tilde{w} d\phi \right)}_{\text{final period wages}}
 \end{aligned}$$

where  $\phi_e$ ,  $\phi_b$  and  $\phi_{dw}$  are the cutoffs seen earlier.

# Worker's Problem

- ▶  $\theta(\tilde{w})$  is market tightness for a given contract
- ▶  $p(\theta(\tilde{w})) = m(\theta(\tilde{w}))/s$  is job finding probability
- ▶

$$U = \max_{\tilde{w}} \underbrace{p(\theta(\tilde{w}))E(\tilde{w})}_{\text{indifference condition}}$$



## Expected Profits of a Contract

- $V(\tilde{w})$  is the value of contract  $\tilde{w}$  taking debt as given

$$\begin{aligned}
 V(\tilde{w}) = & \underbrace{\phi_e(1 + \beta) \cdot 0}_{f(\phi_1) < 0, \text{ exit}} \\
 & + \underbrace{\int_{\phi_e}^{\phi_{dw}} 0 \, d\phi}_{\text{wage} = \text{output, zero div.}} + \underbrace{\int_{\phi_{dw}}^1 f(\phi_1) - \tilde{w} \, d\phi}_{\text{wage} = \tilde{w}, \text{ positive div.}} \\
 & + (1 - \phi_e) \underbrace{\left( \phi_b \cdot 0 + \int_{\phi_b}^{\phi_{dw}} 0 \, d\phi + \int_{\phi_{dw}}^1 f(\phi_2) - \tilde{w} \, d\phi \right)}_{\text{final period wages}}
 \end{aligned}$$

where  $\phi_e$ ,  $\phi_b$  and  $\phi_{dw}$  are the cutoffs seen earlier.

# Firms's Problem

- $q(\theta(\tilde{w})) = m(\theta(\tilde{w}))/v$  is vacancy filling probability

$$W = \max_{\tilde{w}; D} \underbrace{q(\theta(\tilde{w})) V(\tilde{w}; D)}_{\text{indifference condition}}$$

- Optimal debt choice will involve firms choosing debt and posting the corresponding profit maximizing contract  $\tilde{w}$  which maximizes ex-ante value,  $U$  for workers.

## Results: Wages



## Results: Entry



## Results: Ex-ante Value of Unemployment



## Results: Profits condition on Matching



# Dynamic Model with Labor Market Frictions

- ▶
- ▶
- ▶
- ▶
- ▶

# Conclusion

- ▶
- ▶
- ▶
- ▶
- ▶