

# Labor and Finance: New Perspectives

Tito Boeri, Pietro Garibaldi, Espen R. Moen

Centre for Economic Performance Annual  
Conference, 2014

# Labor and finance

- Standard models of labor (like search models)
- No role for finance
- All projects with positive npv are realized
- Financial markets are assumed to be perfect
- What if financial markets are not perfect? Does access to finance influence the firms' hiring and firing decisions?
- The Great Recession indicates that the firms' leverage and access to finance are important for hiring and firing decisions
- Calls for a deeper understanding of the relationship between labor and finance

# Some motivating facts

- 1 Unemployment adjustment amplified during financial recessions
- 2 Procyclical leverage
- 3 Heterogeneity: some firms put aside liquidity buffers, others don't
- 4 During financial crises, leveraged firms experience larger job destruction rates

# I: Financial Recessions and Unemployment to Output Elasticity

	A	B	
	$du/u(\%)$	$-dy/y(\%)$	A/B
Italy			
<i>Financial recession</i>	15	1,5	10
<i>Ordinary recession</i>	6	2,2	3
Japan			
<i>Financial recession</i>	13	1,8	7
<i>Ordinary recession</i>	6	5,9	1
UK			
<i>Financial recession</i>	36	3,2	11
<i>Ordinary recession</i>	7	3,1	2
US			
<i>Financial recession</i>	50	3,0	17
<i>Ordinary recession</i>	33	2,6	13

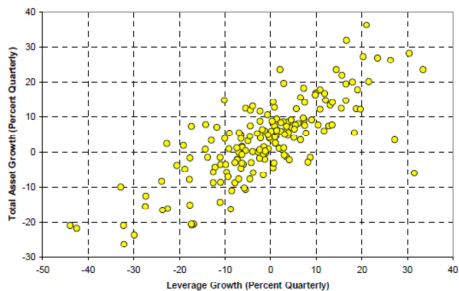
# I: Financial Recessions and Unemployment forecast errors

## Deviation from Okun's law (including LM institutions)

	Unemployment Forecast Errors during Recessions		
	[1]	[2]	[3]
Financial Crisis	0.702 [0.185]***		
Financial stress index (FSI-four-quarter moving average)		0.209 [0.106]**	-0.605 [0.250]**
FSI x Corporate Leverage (at peak)			0.034 [0.011]***
Constant	0.228 [0.100]	0.129 [0.123]	0.057 [0.115]
Observations	341	257	154
R	0.04	0.02	0.06

Significance: 10%\*, 5%\*\* , 1%\*\*\*

## II. Procylical Leverage

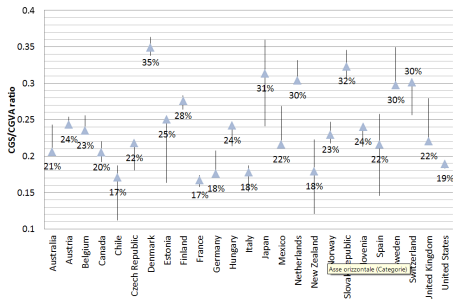


## II. Procylical Leverage: supply of funds)

- Leverage is procyclical in that leverage is increasing when balance sheets are increasing
- *Financial market liquidity can be understood as the rate of growth of aggregate balance sheets. In response to increases in prices on the asset side of intermediaries' balance sheets,....intermediaries hold surplus capital. They will then search for uses of their surplus capital.....On the asset side, they search for potential borrowers that they can lend to. Financial Market liquidity is intimately tied to how hard the financial intermediaries search for borrowers. Adrian and Shin, 2013*

# III. Heterogeneity in Liquidity

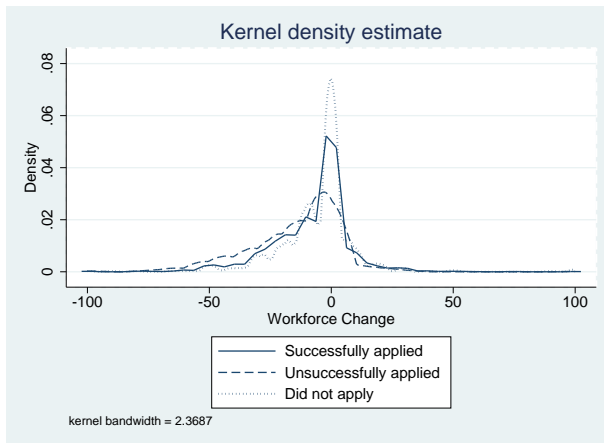
Gross Corporate Savings as a percentage of Value Added



Average: 23.8%, Range: 18.2%  
 Source: Boeri, Garibaldi, Moen 2013



# IV. Borrowing and Job Destruction during the GR



# IV. Large JD for leveraged firms

VARIABLES	All Firms			Only Firms Downsizing		
	(1) $\Delta e(\%)$	(2) $\Delta e(\%)$	(3) $\Delta e(\%)$	(1) $\Delta e(\%)$	(2) $\Delta e(\%)$	(3) $\Delta e(\%)$
$\Delta \bar{y}$	1.107 (0.910)	1.049 (0.901)	1.040 (0.910)	0.547 (1.243)	1.322 (1.209)	1.378 (1.243)
Gearing	-0.00426*** (0.000855)			-0.00308** (0.00120)		
Solvency		0.0396*** (0.00640)			0.0573*** (0.00926)	
LT DA			-0.133 (0.607)			-2.449* (1.474)
Constant	-8.123*** (2.594)	-10.73*** (2.630)	-10.02*** (2.555)	-20.23*** (3.314)	-23.08*** (3.324)	-21.95*** (3.268)
Country	YES	YES	YES	YES	YES	YES
Sector	YES	YES	YES	YES	YES	YES
Country*Sector	YES	YES	YES	YES	YES	YES
Size	YES	YES	YES	YES	YES	YES
Observations	8,596	9,649	8,064	4,151	4,677	3,783
R-squared	0.078	0.074	0.061	0.071	0.071	0.057

Standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Source: Boeri, Garibaldi and Moen, 2013

# Imperfect financial and labour markets

- Construct an archetype model set up - based on search theory and models of financial frictions - to understand the role of financial frictions in labor markets and the role of labor frictions in financial markets
- Labour market: Mortensen and Pissarides (1994)
- Financial frictions: Mostly Homstrom and Tirole
- Go back to the data (matched employer-employees)
- Ongoing projects /models
  - 1 The firms' choice of leverage and the effect of financial crisis (MP meets HT)
  - 2 Financial constraints and the responsiveness of employment to productivity shocks
  - 3 Kiyotaki - Moore applied to a search setting

# Types of financial frictions

- Townsend's costly verification model (1979), used in for instance Bernanke, Gertler, Gilchrist (1999)
- Need to collateralize debt. Kiyotaki and Moore (1997, 2012), Brunnermeyer and Sannikov (2011)
- Holmstrom and Tirole:
- Only part of the entrepreneur's income is *pledgeable* and can be borrowed upon
- Because the entrepreneur has to be incentivized
- Because part of the income is a private benefit
- Well-known model framework in corporate finance

# Project 1: Liquidity, labor frictions and FC

- Time is divided into "periods" with stochastic time length, expected time length  $1/\lambda$
- Entrepreneurs set up a firm at effort cost  $K$ , invest in machines and in "search" to find workers, and produce for a period
- Before the next period, the machines are destroyed, and the entrepreneur has to buy new machines in order to produce.
- All contracts last one period (attached to capital)

- Financing in period 1: In the beginning of the first period, the entrepreneur use own funds + borrows to finance machines, search costs, and to build up independent financial reserves - a "war-chest" of cash
- Trade-off between "size" and "cash" (reserves). Size increases period 1 profit, cash protects search capital in period 2
- Search capital includes lower average wages, as workers prefer long-lasting jobs

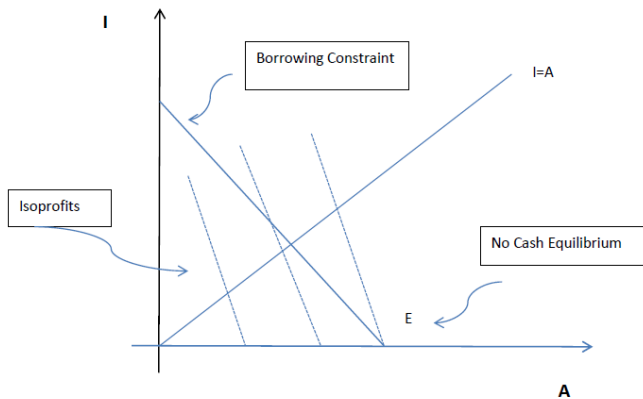
- If the entrepreneur gets refinancing, which happens with probability  $1 - \tau$ , she can continue for one more period, after which the firm dies.
- If it does not, which happens with probability  $\tau$ , the firm has to rely on internal funds – and if it doesn't have any, has to close down
- If the firm closes down, the search capital is lost

# General equilibrium

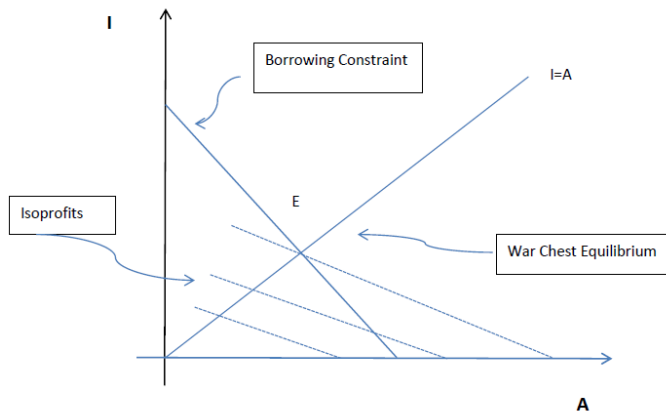
- Entrepreneurs enter the market up to the point where the npv value of the firm is equal to the entry cost  $K$
- The npv income of unemployed workers,  $U$ , clears the market



# The No cash equilibrium



# The Warchest equilibrium



# Model: details

- 1 Workers and entrepreneurs are risk neutral with discount rate  $r$
- 2 The entrepreneur has a private revenue flow of  $y_0$ , independent of her entrepreneurial activities
- 3 Let  $A$  denote firm size (number of machines, cost of machine normalized to 1). Chosen by the entrepreneur initially.
- 4 A firm of capacity  $A$  hires  $A$  workers and produce an output flow of  $yA$ , where  $y$  is an exogenous efficiency parameter

# Search

- Number of matches given by a CRS matching function
- Competitive search, as in Moen (1997). Firms trade of search cost and wage cost
- Total cost of obtaining a worker is  $C(U)$ , where  $U$  is npv income of unemployed

# Borrowing Constraint

- The *pledgeable income flow of the project is*

$$p = y_0 + \rho(y - rU)A \quad (1)$$

- $\rho \in (0, 1)$  *is the share of the income flow that is pledgeable, may vary between entrepreneurs*

- The maximum amount the firm can borrow is thus the npv of the flow over the project's life time, the first "period", is

$$P = \frac{y_0 + \rho(y - rU)A}{r + \lambda} \quad (2)$$

- Financial multiplier:
- An increase in  $A$  increases  $P$ , which opens up for an increase in  $A$  etc
- The financial multiplier is decreasing in  $U$ , links labor to finance

# Cash or size?

- A firm either has a full ( $I = A$ ) war-chest or no ( $I = 0$ ) war chest
- A firm chooses a war chest whenever

$$\left[ \frac{y - rU}{r + \lambda} - 1 \right] (1 + \tilde{\lambda}(1 - \tau)) - C \leq \frac{\tau}{k} \left[ \frac{y - rU}{r + \lambda} - 1 \right]$$

where  $\tilde{\lambda} = \lambda / (r + \lambda)$

# Propositions

- *Fundamental limit result*: When search frictions vanish, firms never use cash
- *Financial strength result*: Firms with a superior financial situation, a high  $\rho$  or a low  $\tau$ , tend to go for size rather than cash



# Financial crisis

- The firms (or a fraction of them) suddenly have to repay  $H$  of the loan
- Those who cannot pay, have to sell some machines, obtain  $\kappa > \rho$  per machine
- The crisis lasts short relative to  $1/\lambda$  (lasts an instant)
- Re-hiring of workers after the crisis cost  $aC$ , where  $0 \leq a \leq 1$
- The crisis does not influence new entrants

# Results

- A firm with a war chest – low leverage – is not influenced by the crisis
- A firm without a war chest – high leverage – has to dismiss  $H/\kappa$  of its workers in the short run
- The expansion after the crisis is

$$\Delta A = \frac{\kappa - \rho \frac{y-rU}{r+\lambda}}{1 + aC - \rho \frac{y-rU}{r+\lambda}} \frac{H}{\kappa} \quad (3)$$

**Proposition:** Unless  $a = 0$  and  $\kappa = 1$ , the crisis permanently reduces the employment level in the no-cash firms. Firms with cash are not influenced

The crisis leaves a long-lasting scar

# Project 2: Macro-shocks

- Dynamic model in which aggregate shocks induce fluctuations in **both** investment/labor opportunities as well as in financial constraints..
- Firms get funding from their pledgeable income and invest and build capacity within an imperfect labour market.
- Aggregate productivity changes affect investment opportunities, the labor market and- indirectly- firm funding.
- A natural amplification mechanism of aggregate shocks emerge from the model.

# Results

- 1 Financial frictions increase equilibrium unemployment and reduce welfare.
- 2 *Analytically*: increase elasticity of unemployment to productivity changes
- 3 *Quantitatively*: increase elasticity of unemployment to productivity changes by approximately 10/15 percent against a financially frictionless model.
- 4 A deeper modelling. Financial frictions as an obstacle to firm growth.
- 5 Do elasticity and volatility increase? Need to study transitional dynamics (ongoing)

# Project 3: Debt and Collateral

- Kiyotaki and Moore into labor
- The value of the "machine" or the job used as collateral
- Supply of machines upward-sloping in the short run
- Machines will be (temporarily) more valuable after a positive productivity shocks
- More valuable collateral allow for more borrowing of leveraged firms, multiplier effects

# Preliminary conclusions and plans

- Imperfect labor market dimensions and "search capital" fundamental motives for firms holding cash
- Economies with easy access to credit have higher welfare but are also more volatile than economies with less easy access to credit.
- Plans to explore effects of changes in costs of dismissals on liquidity of firms over panel of firms
- Calibrations looking at effects of financial frictions on employment/unemployment adjustment over the cycle