

Labor and Finance: New Perspectives

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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
- Evidence that financial frictions amplify adjustment during recessions

Some motivating facts

- 1 Financial frictions and unemployment volatility
- 2 Financial intermediaries, leverage and liquidity
- 3 Financial distress and job destruction

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: Unemployment forecast errors

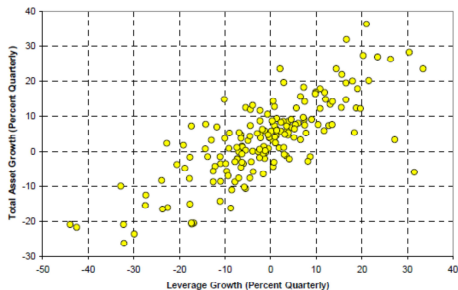
Deviation from Okun's law (including LM institutions)

	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%***

Source: IMF WEO 2010

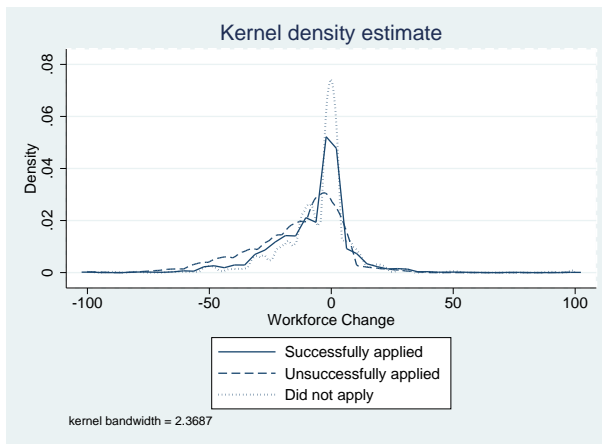
II. Financial intermediaries and procyclical leverage



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. Credit Constraints and Job Destruction



Research Questions

- Which are the relevant links between financial shocks and labor market dynamics, in imperfect labor markets?
- How does finance interact with labor market frictions? And unemployment with financial frictions at business cycle frequencies?
- Can finance be bad for employment during a (financial) crisis and be good instead in normal times?
- How does a credit crunch translate into job destruction and unemployment?

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/liquidity and labour market effects of a credit squeeze (MP meets HT)
 - 2 Financial constraints and the amplification of productivity shocks
 - 3 Kiyotaki - Moore applied to a search setting

A model of financial and labor frictions

Two types of frictions in financial markets

- 1 Not all future income from a firm can be pledged: initial financing problem
 - Because of part of the benefits from running a business are private and non pecuniary, and
 - she/he needs to be incentivized by having some stake in the project
- 2 Refinancing shocks. Unless the firm has some liquid reserves (or unused credit lines), the search capital is lost.

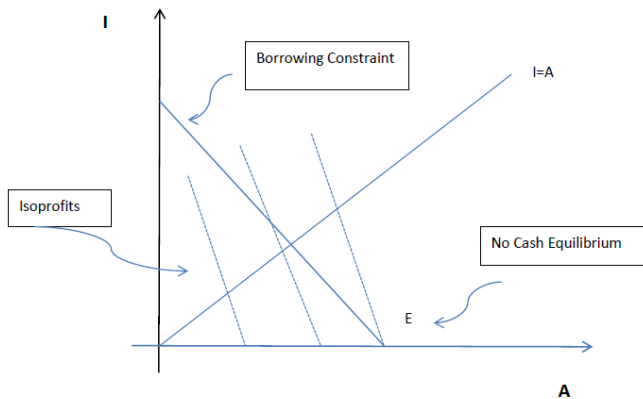
Labor frictions

- Entrepreneurs set up a firm at effort cost K , invest in machines and in "search" to find workers, and produce for a period
- Competitive search, as in Moen (1997). Firms trade of search cost and wage cost
- When a productivity shock takes place, the machines are destroyed and have to be replaced
- The entrepreneur has to buy new machines in order to produce.

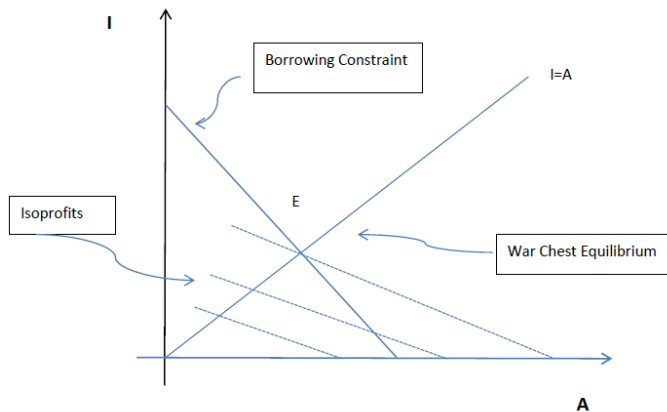
Trade-off Cash/Size

- 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 (which has an opportunity cost proportional to financing frictions or non-pledgeability of income)
- 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

The No cash equilibrium



The Warchest equilibrium



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

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

Firm's financial choice

- The entrepreneur must obey the financing constraint

$$(1 + C(U))A + I = P \quad (3)$$

- The multiplier $k(U)$ shows the trade-off between cash and size ($-dA/dI$)
- Is high when ρ is high and U is low
- Makes it more costly to hold cash

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 ρ or a low τ , 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/κ of its workers in the short run
- The expansion after the crisis is

$$\Delta A = \frac{\kappa - \rho \frac{y-rU}{r+\lambda}}{1 + aC - \rho \frac{y-rU}{r+\lambda}} \frac{H}{\kappa} \quad (4)$$

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

Firm-level response and leverage during a FC, the GR

- Firm-level response and leverage during the GR
An EFIGE-Amadeus matched dataset
- Mainly a cross-section (some retrospective info, series limited to some variables)
- 14,759 firms, 7 countries, 11 sectors
- Variables covering the 2007-9 period
- Detailed info on firms' characteristics, employment and financial conditions

Key Variables

- Employment variation during the Great Recession:
- Δe : During the last year (2009) did you experience a reduction or an increase/decrease of your workforce in comparison with 2008?
- Those reporting a change are also requested to specify percentage variation
- Imputed value 0 of Δe to firms reporting no change
- Δy : measured through operational revenue growth in 2008-2009

Frame Measures of Financial Leverage

- **Gearing:** Debt to equity ratio (creditor's vs. owner's funds)
- **Solvency Ratio:** Ratio of after tax net profit (plus depreciation) over debt (company's ability to meet long-term obligations)
- **Long-term debt to assets ratio:** Loans and financial obligations lasting more than one year.

Descriptive statistics

Table: Measures of Leverage, Descriptive Statistics

Country	N of Firms	Average Size of Firms	St Dev	Gearing R 2007 (%)	St Dev	Solvency R 2007 (%)	St Dev	LT DA 2007 (%)
AUT	443	100	33	84.29	6.85	30.22	1.61	.
FRA	2,973	50	8	68.56	2.27	37.44	0.45	6.48
GER	2,935	96	11	172.41	5.80	28.89	0.60	31.81
HUN	488	68	9	51.28	4.74	48.65	1.27	2.78
ITA	3,021	40	2	224.82	4.48	24.02	0.37	7.40
SPA	2,832	45	3	92.29	2.84	37.54	0.46	11.11
UK	2,067	180	20	71.72	3.21	39.73	0.72	6.89
Sector	N of Firms	Average Size of Firms	St Dev	Gearing R 2007 (%)	St Dev	Solvency R 2007 (%)	St Dev	LT DA 2007 (%)
1	3,430	40	2	139.17	3.65	31.93	0.43	13.29
2	1,520	57	7	153.48	6.14	29.98	0.75	22.56
3	937	90	27	132.07	6.82	32.98	0.91	13.38
4	1,966	47	4	145.43	5.23	30.47	0.64	15.11
5	1,038	43	5	162.84	7.58	31.13	0.82	11.25
6	563	100	9	125.23	8.01	35.41	1.15	11.25
7	424	130	32	127.16	9.31	31.31	1.33	11.38
8	705	36	3	131.23	7.22	30.81	1.00	16.31
9	21	96	59	110.53	36.12	41.24	5.49	10.53
10	2,353	70	9	135.50	4.45	33.30	0.57	14.37
11	1,888	67	6	131.88	5.06	31.88	0.62	1.01

Empirical Framework

We estimate the following equation

$$\Delta e_{ijc} = \alpha + \alpha_j + \alpha_c + \alpha_j * \alpha_c \beta \Delta y_{jc} + \gamma Lev_{ijc} + \delta S_{ijc} + \epsilon_{ijc}$$

where Δe is the reported employment growth rate *during* the period 2008-9, i denotes the firm, j the sector and c the country, S is set of size dummies (employment or turnover) and Lev is either the Gearing Ratio, the Solvency Ratio or the Long-term Debt to Asset ratio all measured *before* the Great Recession (according to 2007 balance sheet data). We also include country and sector dummies as well as interactions between the two sets of dummies.

Simple OLS and 2SLS using third party collateral as **instrument**. Identification assumption: involvement in consortium affects leverage in normal times (risk-aversion), but not directly employment adjustment during the crisis.

Employment growth during financial crises and leverage

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

Instrumenting with third-party collateral

Table: Only Firms Downsizing

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
Method	$\Delta e(\%)$ OLS	$\Delta e(\%)$ IV	$\Delta e(\%)$ OLS	$\Delta e(\%)$ IV	$\Delta e(\%)$ OLS	$\Delta e(\%)$ IV
Second stage						
$\Delta \bar{y}$	0.547 (1.243)	-95.87 (132.8)	1.322 (1.209)	14.79 (179.7)	1.378 (1.243)	-181.8 (739.2)
Gearing	-0.003** (0.001)	-0.034* (0.017)				
Solvency			0.057*** (0.009)	0.748** (0.314)		
LT DA					-2.449* (1.474)	-343.7 (669.0)
Constant	-20.23*** (3.314)	-24.75 (16.62)	-23.08*** (3.324)	-31.40 (21.79)	-21.95*** (3.268)	-38.91 (91.39)
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
First stage						
Third party collateral		Gearing 88.366*** (21.310)		Solvency -5.928*** (1.989)		LT DA 0.012 (0.024)
Observations	4151	1195	4677	1458	3783	1091

Standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

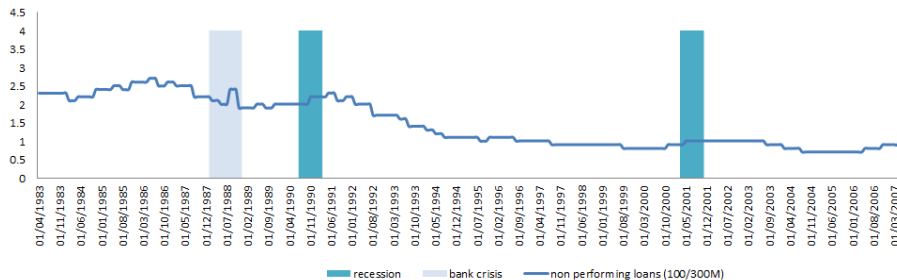
Project 2: Macro-shocks

- 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*: financial frictions increase elasticity of unemployment to productivity changes
- 3 *Quantitatively*: Financial frictions increase the 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.

I. Bad loans and bank crises



I. Bank crises and volatility

Table: Volatility during bank crises

	st.dev.	st.dev. in banking crises
vacancy rate in private sector	3.64	4.85
vacancy opening rate	0.0038	0.00513
unemployment rate	1.64	1.86
real detrendend GDP	44.78	113.72

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