13TH JACQUES POLAK ANNUAL RESEARCH CONFERENCE
NOVEMBER 8–9, 2012

The Labor Market Consequences of Adverse Financial Shocks

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Paper presented at the 13th Jacques Polak Annual Research Conference
Hosted by the International Monetary Fund
Washington, DC─November 8–9, 2012

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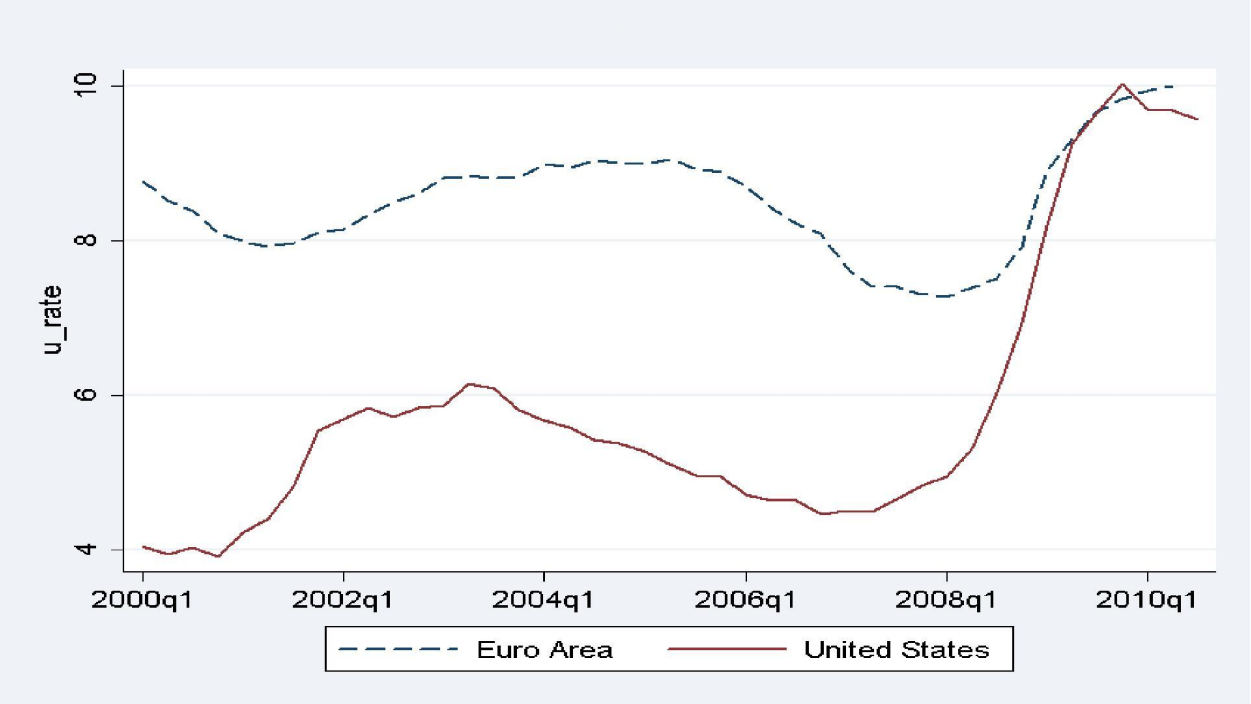
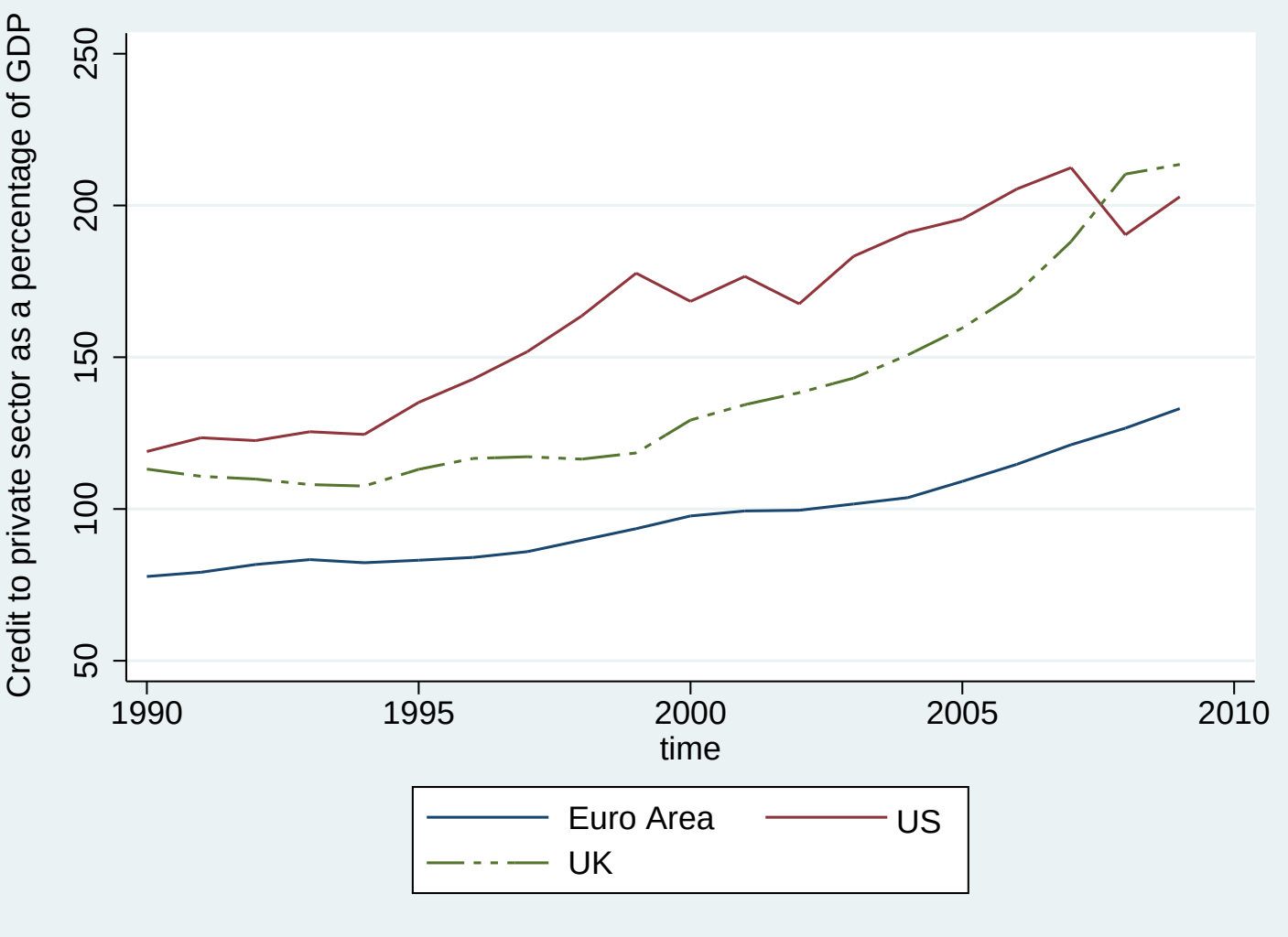
Unemployment rate on the two sides of the Atlantic



Credit to the private sector over GDP



Stock Market Capitalization over GDP

Financial Recessions are Different:1.Unemployment

Country	Type of recession	du	du/u	dy/y
France	Financial rec	1.40	19%	-4%
	Other rec	1.00	11%	-1%
	Difference	*0.40*	*8%*	*-3%*
Germany	Financial rec	-0.40	-5%	-7%
	Other rec	0.54	8%	-1%
	Difference	*-0.94*	*-13%*	*-6%*
Italy	Financial rec	1.30	15%	-1%
	Other rec	0.43	6%	-2%
	Difference	*0.88*	*9%*	*1%*
UK	Financial rec	2.10	36%	-3%
	Other rec	0.50	7%	-3%
	Difference	*1.60*	*28%*	*0%*
US	Financial rec	2.65	50%	-3%
	Other rec	1.93	33%	-3%
	Difference	*0.72*	*17%*	*0%*

France: Unemployment data starting from Q1-1978; GDP from 1970;
Germany: Data starting from Q1-1991
Italy: Unemployment data starting from Q1-1983; GDP from 1970;
UK: Unemployment data starting from Q1-1983; GDP from 1970;
US: Unemployment data starting from Q1-1970; GDP from 1970
Episodes of recessions with financial crises: France 2008; Italy 1992; Germany 2008; UK 1975, 1990, 2008; US 1990, 2008

Financial Recessions are Different:2.Employment

1 All series are in levels indexed to 100 at the peak; quarters on x-axis; peak in output at = 0; solid line is the mean and dashed line the 95% CB.

2 Episodes of recessions with financial crises: previous- Australia (1990), Germany (1980), Great Britain (1973), Great Britain (1990), Italy (1992), Japan (1993), Japan (1997), Norway (1988), Spain(1978), Sweden (1990); current- Belgium (2008), Great Britain (2008), Ireland (2008), Netherlands (2008), United States (2008).

Open Issues

- During the Great Recession (2008-2009), initially larger labor market response in the US (and UK) than in the Euro area.
- Labour market institutions (usual suspects) not enough to understand these dynamics (WEO 2010, EmO 2010).
- As it was a (global) financial recession, the new suspect is finance, the links between financial shocks and labor market dynamics.
- Evidence that financial crises are particularly bad for employment.

Research Questions

- Which are the relevant links between financial shocks and labor market dynamics?

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- Which are the relevant links between financial shocks and labor market dynamics?
- Do they mainly operate along the job creation or the job destruction margin?
- 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?

Outline

- A reduced-form (toy) model of labor-finance interactions
- Micro evidence on leverage and employment adjustment during the Great Recession
- Macro evidence on employment and leverage under financial vs. non-financial recessions

Key results: Theory

1. Search model of endogenous leverage and job destruction predicts that
    1. more finance means lower average unemployment, but more vulnerability to aggregate financial shocks
    2. with heterogeneous costs of finance, coexistence of highly and low leveraged firms
    3. conditional on a financial shock, more leveraged segments of the economy destroy more jobs
    4. the effect operates along the job destruction margin
    5. labor market institutions operating on JD margin are relevant during a financial recession

Key results: Data

Evidence from *micro data* that

1. highly leveraged firms destroyed more jobs during the Great Recession
2. no significant effects of leverage on job creation during the GR

and from *macro data* that:

1. financial recessions are worse than other recessions for employment also conditioning on aggregate output
2. they destroy more jobs in more leveraged countries-sectors
3. the same applies to financial *crises* (not necessarily recessions)

A toy model

1. No frictions (just shocks) in financial markets.
2. (Matching) frictions in labor markets
3. Wages indexed to productivity, subject to participation constraint
4. Finance is endogenous

How Finance is framed

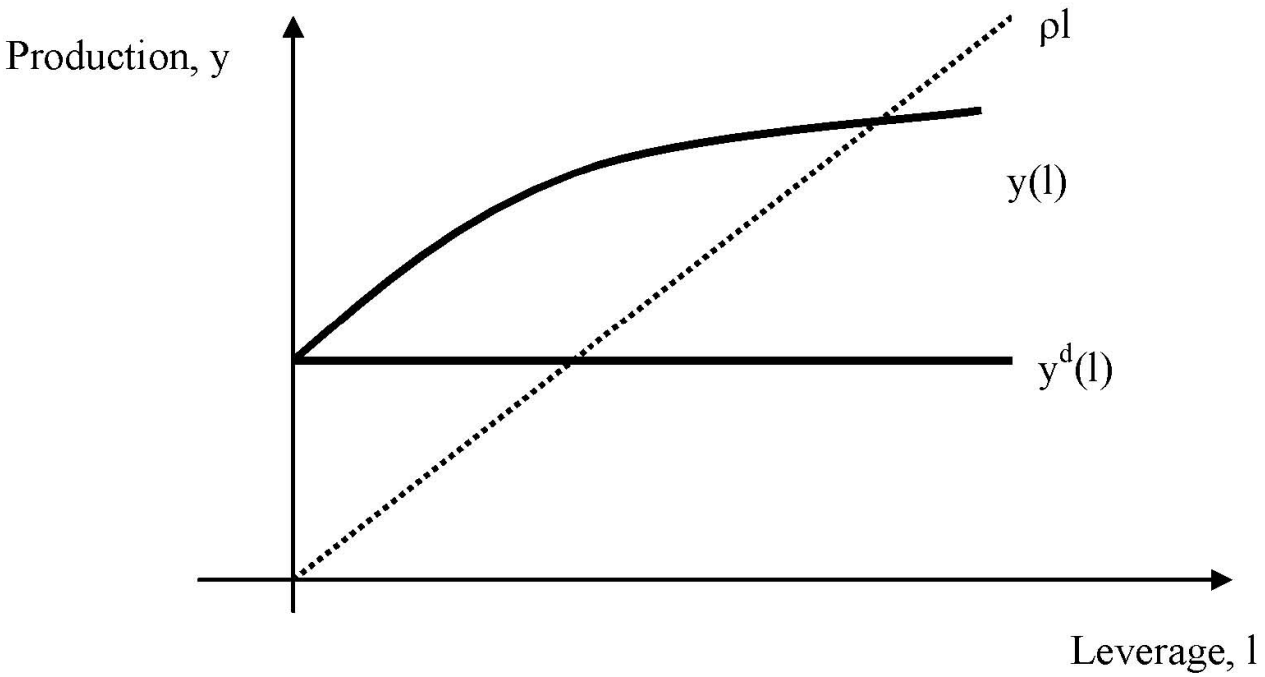
- Production requires an entrepreneur a worker and, *potentially*, finance or credit.Like Leontief with 2+1 inputs.
- In other words, finance or credit (used interchangeably) is akin to an input in production.
- Finance intensity is endogenous (leverage) at entry.
- Entrepreneur and labor indivisible.
- All agents are risk neutral and discount the future at rate r

Finance

- Entrepreneurs must choose *ex-ante* the finance intensity of their production
- Finance is readily available at the time of job creation, but it can be suddenly pulled back from the firm as a result of an idiosyncratic shock
- In *financial distress* (when credit disappears), production can still continue
- Firms in financial distress can get credit back at an exogenous probability

Technological trade-off of finance

- More leverage increases production in normal times but it reduces production during financial distress.
- Consistent with work on liquidity (Holmstrom and Tirole, 2011).



What we do

- We look at two different outcomes, depending on whether firms operate or not in financial distress
- In the *high credit* equilibrium, firms destroy jobs in financial distress and choose high leverage (low unemployment/high volatility)
- In the *low credit* equilibrium, firms operate in financial distress and choose lower leverage (high unemployment/low volatility)
- We characterize the two regimes in terms of the cost of credit (threshold level below which the high credit equilibrium prevails).

Unemployment in the two regimes

In normal times unemployment is lower in the high-credit equilibrium because market tightness is higher in the high credit equilibrium (job creation effect)
However, in the aftermath of a financial shock occurs

- Unemployment increases more in the high credit equilibrium then in the low credit one
- This is because in the high credit equilibrium there is not only a negative job creation effect (as in the low-credit equilibrium), but also a positive job destruction effect

From Theory to the Data

- Cross-country variation can be explained by overall depth of financial markets
- Within country variation: we consider economies with a coexistence of high-credit and low-credit sectors and firms
- Assuming that cost of finance is firm-specific:
  1. high credit firms destroy more jobs at time of financial distress
  2. low credit firms should be less hit by the financial shock

Firm-level response and leverage during the GR

An EFIGE-Amadeus matched dataset

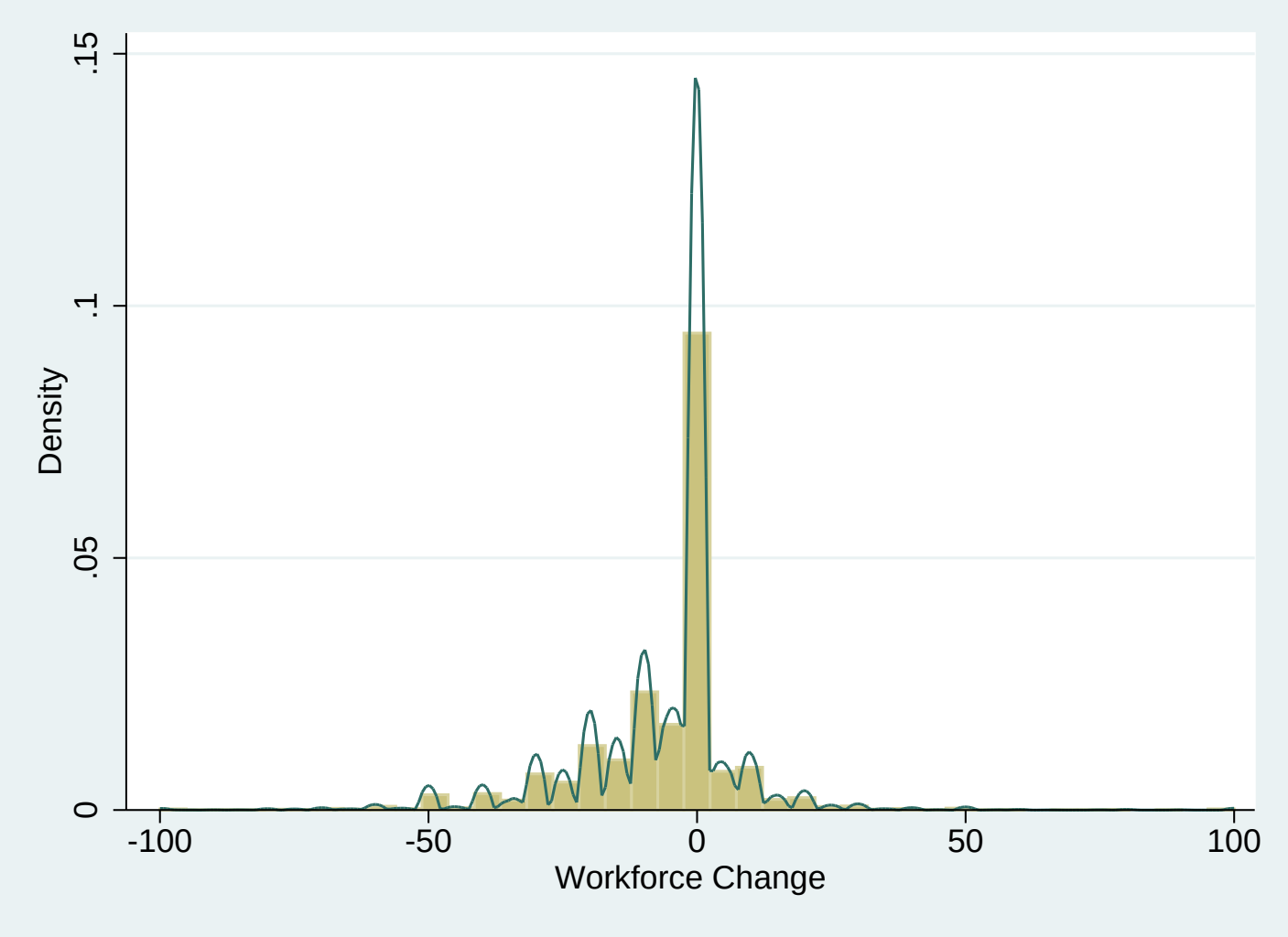
- Mainly a cross-section (some retrospective info, series limited to some variables)
- 14,759 firms, 7 countries, 11 sectors
- Variables covering the 2007-9 period
- Detailed info on firms' characteristics, employment and financial conditions

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
- we imputed value 0 of Δe to firms reporting no change
- Δy: measured through operational revenue growth in 2008-2009

Firm-level response during the GR



Firm-level response and Leverage during the GR

Graphs by "During the last year, did the firm apply for more credit?"

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.

Empirical Framework

We estimate the following equation

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

where Δe is employment growth *during* in 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 Gearing Ratio, Solvency Ratio or Long-term debt to asset ratio *before* the Great Recession (2007 balance sheet data).
Simple OLS and 2SLS using age of the CEO as **instrument**. Identification assumption: age of CEO affects leverage in normal times (risk-aversion), but not directly employment adjustment during the crisis.

Δe, All Firms

	(1)	(2)	(3)	(4)	(5)	(6)
Method	OLS	IV	OLS	IV	OLS	IV
VARIABLES	$\Delta e\%$	$\Delta e\%$	$\Delta e\%$	$\Delta e\%$	$\Delta e\%$	$\Delta e\%$
$\Delta \bar{y}$	1.192*	1.332*	1.200*	1.032	1.188*	0.199
	(0.640)	(0.703)	(0.639)	(0.671)	(0.638)	(2.055)
Gearing	-0.00430***	-0.0398***				
	(0.000853)	(0.0151)				
Solvency			0.0399***	0.231***		
			(0.00637)	(0.0731)		
LT DA					-0.152	-148.5
					(0.602)	(130.9)
Constant	-6.158***	-3.382*	-8.556***	-13.99***	-7.776***	-6.019
	(1.417)	(1.973)	(1.395)	(2.509)	(1.371)	(4.314)
Country	YES	YES	YES	YES	YES	YES
Sector	YES	YES	YES	YES	YES	YES
Size	YES	YES	YES	YES	YES	YES
Observations	8,596	8,582	9,649	9,630	8,064	8,044
R-squared	0.069	-0.120	0.066	-0.022	0.052	-7.068

First stage		IV Gearing		IV Solvency		IV LT DA
Age of CEO		-10.381***		1.983***		-0.003
		(1.816)		(0.216)		(0.003)

Standard errors in parentheses;*** p<0.01, ** p<0.05, * p<0.1

Δe, Only Firms Downsizing

	(1)	(2)	(3)	(4)	(5)	(6)
Method	OLS	IV	OLS	IV	OLS	IV
VARIABLES	$\Delta e\%$	$\Delta e\%$	$\Delta e\%$	$\Delta e\%$	$\Delta e\%$	$\Delta e\%$
$\Delta\bar{y}$	0.813	0.519	1.003	0.556	1.107	-0.395
	(0.936)	(1.106)	(0.915)	(0.984)	(0.936)	(3.117)
Gearing	-0.003**	-0.050**				
	(0.00119)	(0.0226)				
Solvency			0.058***	0.264***		
			(0.00914)	(0.0959)		
LT DA					-2.495*	-256.3
					(1.456)	(249.2)
Constant	-19.72***	-14.68***	-23.10***	-27.83***	-21.80***	-21.52***
	(2.090)	(3.440)	(2.060)	(3.075)	(2.052)	(6.032)
Country	YES	YES	YES	YES	YES	YES
Sector	YES	YES	YES	YES	YES	YES
Size	YES	YES	YES	YES	YES	YES
Observations	4,151	4,145	4,677	4,668	3,783	3,774
R-squared	0.061	-0.295	0.063	-0.041	0.045	-7.281

First stage	IV Gearing	IV Solvency	IV LT DA
Age of CEO	-10.806***	2.166***	-0.003
	(2.721)	(0.315)	(0.002)

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Δe, Only Firms Upsizing

	(1)	(2)	(3)	(4)	(5)	(6)
Method	OLS	IV	OLS	IV	OLS	IV
VARIABLES	$\Delta e\%$	$\Delta e\%$	$\Delta e\%$	$\Delta e\%$	$\Delta e\%$	$\Delta e\%$
$\Delta \bar{y}$	3.846***	4.474	3.859***	4.566**	3.917***	3.667
	(1.292)	(12.78)	(1.309)	(1.933)	(1.319)	(4.571)
Gearing	-0.004*	0.639				
	(0.00223)	(5.822)				
Solvency			-0.009	-0.405		
			(0.0163)	(0.625)		
LT DA					0.034	-6.928
					(0.695)	(118.1)
Constant	16.81***	-24.49	16.02***	26.33	15.85***	16.13**
	(2.793)	(373.0)	(2.743)	(16.84)	(2.740)	(8.034)
Country	YES	YES	YES	YES	YES	YES
Sector	YES	YES	YES	YES	YES	YES
Size	YES	YES	YES	YES	YES	YES
Observations	1,060	1,058	1,181	1,178	1,033	1,030
R-squared	0.061	-75.423	0.052	-0.430	0.054	-0.039

First stage	IV Gearing	IV Solvency	IV LT DA
Age of CEO	-0.575	0.702	0.003
	(5.244)	(0.654)	(0.018)

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

Macro Data

Three sources of variation (country, time, sector).

- Macro data from Oecd and IMF on the period 1965-2009 across 6 sectors.
- Estimation of employment equations, including labor market institutions (UB and EPL) and the following 2 measures of firms' leverage:
  1. debt to sales (DS)
  2. debt to assets (DA)

Estimation procedure

We estimate the following equation

$$\Delta e_{ijt} = \alpha_j + \beta \Delta y_{jt} + \gamma Lev_{ijt} + \delta_1 FR_{jt} + \delta_2 FR_{jt} Lev_{ijt} + \delta X_{jt} + \epsilon_{ijt}$$

where $\Delta eijt$ is log employment variation in sector i, country j at time t, α_j denotes the coefficients of sectoral dummies, Δy is the log variation of GDP, Lev is the leverage ratio (either debt-to-assets or debt-to-sales), FR denotes financial recessions, FC is financial crises and X a set of time-varying institutional variables potentially affecting the responsiveness of employment to output change.

Regressions with Debt to Assets

VARIABLES	(1)OLS $\Delta e\%$	(2)IV $\Delta e\%$	(3)OLS $\Delta e\%$	(4)IV $\Delta e\%$
$\Delta\bar{y}$	0.436	0.307	0.512	0.375
	(-0.316)	(-0.319)	(-0.315)	(-0.318)
Recession	-0.005**	-0.005**		
	(-0.002)	(-0.002)		
FinCrisis	-0.001	-0.002		
	(-0.006)	(-0.006)		
FinRec			-0.006	-0.006
			(-0.005)	(-0.006)
DA	-3.99E-07	-4.19E-07	-4.69E-07	-4.67E-07
	(-1.17E-06)	(-1.23E-06)	(-1.17E-06)	(-1.23E-06)
FinCrisis*DA	-0.0004**	-0.0004*		
	(-0.000)	(-0.000)		
FinRec *DA			-0.0004**	-0.0004*
			(-0.000)	(-0.000)
Sector, EPL, UB	YES	YES	YES	YES
Observations	2,912	2,846	2,912	2,846
R-squared	0.045	0.044	0.043	0.043

First Stage	(2)		(4)	
	FinCrisis*DA	DA	FinRec*DA	DA
DA (-1)	3.02E-06	0.963***	3.06E-06	0.963***
	(-0.000)	(-0.006)	(-0.000)	(-0.006)
FinRec* DA (-1)			1.004***	0.268
			(-0.002)	(-0.969)
FinCrisis*DA (-1)	1.004***	0.260		
	(-0.002)	(-0.969)		

Regressions with Debt to Sales

VARIABLES	(1)OLS $\Delta e\%$	(2)IV $\Delta e\%$	(3)OLS $\Delta e\%$	(4)IV $\Delta e\%$
$\Delta\bar{y}$	0.428	0.293	0.504	0.361
	-0.315	-0.318	-0.314	-0.317
Recession	-0.005**	-0.005**		
	(-0.002)	(-0.002)		
FinCrisis	-0.011***	-0.011***		
	(-0.003)	(-0.003)		
FinRec			-0.015***	-0.015***
			(-0.003)	(-0.003)
DS	2.59E-06	4.19E-06	2.61E-06	4.21E-06
	(-3.01E-06)	(-3.33E-06)	(-3.01E-06)	(-3.33E-06)
FinCrisis*DS	-7.56E-06	-4.18E-06		
	(-2.62E-05)	(-2.64E-05)		
FinRec *DS			-7.40E-06	-4.02E-06
			(-2.62E-05)	(-2.65E-05)
Sector, EPL, UB	YES	YES	YES	YES
Observations	2,912	2,846	2,912	2,846
R-squared	0.044	0.043	0.042	0.041

First Stage	(2)		(4)	
	FinCrisis*DS	DS	FinRec*DS	DS
DS (-1)	-0.000	0.916***	-0.000	0.916***
	(-0.000)	(-0.008)	(-0.000)	(0 .008)
FinRec* DS (-1)			1.029***	-0.017
			(-0.003)	(-0.072)
FinCrisis*DS (-1)	1.029***	-0.0176		
	(-0.003)	(-0.071)		

Robustness Checks

Micro data

- Δe categorical to deal with heaping
- Control for Δy_i

Macro data

- time-invariant High-Leverage (top 40%)
- defined in terms of deviation from the Us

Conclusions: not only LM institutions

- Toy search model with endogenous leverage
- Highlights mechanism linking financial *shocks* to labor adjustments
- Deep financial markets good for employment in normal times
- but adverse financial shocks lead to job destruction in highly leveraged environments

Conclusions + Extensions

- Empirically, conditional on a financial shock,
- More leveraged *firms* destroy more jobs
- The effect is non-negligible: 100 basis points more of Gearing Ratio mean JD of 5 per cent
- 10 basis points of solvency ratio mean less JD of 2.5 per cent
- More leveraged *sector/countries* experience larger employment adjustment during FC than non-financial recessions
- Causal effect of leverage on job destruction
- More work on microfoundations: refinancing shocks
- Firms can have a war chest of cash. If so, they are less efficient, but less vulnerable to financial shocks