When Credit Dries Up: Job Losses in the Great Recession

Samuel Bentolila
CEMFI

Marcel Jansen
U. Autónoma de Madrid

Gabriel Jiménez
Banco de España

Sonia Ruano
Banco de España

New Developments in Labor Markets
Warsaw, November 2015.

Motivation

- Many countries suffered severe credit market disruptions and a strong rise in unemployment during the Great Recession
- Concerns about lack of credit supply led to massive injections of capital in banks with solvency problems (over € 600 Bn in Europe)
- Yet, evidence on the effects of credit supply shocks and bailouts on employment is still scant.
  - Challenging identification problems
  - Lack of high-quality loan-level data (in the US)

Spain's experience in the Great Recession

Spain's economy offers an ideal setting to explore how shocks to credit supply spill over onto the real economy:

- Unprecedented drops in employment and bank credit to firms
- Spanish firms rely heavily on bank credit and were highly leveraged at the onset of the crisis
- The boom-bust cycle in housing prices caused catastrophic effects on bank solvency
- The credit register of the Bank of Spain (*CIR*) offers detailed information on universe of bank loans to non-financial firms

Identification challenges

A concurrent drop in bank credit and employment at the firm level is obviously *no proof* of the existence of credit constraints.

- One must disentangle shocks to credit supply and demand
  - The bursting of the housing bubble is likely to affect both credit demand and supply.
- Selection effects and reverse causality
  - Weak banks may have worse client firms than strong banks
- Firms may have access to alternative sources of funding

Most recent studies exploit *quasi-experimental techniques* to overcome these identification problems

Our approach

We exploit large cross-sectional differences in lender health at the onset of the crisis

- The weakest banks, all but one *cajas de ahorros*, were bailed out by the State — mostly after 2010. The rest survived without financial assistance
- We demonstrate that bailed-out or *weak banks* reduced credit more than the rest of the banks after controlling for bank and firm fixed effects (Khwaja and Mian, 2008)
- We compare the change in employment from 2006 to 2010 at two sets of firms: those with a pre-crisis loans from weak banks in 2006 and those who exclusively borrowed from healthy banks

Main contributions

- The extraordinary quality of our data set permit more precise estimates and a much wider set of robustness test than existing studies
- This includes state-of-the-art controls for demand effects
- Novel results regarding transmission channel:
  - *i* Firms' financial vulnerability and credit history
  - *ii* Gains or risks from concentrating bank loans
  - *iii* Local bank-firm level vs. firm level effects
  - *iv* Employment losses at the internal and external margin

Related literature

The two most closely related papers also exploit heterogeneity in lender health, but

- **Greenstone and Mas (2014)**: Impute US county-level credit supply shock from nationwide data on credit to small firms
- **Chodorow-Reich (2014)**: Impute US firm-specific credit supply shock from lending by its pre-crisis syndicated loan banks

They impute a credit shock to each firm, while we estimate the treatment effect for firms exposed to weak banks with a much richer set of firm controls. We show, in line with Paravisini et al. (2015), that it is crucial to compare firms within narrowly-defined cells.

Summary of results

- Controling for selection, weak-bank exposure caused an extra employment fall of around 2.2 pp from 2006 to 2010
- This corresponds to about one-quarter of aggregate job losses in firms exposed to weak banks in our sample
- Stronger aggregate impact on surviving than on exiting firms
- The results are very robust and reveal sizable differences depending on firm financial vulnerability and firm size
- Differences in employment destruction and firm exit are concentrated at multi-bank firms

Plan of the talk

- Theoretical background
- The financial crisis in Spain
- Data
- Empirical strategy
- Empirical results:
  - Baseline (DD) and alternative specifications
  - Local bank-firm analysis
  - IV analysis: Transmission mechanism and exogenous exposure
  - Treatment heterogeneity
  - Probability of firm exit
  - Job loss estimates
- Conclusions

Theoretical background

Financial accelerator

Endogenous changes in credit markets may amplify, propagate, or initiate shocks to the real economy (*e.g.* Bernanke and Gertler, 1995)

- Agency costs drive a wedge between cost of internal and external funds; the external finance premium depends negatively on the borrower's net worth
- Pro-cyclical fluctuations in borrowers' net worth lead to a rise in cost of funding during recessions (*net-worth effect*)
- Capital-weak borrowers are the first ones to suffer credit restrictions (*flight to quality*)

This literature mostly treats financial intermediation as a veil, but the same logic also applies to the relationship between banks and their lenders (Gertler and Kiyotaki, 2010).

Theoretical background

Relationship banking

Our study provides an empirical test of the importance of stable banking relationships for the access to credit

- Banks have an incentive to acquire soft information about their stable clients. This weakens the agency problem.
  - The superior information may provide better access to credit at the same bank when capital is scarce;
  - The same reasoning explains why it may be difficult to switch to other banks;
- Ambiguous prediction for the optimal number of banks (Detragiache *et al.*, 2000)
- In line with Gobbi and Sette (2014) we find that concentration of loans in one bank is better during the Great Recession

Links between credit supply and employment

Economic theory identified several potential links between employment and the availability of external finance

- Mismatch between the timing of payments to workers and generation of cash flow
- Turnover costs may transform labor into a quasi-fixed factor of production, creating a link between employment and the availability of external finance similar to the well-known link with corporate investment (*financial accelerators*)
- Financial frictions may alter the optimal mix of contracts
- Complementarity between capital and labor

Our aim is to gauge the overall quantitative importance of these links.

The financial crisis in Spain

Spain went through a boom-bust cycle in bank credit. Real annual flow of new credit to non-financial firms by deposit institutions

- 2003-2007: 23%
- 2007-2010: -38%

The low interest rates induced banks to take on substantially more risk (Jiménez *et al.* 2014)

Strong rise in loans to real estate developers and construction companies (REI): 14.8% of GDP 2002 to 43% in 2007

$\rightarrow$ Housing bubble: 59% rise in real housing prices over 2002-2007 (-15% over 2008-2010)

The problems were concentrated in the saving banks

Savings banks and the credit crunch

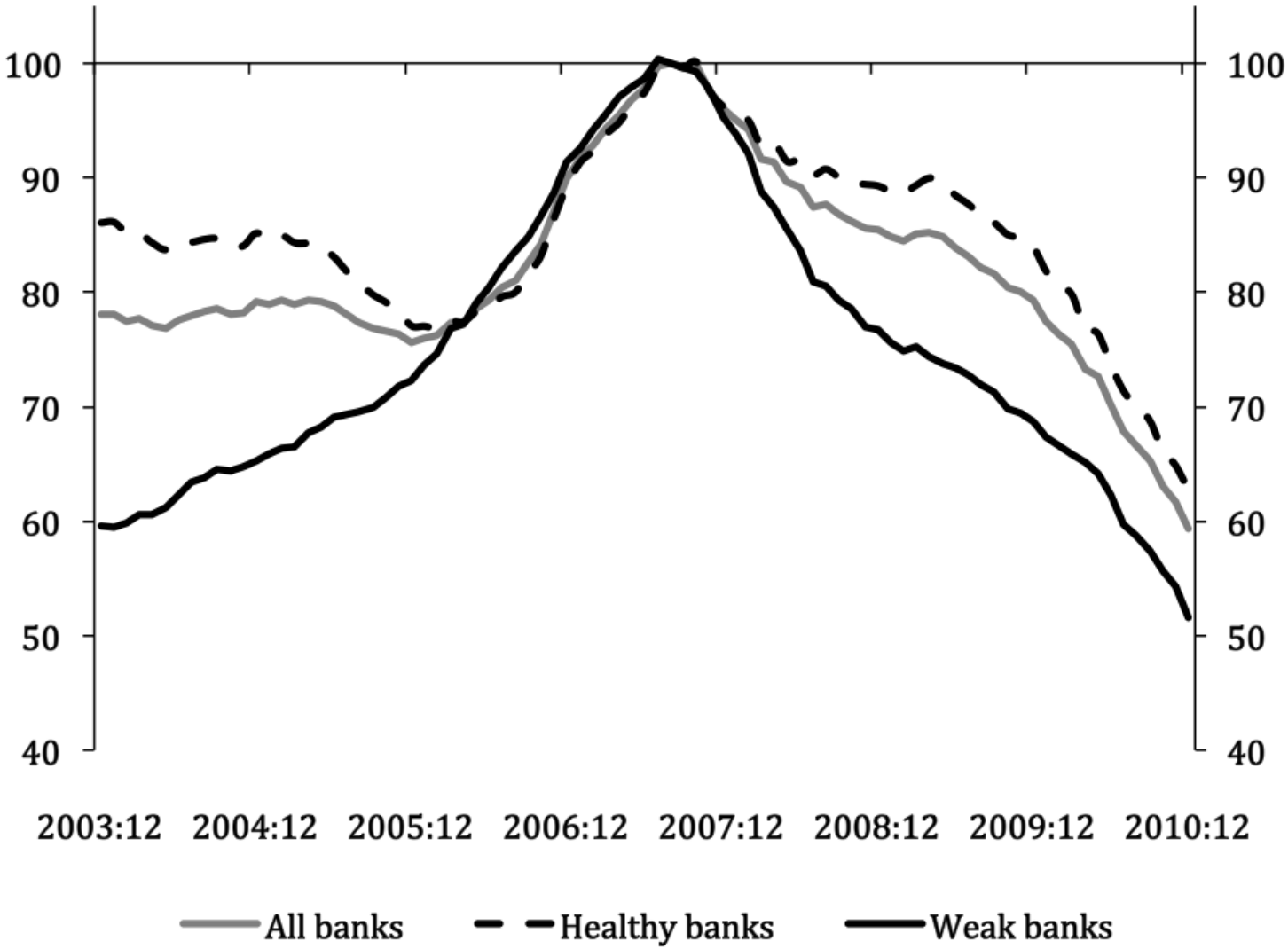
- Savings banks: same regulation and supervision, different ownership and governance
- Market shares and exposure to REI (%):

	Credit to Non-Fin. Firms	Loans to REI/ Loans to NFF
Weak banks	32	68
Healthy banks	67	37

- Differential credit growth:
  - Expansion (2002-2007): Weak 60% v. healthy 12%
  - Recession (2007-2010): Weak -46% v. healthy -35%
- Both at intensive and extensive margins

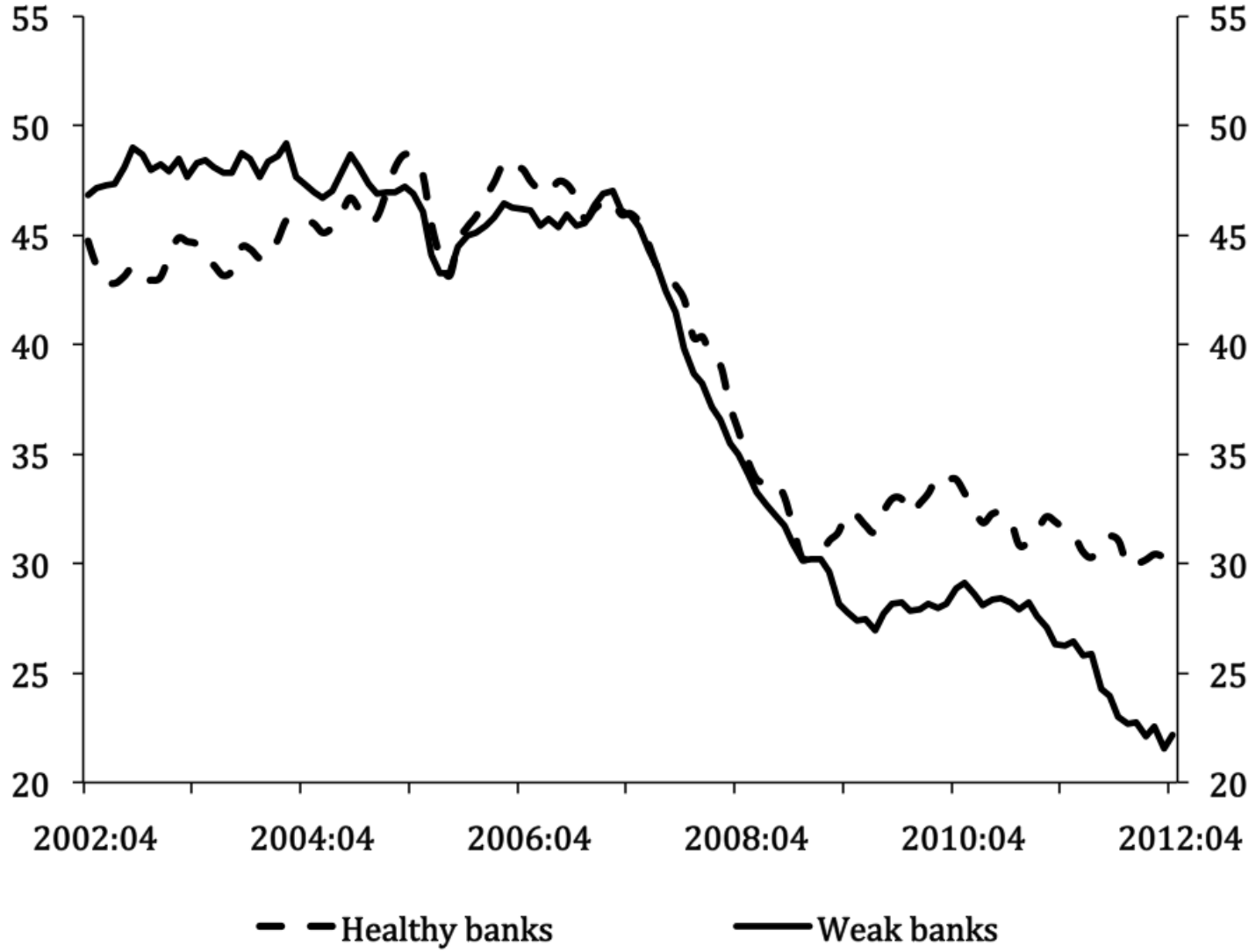
Savings banks and the credit crunch

New credit to non-financial firms by bank type (12-month backward moving average, 2007:10=100)



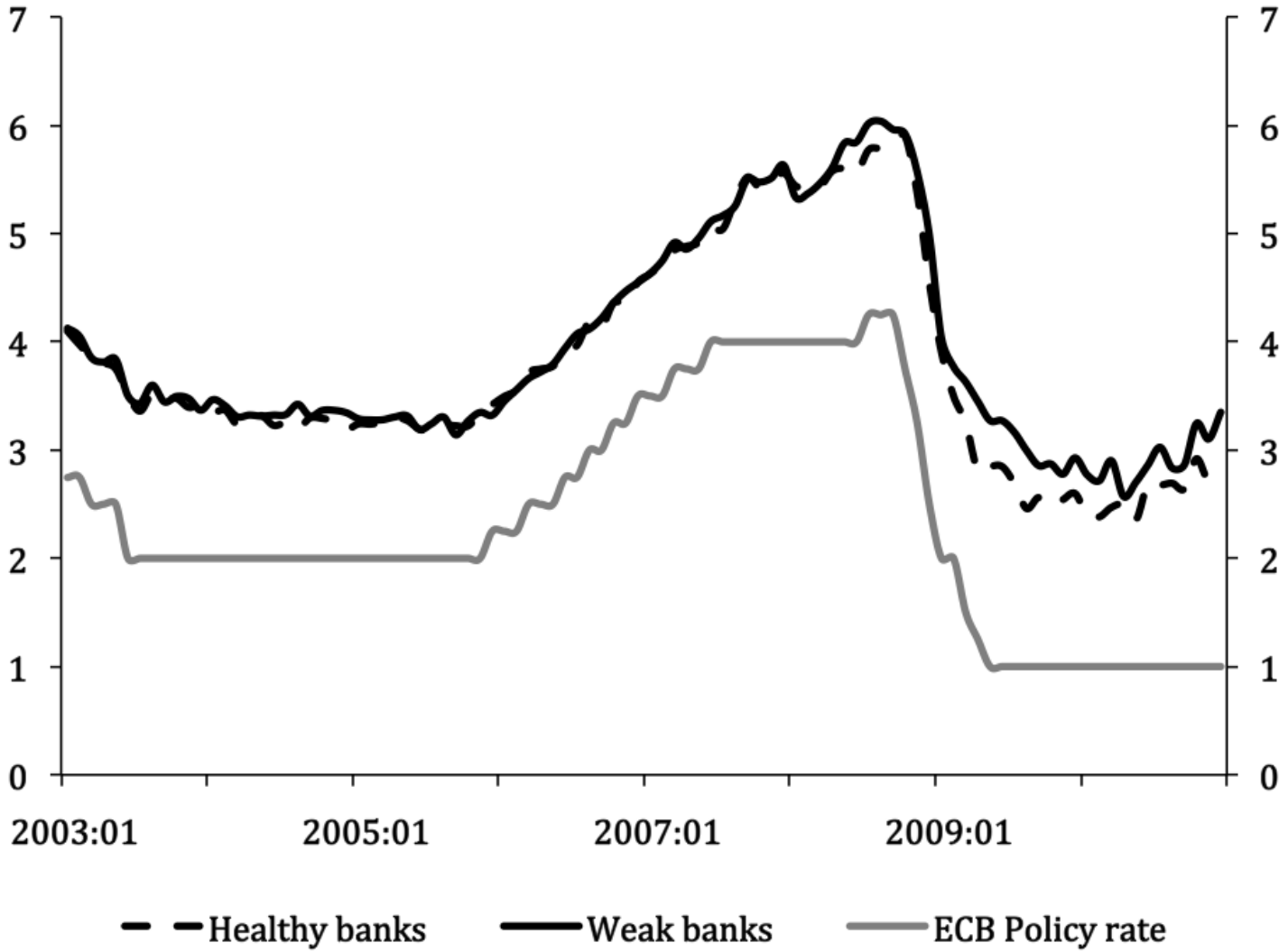
Savings banks and the credit crunch

Acceptance rates of loan applications by non-current clients, by bank type (%)



Not much action in interest rates

Average annual interest rate for new loans to non-financial firms by bank type and the policy rate (%)



The restructuring process of the banking sector

1. Nationalization and reprivatization (2 WBs, 3/2009-7/2010): 0.44% GDP
2. Mergers (26 WBs) and takeovers (5 WBs), from 3/2010: 1.1% GDP by 12/2010
3. Further consolidations and nationalizations (since 2011). Loan from European Financial Stability Facility to finance weak-bank recapitalization (6/2012, 4% GDP)

Also notice the following peculiarities:

- 2009-2010: Run by own managers (exc. 2 weak banks in 1.)
- Institutional Protection System: separate legal entities

Weak bank definition

A bank is clasified as weak if:

- It was nationalized
- It participated in a merger with funding support from the State
- It was insolvent and bought by another bank, with or without State support

Banks that received funds to absorb other banks with solvency problems are considered healthy banks.

Bank characteristics

Variable	Healthy banks		Weak banks	
	Mean	St. Dev.	Mean	St. Dev.
ln(Total Assets)	13.74	2.11	16.40	0.97
Own Funds/Total Assets	8.38	9.02	5.15	1.24
Liquidity/Total Assets	23.72	22.40	11.49	4.50
Return on Assets	1.04	1.73	0.89	0.28
Non-performing Loan Ratio	1.52	6.29	0.70	0.55
Non-performing Loan Ratio (2012)	8.55	12.75	21.99	5.99
Loans to REI/Total Loans to NFF	36.76	22.32	67.87	8.07
Securitized loans/Total Assets	14.86	10.48	18.51	6.25

Data

1. Central Credit Register of the Bank of Spain (CIR):
   - All loans above € 6,000: identity of bank and borrower, collateral, maturity, etc.
   - Firms' credit history: non-performing loans and potentially problematic loans
2. CIR: Loan applications by non-current borrowers
3. Annual balance sheets and income statements of firms from Spanish Mercantile Registers via SABI
4. Firm entry and exit from Central Business Register
5. Bank balance sheets from supervisory Bank of Spain database
6. Bank location database

Sample selection

We adopt very stringent sample selection criteria

- We exclude all firms in REI and related two-digit industries selling over 20% of value-added to REI
- Balanced panel of firms with reliable information in 2006 and 2010.
- Exiting firms are included if they disappear from the official register and do not deposit accounts in 2010
- We exclude firms without bank credit in 2006
- **Final sample:** 169,295 firms
- **Coverage:** 21% firms, 32% value added, 48% private employees

The treatment variable

We use both a discrete and a continuous treatment variable:

- Discrete WB_i: Dummy variable that takes the value 1 if the firm had any loans with weak banks in 2006
- Continuous treatment $WB\ intensity_i$: ratio of loans from weak banks to asset value

$$WBintensity_i = \frac{\text{loans from weak banks}}{\text{total value of loans}} * \frac{\text{total value of loans}}{\text{asset value}}$$

In an extension we also analyze what factors drove the demise of the savings banks.

No anticipation effects

Our treatment is an outcome. Was it anticipated? No

- Securitization/Assets (2006): 18.5% for weak banks, 14,9% for healthy banks
- Data on all securitizations in 2006: Floating-rate, quarterly coupon, ref. to 3-month euribor (303 obs., 24 issuers)
- Raw premium: weak banks paid 7 basis points *less* than healthy banks
- Controls: type (MBS, ABS), risk (AAA, AA+ to BBB-, BB+ to D), collateral and guarantor type, years to maturity, month of issue
- Dummy=1 if weak bank: 2.8 basis points (p-value: 0.55)

Even financial markets failed to recognize the differential build-up of risks

Firm characteristics

There are significant differences in the characteristics of firms in the treatment and control groups. Treated firms are on average:

- Older and larger
- Financially worse: less capitalized, liquid, and profitable, more indebted with banks
- More loan applications to non-current banks, more frequent defaults

These differences lead to different unconditional trends. We rely on random selection conditional on controls in baseline DD, but also consider panel estimations with firm fixed effects

Firm characteristics

Variable (2006)	Control	Treated	t test
No. of Firms	103,441	65,854	
Share Loans Weak Banks	0.00	0.62	
Loans w. WB/Assets	0.00	0.18	
Employment (employees)	19.75	33.39	8.64
Firm Size (million euros)	3.47	7.30	8.07
Firm Age (years)	12.08	13.39	6.48
Own Funds	0.34	0.27	62.98
Liquidity	0.13	0.09	53.37
Return on Assets	0.07	0.05	21.84
Bank Debt	0.32	0.44	92.22
Banking Relationships (no.)	1.67	3.10	160.00
Past Defaults (share)	1.34	2.32	15.11

Empirical strategy

Differences in differences (DD), estimated in differences:

$$\Delta_4 \log\left(1 + n_{ijkt}\right) = \alpha + \beta WB_i + X_i\gamma + d_j\delta + d_k\lambda + u_{ijkt}$$

- Δ_4=4-year difference, n_{ijkt}=employment at firm i in municipality j, industry k, year t=2010
- We allow for differential trends by municipality (3,697), industry (80) and firm characteristics
- Employment level in 2010 set to zero for firms that closed down$\rightarrow \log(1 + n_{ijkt}) \rightarrow$ Surviving *and* closing firms
- β measures Average Treatment effect on the Treated (ATT)

Main identification threats

- **Demand effects** (Mian-Sufi, 2014): Lending in REI / certain areas $\longrightarrow$ Larger drop in household demand and higher density of (non-REI) firms exposed to WB $\longrightarrow$ Job losses from consumption rather than credit
  $\longrightarrow$ Municipality (3,697) and Industry (80) dummies
- **Non-random matching:** laxer loan-approval criteria at WB may cause bias in risk profile and reduce access to credit. And aggregate shocks may differentially affect productivity (Paravisini *et al.*, 2015) $\longrightarrow$ Firm controls:
  - Productivity: age, age^2, size, ROA, share of temp contracts
  - Finance: bank debt, short-term and long-term bank debt, liquidity, own funds, no. past loan applications to non-current banks and whether all accepted, past loan defaults, current loan defaults, credit lines, no. banking relationships and square, share of uncollateralized loans

Baseline: Difference in differences

Dependent variable: $\Delta_4 \log\left(1 + n_{ijkt}\right)$

	No firm controls	Firm controls Productivity	Baseline	Placebo ('02-'06)
WB_i	-0.067***	-0.059***	-0.022***	0.004
	(0.010)	(0.010)	(0.007)	(0.008)
R^2	0.050	0.063	0.074	0.156
No. obs.	169,295	169,295	169,295	126,997

Municipality and industry fixed effects included in all specifications

(No controls: -7.7% difference.)

Alternative specifications

- Selection: Exact matching within municipality, industry, and firm control cells (0-1 dummies)
- Selection: Panel with firm-specific trends (t=2007,...,2010): -3.0 pp

$$\Delta \log (1 + n_{ijkt}) = \alpha_i' + WB_i d_t \beta' + X_i d_t \gamma' + d_j d_t \delta' + d_k d_t \lambda' + d_t \phi + v_{ijkt}$$

- Demand: traded-goods sectors, based on high concentration - highest quartile Herfindahl (Mian-Sufi, 2014)
- Alternative definition of weak banks: 2006 loan exposure to firms in REI within upper quartile
- Surviving firms only

Alternative specifications

Dependent variable: $\Delta_4 \log\left(1 + n_{ijkt}\right)$

	Exact matching	Tradable goods	Loans to REI	Survivors
WB_i	-0.034***	-0.049***	-0.021***	-0.011***
	(0.010)	(0.020)	(0.008)	(0.005)
R^2	0.001	0.109	0.074	0.074
No. obs.	169,295	21,029	169,295	152,209

Municipality and industry fixed effects, and firm controls included

Credit supply shocks?

Local firm-bank effect:

- Bank-firm sample (281,016 observations, 98,754 firms)

$$\Delta_4 \log\left(1 + Credit_{ibt}\right) = \eta_i + \beta WB_b + \gamma FB_{ib} + \varepsilon_{ibt}$$

  $Credit_{ibt}$ = total credit committed by bank b to firm i, t=2010, FB_{it} = firm-bank controls [log(no. of years with the bank), past defaults with the bank]

- Fixed effects leave only firms that work with more than 1 bank, but this specification controls perfectly for credit demand (Khwaja-Mian, 2008)
- Result: $\widehat{\beta}$=0.081 (0.040) $\rightarrow$ Weak banks cut credit more to firms that were clients in 2006

Instrumental variables: Is credit the channel?

- Transmission mechanism ($t = 2010$):

$$\begin{aligned}\Delta_4 \log\left(1+n_{ijkt}\right) &= \alpha''+\beta''\Delta_4 \log\left(1+Credit_{ijkt}\right) \\ &\quad +X_i\gamma''+d_j\delta''+d_k\lambda''+\varepsilon_{ijkt} \\ \Delta_4 \log\left(1+Credit_{ijkt}\right) &= \rho+\mu WB_i+X_i\eta+d_j\sigma+d_k\psi+\omega_{ijkt}\end{aligned}$$

  $Credit_{it}$ = total credit committed by banks. Exclusion restriction: Working with a weak bank affects Δ(Employment) only through Δ(Credit).

- Trade credit: Subsample of firms (8%), with financial institutions (32% of liabilities) and trade credit (35%)

Instrumental variables: Is credit the channel?

Dependent variable: $\Delta_4 \log\left(1 + n_{ijkt}\right)$

Instrumented variable	$\Delta_4$log (1+Credit$_{it}$)	$\Delta_4$log (1+Credit$_{it}$)	$\Delta_4$log (1+Credit$_{it}$)^a
	0.447***	0.301***	-0.849***
	(0.127)	(0.132)	(0.367)
	First stage		
WB_i	-0.048***	-0.061***	-0.039***
	(0.010)	(0.014)	(0.014)
Overall effect	-0.022	-0.018	-0.033
F test / p value	23.1/0.00	17.9/0.00	4.09/0.05
No. obs.	169,295	47,847	12,889

Industry f.e. and firm controls included. ^{a}Col. (3) uses total credit

From local to firm level effects

Repeating the IV analysis for the sample of multibank firms yields interesting insights:

The first-stage coefficient is equal to -6.1pp.

- Smaller than the local bank-estimate of -9.0pp — treated firms were unable to offset credit supply shock by turning to other lenders
- Larger than first stage estimate for entire sample — multibank firms experienced stronger credit supply restrictions

Exogenous variation in weak bank exposure

Firms' exposure to weak banks is an endogenous outcome. To deal with this endogeneity problem we use a regulation based IV design.

- A regulatory change in 12/1988 allowed savings banks to expand beyond region of origin
- We use density of weak-bank branches at municipal level in 12/1988 as an instrument for WB_i.
- Exclusion restriction: local weak-bank density only affects employment through exposure to weak banks
- We allow for differential trends in coastal provinces

Exogenous variation in weak bank exposure

Instrumented variable	$\Delta_4$log (1+Credit$_{it}$)	$\Delta_4$log (1+Credit$_{it}$)^a	WB_i
	0.447***	0.849***	-0.061***
	(0.127)	(0.367)	(0.026)
	First stage		
WB_i	-0.048***	-0.039***	
	(0.010)	(0.019)	
Local weak-bank density$_i$			0.496***
			(0.071)
Overall effect	-0.022	-0.033	-0.030
F test / p value	23.1/0.00	4.09/0.05	13.3/0.00
No. obs.	169,295	12,889	169,295

Financial vulnerability of firms

Economic theory suggests that smaller, less transparent and financially vulnerable firms should be more vulnerable to changes in credit market conditions.

We analyze the impact of five such characteristics:

- Past or current defaults (2002-2006)
- Rejected loan applications
- Share of short-term debt
- Total assets
- Number of banking relations (1 vs multiple)

Treatment heterogeneity: Financial vulnerability

Dependent variable: $\Delta_4 \log(1 + n_{ijkt})$

Rejected applications$_i$	-0.065***	log(Total Assets)$_i$	0.018***
	(0.008)		(0.005)
$WB_i \times$ Rejected applic.$_i$	-0.027**	$WB_i \times$ log(Total Assets)$_i$	0.004
	(0.013)		(0.006)
Defaults$_i$	-0.212***	Single bank$_i$	0.033***
	(0.031)		(0.007)
$WB_i \times$ Defaults$_i$	-0.059**	$WB_i \times$ Single bank$_i$	0.037***
	(0.033)		(0.016)
Short-term debt$_i$	-0.083***	WB_i	-0.035***
	(0.013)		(0.007)
$WB_i \times$ Short-term debt$_i$	-0.016	R^2	0.071
	(0.014)	No. obs.	169,295

Municipality and industry fixed effects, and firm controls included

Treatment heterogeneity: Degree of exposure

- Effect on employment is expected to increase with the degree of exposure to weak banks
- $WB\ Intensity_i$ = Loans from weak banks / Asset Value

Dependent variable: $\Delta_4 \log\left(1 + n_{ijkt}\right)$	
WB Intensity$_i$	-0.104***
	(0.028)
R^2	0.074
No. obs.	169,295

Municipality and industry fixed effects, and firm controls included

- Evaluated at the average intensity of exposure, it gives an effect of 1.9 pp

Probability of exit

Dependent variable: Probability of exit from 2006 to 2010$_i$			
WB_i	0.010***		
	(0.004)		
WB Intensity$_i$		0.070***	0.080***
		(0.015)	(0.016)
WB Intensity$_i$			-0.054***
$\times$ Single bank$_i$			(0.017)
R^2	0.080	0.081	0.078
No. obs.	169,295	169,295	169,295

Municipality and industry fixed effects, and firm controls included

- WB Intensity$_i$: 9th v. 1st decile $\longrightarrow$ 1.7% higher probability (17% of baseline rate)

Job loss estimates

Caveat:

- These are not macro effects (Chodorow-Reich, 2014)
- These are only differential effects

Estimates as a share of observed aggregate job losses in exposed firms:

- Baseline: 23.7% of job losses

- Survivors: 52% of job losses
- Closing firms: 19% of job losses

  $\longrightarrow$ Impact is stronger on continuing firms than on exiting firms

Conclusions

- Aim: measure the impact of credit constraints on employment during the Great Recession in Spain
- Identification: We exploit differences in lender health at the onset of the crisis, as evidenced by savings banks' bailouts
- We find that job losses from expansion to recession at firms exposed to weak banks are significantly larger than at similar non-exposed firms
- This explains around one-fourth of aggregate job losses at exposed firms

Conclusions

- The estimated effects vary considerably with the firm's creditworthiness and the structure of its banking relationships, in particular how many banks it works with
- Credit constraints do not just force firms to purge jobs but also cause some of them to close down
- Given our controls, constrained firms would have received more credit had they not been attached to weak banks and, in this sense, these job losses are inefficient
- The standard approach to restrict attention to multibank firms tends to overstate the effects of credit shocks & it is crucial to compare firms within very narrowly-defined cells