

# When Credit Dries Up: Job Losses in the Great Recession

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# Motivation

- ▶ Do shocks to the banking system have real effects and, if so, do they give rise to employment losses?
- ▶ Both questions have strongly resurfaced in the wake of the economic and financial crisis that started in 2008
- ▶ The renewed interest is motivated by the exceptionally strong and persistent contraction of employment in the countries that suffered a banking crisis, like the US and several peripheral countries in Europe

# Motivation

The Spanish economy offers an ideal setting to explore how shocks to credit supply spill over to the real economy:

- ▶ A large employment fall: 9% over 2008-2010
- ▶ Spanish firms rely heavily on bank credit and the high leverage ratios of many firms, mostly SMEs, made them vulnerable to the reduction in credit supply during the Great Recession
- ▶ Bank credit to non-financial firms fell by almost 40% in real terms from 2007 to 2010

→ We analyze the link between unprecedented drops in bank lending and employment in Spain

# Literature

## Theory

- ▶ Mismatch between payments to workers and cash flow: Wasmer & Weil (2004), Petrosky-Nadeau & Wasmer (2013)
- ▶ Labor as quasi-fixed factor of production ( $\approx$  investment)
- ▶ Financial frictions alter optimal mix of perm-temp jobs (Caggese and Cuñat, 2009)

## Exploit cross-sectional differences in lender health at onset of crisis

- ▶ Greenstone *et al.* (2014): US county-level credit supply shock. Small effect: 5% (attributed)
- ▶ Chodorow-Reich (2014): US loan-level data from syndicated loans, SMEs, large effect (33-50%), no effect for largest
- ▶ Popov & Rocholl (2016), Fernandes & Ferreira (2016), Duygan-Bump *et al.* (2015), Hochfellner *et al.* (2015), Siemer (2014), Acharya *et al.* (2016), Balduzzi *et al.* (2015), Cingano *et al.* (2016), Jiménez *et al.* (2016)

# Our strategy

- ▶ Identification strategy: Exploit large cross-sectional differences in bank health at the onset of the crisis
- ▶ The construction sector collapsed when a housing bubble burst. The main problems were located in savings banks (*cajas de ahorros*). The weakest ones, 33 *weak banks*, were bailed out by the State –mostly after 2010
- ▶ *Weak banks* overinvested in loans to real estate during the boom and they reduced credit more during the recession
- ▶ We compare the change in employment from 2006 to 2010 in Spanish firms with a significant pre-crisis exposure to weak banks in 2006 and those without such exposure

# The key challenges

- ▶ Disentangling credit supply and credit demand shocks:
  - ▶ The crisis may force banks to reduce credit supply, but it may also induce firms to reduce credit demand
  - ▶ The troubles of firms may cause the hardship of banks, inducing reverse causality
- ▶ Selection: Positive matching between weak banks and weak firms
- ▶ Local demand effects

# Our strength

Existing work is based on either incomplete data on bank loans to the corporate sector or information about banking relationships rather than loans

The most extensive database ever assembled to analyze credit supply shocks (we believe):

- ▶ The Credit Register of the Bank of Spain provides (confidential) information about all bank loans to firms in the non-financial sector and loan applications to non-current banks
- ▶ These data are matched to balance sheet data for all banks and nearly 150,000 non-financial firms
- ▶ They allow us to reconstruct the entire banking relations and credit histories of those firms

# Dealing with identification

We exploit quasi-experimental techniques to overcome these identification problems:

- ▶ Credit: We show the existence of a credit supply shock, controlling for credit demand, with bank-firm data
- ▶ Employment:
  - ▶ We analyze non-financial, non-real estate firms to avoid reverse causality
  - ▶ We use an exhaustive set of firm controls, various techniques, and an instrument generating exogenous variation in weak-bank exposure to account for selection



## Preview of results

- ▶ Controlling for selection, weak-bank exposure caused an extra employment fall of around 2.8 pp from 2006 to 2010
- ▶ This corresponds to about 25% of aggregate job losses in firms exposed to weak banks in our sample and to 7% of all job losses in the sample
- ▶ The results are very robust and reveal sizeable differences depending on firms' financial vulnerability and size
- ▶ Temporary jobs bore the brunt of the impact from credit constraints

# Plan of the talk

- ▶ The financial crisis in Spain
- ▶ Data and treatment variable
- ▶ Empirical strategy: credit supply shock, employment effect
- ▶ Empirical results: Credit supply shock
- ▶ Empirical results: Employment effects
  - ▶ Baseline, transmission, robustness
  - ▶ Selection: panel, matching, geographical IV
  - ▶ Heterogeneity: financial vulnerability
  - ▶ Margins of adjustment: temporary jobs, wages, exit
  - ▶ Job loss estimates
- ▶ Conclusions

# The financial crisis in Spain

- ▶ The Spanish cycle
  - ▶ Expansion, 2002-2007: GDP 3.7%; employment 4.2% (p.a.)
  - ▶ Recession, 2007-2010: GDP -3.0%; employment -9.0%
- ▶ Bank credit boom-bust: Real annual flow of new credit to non-financial firms by deposit institutions
  - ▶ 2003-2007: 23%, 2007-2010: -38%
- ▶ Euro membership + Monetary policy (ECB): Sharp drop in real interest rates and easy loans to real estate developers and construction companies (REI): 14.8% GDP 2002 - 43% 2007  
→ Housing bubble: 59% rise in real housing prices over 2002-2007 (-15% over 2008-2010)

# The bank restructuring process

33 bailed-out savings banks in 3 steps (out of 239 in sample):

1. Nationalization and reprivatization (2 WBs, 3/2009-7/2010)
2. Mergers (26 WBs) and takeovers (5 WBs), from 3/2010 (1.1% GDP by 12/2010)
3. Consolidations and nationalizations (since 2011). Loan from European Financial Stability Facility for recapitalization (6/2012, 4% GDP)

So:

- ▶ Weak bank definition: nationalized, merged with State support, or taken over by another bank
- ▶ 2009-2010:
  - ▶ Run by own managers (exc. 2 weak banks in 1.)
  - ▶ Separate legal entities (SIP)

## Differences in lender health

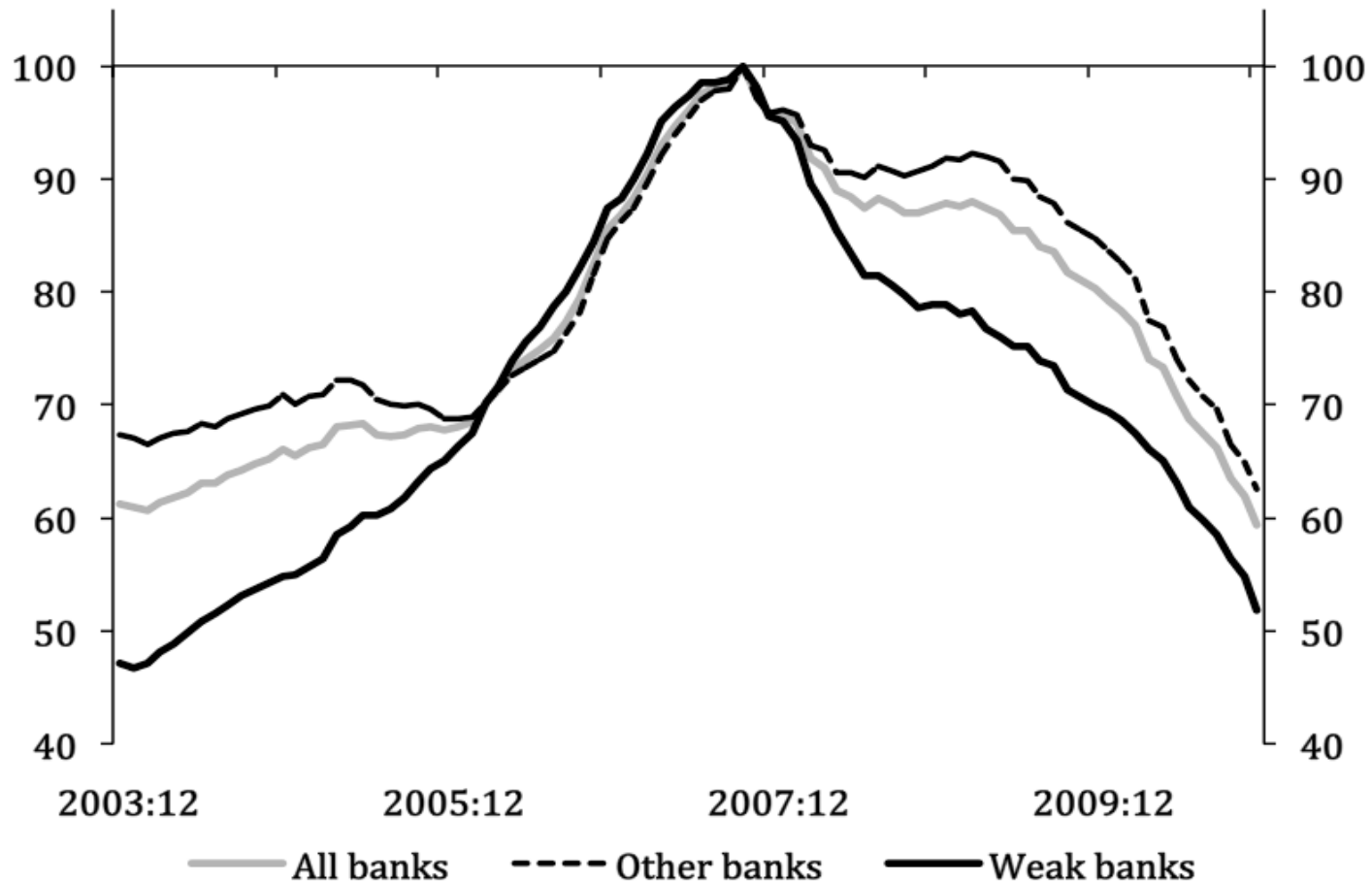
- ▶ Savings banks: same regulation and supervision, different ownership and governance
- ▶ Market shares and exposure to REI (%):

	Credit to Non-Financ. Firms	Loans to REI/ Loans to NFF
Weak banks	33	68
Healthy banks	67	37

- ▶ Differential real credit growth:
  - ▶ Expansion (2002-2007): Weak 40% v. Healthy 12%
  - ▶ Recession (2007-2010): Weak -46% v. Healthy -35%
- ▶ Both at intensive and extensive margins (figures)

# The credit collapse

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



# The credit collapse

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



Table 1. Descriptive statistics of healthy and weak banks (2006)

	Healthy banks		Weak banks		Mean	Normalized
	Mean	St. dev.	Mean	St. dev.	$t$ test	difference
ln(Assets)	13.7	2.1	16.4	1.0	7.1	1.14
Own Funds/Assets	8.4	9.0	5.2	1.2	-2.0	-0.35
Liquidity/Assets	23.7	22.4	11.5	4.5	-3.1	-0.54
Return on Assets	1.0	1.7	0.9	0.3	-0.5	-0.09
Non-Performing Loans	1.5	6.3	0.7	0.6	-0.7	-0.13
Non-Performing Loans (2012)	8.6	12.7	22.0	6.0	3.5	0.95
Loans to REI/Loans to NFF	36.8	22.3	67.9	8.1	7.9	1.31
Securitized Loans/Assets	14.9	10.5	18.5	6.3	1.6	0.30

Notes. There are 206 healthy and 33 weak banks. Non-performing Loans is the ratio of the value of loans. Securitized Loans/Assets is only for banks that securitize. NFF denotes non-financial firms. Except for the ln(Assets), variables are ratios in percentages. The last column shows the  $t$  ratio of the test for the difference of the means and the last column the normalized difference test of Imbens and Wooldridge (2009). See definitions in Appendix 2. Source: Own computations on bank balance sheet data from the Bank of Spain.



# Data: Six different databases

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 (2): Loan applications by non-current borrowers
3. Annual balance sheets and income statements of firms from Spanish Mercantile Registers via SABI
  - ▶ Exclude construction, real estate, and related industries: 149,458 firms
  - ▶ Coverage: 19% firms, 28% value added, 42% private employees
4. Firm entry and exit from Central Business Register
5. Bank balance sheets from supervisory Bank of Spain database
6. Bank location database

# The treatment variable

- ▶ Define:  $WB\ intensity_i = \frac{\text{Loans from weak banks}}{\text{Asset value}}$   
= Weight of weak banks in debt  $\times$  Leverage
- ▶  $WB_i = 1$  if weak bank intensity  $>$  1st quartile (P25) of distribution of firms with nonzero exposure in 2006 (4.8%)
- ▶ Excludes firms with marginal attachment to weak banks from the treatment group
- ▶ Robustness: We also present results for
  - ▶ Other cutoffs: zero (any exposure), median (P50), and third quartile (P75)
  - ▶ Continuous treatment:  $WB\ intensity_i$

# Firm characteristics

- ▶ Full sample:
  - ▶ 98.7% SMEs ( $< 250$  employees)
  - ▶ Employment in sample fell by 8.1% over 2006-2010
  - ▶ 31% had credit from weak banks, Avg.  $WB\ intensity_i = 22.8\%$
- ▶ Treated firms are on average:
  - ▶ Younger, smaller, more temporary workers
  - ▶ Finance: lower capital\*, higher bank debt\*, work with more banks\*, lower liquidity, less profitable, defaulted and applied for loans more often
  - \* = significant in normalized difference test of Imbens and Wooldridge (2009)

$$\blacktriangleright \Delta_X = (\bar{X}_1 - \bar{X}_0) / \sqrt{S_0^2 + S_1^2}$$

versus

$$\blacktriangleright t = (\bar{X}_1 - \bar{X}_0) / \sqrt{S_0^2 / N_0 + S_1^2 / N_1}$$

where for  $\omega = 0, 1$

$$S_\omega^2 = \sum_{i: W_i = \omega} (X_i - \bar{X}_\omega)^2 / (N_\omega - 1)$$

the sample variance of  $X_i$  in the subsample with  $W_i = \omega$ .

Table 2. Descriptive statistics of control and treated firms (2006)

	Control					Treated					Mean	Norm.
	Mean	St. Dev.	P25	P50	P75	Mean	St. Dev.	P25	P50	P75	<i>t</i> test	diff.
Loans with WB/Assets	0.3	0.9	0.0	0.0	0.0	22.8	17.1	9.7	17.3	30.9	427.3	1.31
Share of Loans with WB	8.5	24.1	0.0	0.0	0.0	68.5	30.3	40.9	73.3	100.0	403.9	1.55
Employment (employees)	25.3	365.6	2.0	6.0	13.0	20.3	207.2	2.0	5.0	13.0	-2.7	-0.01
Temporary Employment	20.4	25.4	0.0	11.1	33.3	22.7	26.0	0.0	14.5	36.6	16.0	-0.06
Age (years)	12.6	9.8	6.0	11.0	17.0	11.7	8.7	6.0	10.0	16.0	-17.1	-0.07
Size (million euros)	5.8	118.2	0.3	0.6	1.7	3.6	27.5	0.3	0.6	1.7	-4.0	-0.02
Exporter	13.0	33.7	0.0	0.0	0.0	13.1	33.7	0.0	0.0	0.0	0.3	0.00
Own Funds/Assets	34.4	23.8	14.2	30.3	51.1	24.9	18.5	10.0	20.8	35.8	-74.3	-0.31
Liquidity/Assets	12.4	15.1	1.9	7.0	17.4	8.6	11.8	1.1	4.2	11.2	-47.3	-0.20
Return on Assets	6.7	11.4	1.8	4.9	10.2	5.2	9.0	2.0	4.4	8.0	-23.8	-0.10
Bank Debt	30.7	26.7	6.8	24.8	49.8	48.5	23.5	29.4	47.4	66.2	120.8	0.50
Short-Term Bank Debt (< 1 yr)	48.8	41.5	0.0	46.7	100.0	45.7	37.1	4.3	44.9	80.7	-13.2	-0.05
Long-Term Bank Debt (> 5 yrs)	21.5	35.3	0.0	0.0	37.1	29.5	36.3	0.0	7.4	59.0	39.7	0.16
Non-Collateralized Bank Debt	81.9	33.4	82.7	100.0	100.0	73.7	35.6	47.4	100.0	100.0	-42.3	-0.17
Credit Line (has one)	69.0	46.3	0.0	100.0	100.0	72.2	44.8	0.0	100.0	100.0	12.5	0.05
Banking Relationships (no.)	1.9	1.5	1.0	1.0	2.0	3.0	2.7	1.0	2.0	4.0	103.7	0.37
Current Loan Defaults	0.3	5.6	0.0	0.0	0.0	0.6	7.4	0.0	0.0	0.0	6.8	0.03
Past Loan Defaults	1.4	11.9	0.0	0.0	0.0	2.4	15.2	0.0	0.0	0.0	12.7	0.05
Past Loan Applications	54.2	49.8	0.0	100.00	100.00	68.9	46.3	0.0	100.0	100.0	52.7	0.22
All Loan Applications Accepted	22.0	41.4	0.0	0.0	0.0	26.2	44.0	0.0	0.0	100.0	17.6	0.07

Notes. Observations: 149,458 firms; 106,128 control and 43,330 treated firms. WB denotes weak banks. Variables are ratios in percentages unless otherwise indicated. The twelfth column shows the *t* ratio on the test for the difference of the means and the last column the normalized difference test of Imbens and Wooldridge (2009). See definitions in Appendix 2.

## Empirical strategy: 1. Credit supply shock

**Differences in differences (DD) credit growth rate for firm-bank pairs:**

$$\Delta_{\tau} \log(1 + Credit_{ib}) = \theta_i + \pi WB_b + Z'_{ib}\kappa + S'_b\lambda + \epsilon_{ib}$$

- ▶  $\Delta_{\tau}$  =  $\tau$ -year difference (2006 to 2010),  $Credit_{ib}$  = credit committed by bank  $b$  to firm  $i$  (drawn and undrawn),  $\theta_i$  = firm fixed effect,  $WB_b = 1$  if bank  $b$  is a weak bank,  $Z_{ib}$  = firm-bank controls (length of relationship, past defaults),  $S_b$  = bank controls. Note that  $\log(1 + Credit_{ib})$  keeps zeros
- ▶ Khwaja and Mian (2008):  $\theta_i$  absorb any differences in firm characteristics  $\rightarrow$  control perfectly for credit demand
- ▶ For firms working with both types of banks,  $\pi$  tests whether *the same firm* has a larger reduction in lending from weak banks, controlling for differences in  $Z_{ib}$  and  $S_b$

## Empirical strategy: 1. Credit supply shock

### DD credit growth rate for (all) firms:

$$\Delta_{\tau} \log (1 + Credit_{ij}) = \rho + \mu WB_i + X_i' \eta + \delta_j + v_{ij}$$

- ▶  $WB_i$  = treatment dummy,  $\delta_j$  = vector of industry (78)  $\times$  municipality (2,749) dummies that control for local credit demand conditions. Minimize bias through  $X_i$  in 2006 (17):
- ▶ **Performance related:** Age, Age<sup>2</sup>, Size (assets), Exporter, Temporary employment rate
- ▶ **Financial:** Own funds, Liquidity, Return on assets, Bank debt share, Short-term bank debt (<1 year), Long-term bank debt (>5 years), Non-collateralized bank debt, Credit line, No. banking relationships, Current loan defaults, Past loan defaults (2002-2005), Past loan applications, and All loan applications accepted

## Empirical strategy: 2. Employment effect

### DD employment growth rate:

$$\Delta_{\tau} \log(1 + n_{ij}) = \alpha + \beta WB_i + X_i' \gamma + \delta_j + u_{ij}$$

- ▶  $n_{ij}$  = employment in firm  $i$  in industry  $\times$  municipality cell  $j$ , typically from 2006 to 2010  $\rightarrow$  Trends in all control variables
- ▶  $n_{ij}$  set to zero for firms in the sample in 2006 but not in 2010 *because they closed down*  $\rightarrow \log(1 + n_{ijkt}) \rightarrow$  Surviving *and* closing firms
- ▶  $\beta$  measures Average Treatment effect on the Treated (ATT)



## Credit supply shock: firm-bank

Dependent variable:  $\Delta_4 \log(1 + Credit_{ib})$

	Multi-bank firms	Fixed effects	Credit lines	Positive credit	REI expos.
$WB_b$	-0.256*** (0.094)	-0.255*** (0.008)		-0.079** (0.034)	-0.180* (0.096)
<i>Credit line</i>			0.074*** (0.015)		
<i>Credit line</i> $\times WB_b$			-0.106*** (0.039)		
$R^2$	0.059	0.407	0.452	0.394	0.406
No. firms	72,287	72,287	72,286	42,630	72,287
No. obs.	236,691	236,691	236,689	126,863	236,691

## Credit supply shock: firm-bank

- ▶ Multi-bank  $\approx$  Fixed effects: unobservables not very important
- ▶ Hausman test fails to reject the null hypothesis of orthogonality between the firm fixed effects and  $WB_b$  ( $p$ -value = 0.372)  $\rightarrow WB_b$  captures changes in credit supply
- ▶ WBs reduced credit to firms with credit lines by 10.6 pp relative to other banks  $\rightarrow$  suggests an effect on working capital rather than investment
- ▶ Reductions in lending to continuing borrowers accounts for small share of reduction in lending by WBs
- ▶ Exposure to REI: share of bank's loans to firms in the REI in 2006 in the upper quartile of the distribution: 10 pp lower effect than WB dummy

## Credit supply shock: firm level

Dependent variable:  $\Delta_4 \log(1 + Credit_{ij})$

	All firms	Multi- bank	Real estate
$WB_i$	-0.053*** (0.015)	-0.031*** (0.011)	-0.039*** (0.017)
$R^2$	0.215	0.246	0.215
No. obs.	149,458	74,045	149,458

Firm controls, industry  $\times$  municipality fixed effects, and firm controls

## Credit supply shock: firm level

- ▶ Effect at the firm level is about one-fifth of the size of the effect at the firm-bank level: Treated firms managed to offset a substantial part of the reduction in credit but not all ( $\neq$  Jiménez *et al.*, 2014, for Spain in the expansion)
- ▶ A pre-crisis banking relationship with more than one bank provided some insurance against the shocks that hit WBs during the crisis ( $\neq$  Gobbi and Sette, 2014, for Italy during the Great Recession)
- ▶ Magnitude: attachment to weak banks explains about 34% of the differential fall in credit for attached firms

## Employment effects: baseline

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

	No firm controls	Significantly diff. controls	Baseline	Main bank f.e.	Placebo '02-'06
$WB_i$	-0.076*** (0.013)	-0.035*** (0.006)	-0.028*** (0.006)	-0.028*** (0.006)	0.006 (0.007)
$R^2$	0.046	0.163	0.155	0.179	0.203
No. obs.	149,458	149,458	149,458	149,458	112,933

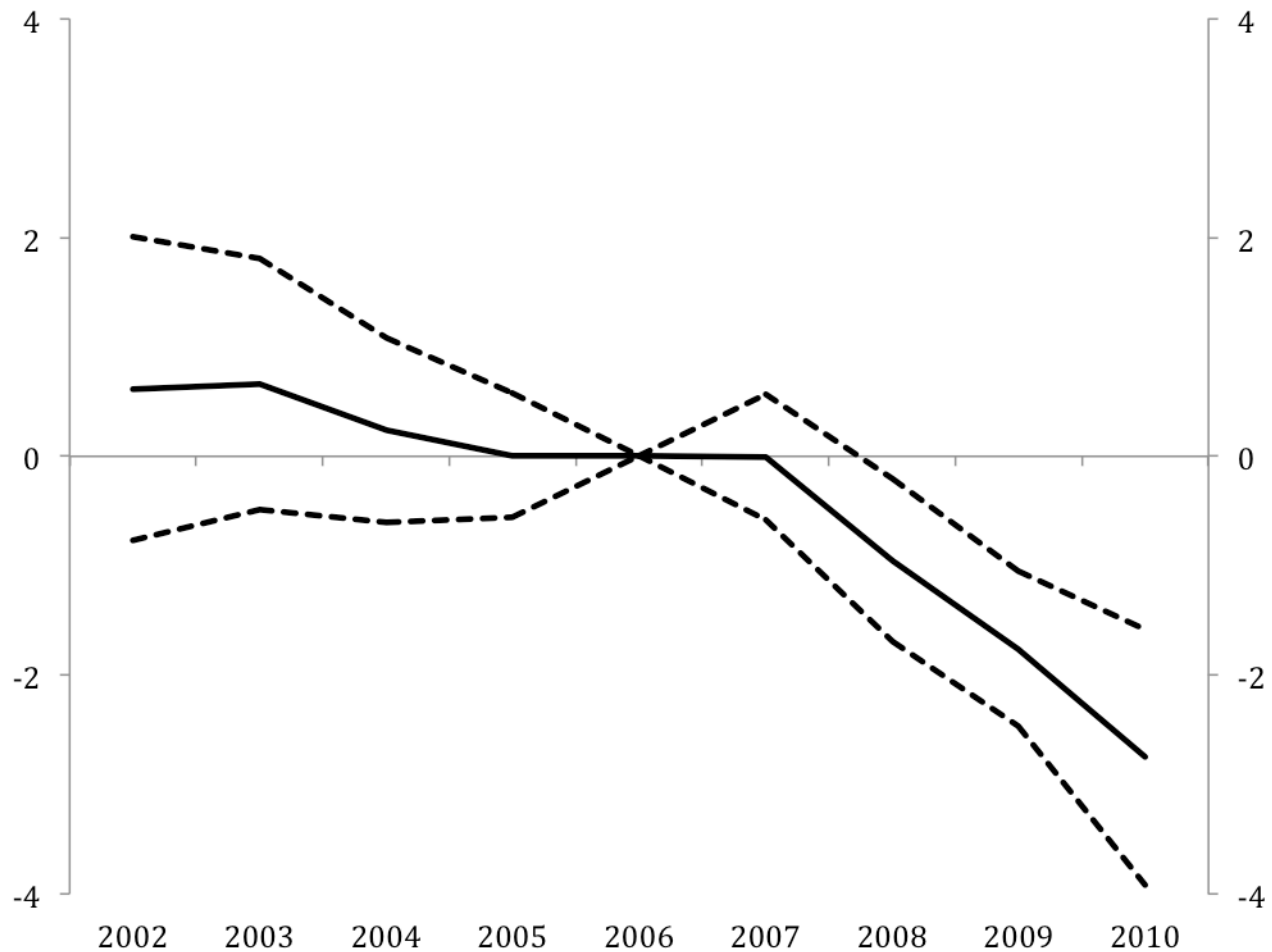
Industry  $\times$  municipality fixed effects included

## Employment effects: baseline

- ▶ Large change in effect due to including significantly different control variables across treated and control firms, not from including remaining controls
- ▶ Controlling for main bank fixed effects does not alter the results → *WB* indicator captures the relevant dimensions that explain reduced access to credit for treated firms
- ▶ Placebo test: 2002 as the pre-crisis year and 2006 as the post-crisis year → coefficient not significantly different from zero
- ▶ Year by year effects: start being significant in 2008 (figure)

# Employment effects: baseline

Impact of weak-bank attachment on employment  
with 95% confidence bands (%)



# Employment effects: transmission

## IV model for employment growth rate:

$$\begin{aligned}\Delta_{\tau} \log (1 + n_{ij}) &= \sigma + \phi \Delta_{\tau} \log (1 + Credit_{ij}) + X_i' \zeta + \delta_j + \varepsilon_{ij} \\ \Delta_{\tau} \log (1 + Credit_{ij}) &= \rho + \mu WB_i + X_i' \eta + \delta_j + v_{ij}\end{aligned}$$

- ▶  $WB_i$  is an instrument for access to credit, first stage coincides with the previous firm-level credit equation,  $\mu\phi$  is equivalent to  $\beta$  in baseline equation
- ▶ Exclusion restriction: working with a weak bank alters employment growth only through credit
- ▶ Decomposition: Credit-volume effect of  $WB_i \times$  Effect of predicted credit volume on employment



## Employment effects: transmission

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

Instrumented variable	All firms	Multi-bank firms
	$\Delta_4 \log(1 + \text{Credit}_{ij})$	
	0.519*** (0.179)	0.797*** (0.294)
	First stage	
$WB_i$	-0.053*** (0.015)	-0.031*** (0.011)
Overall effect	-0.028	-0.025
$F$ test / $p$ value	13.1/0.00	7.65/0.00
No. obs.	149,458	74,045

Firm controls and industry  $\times$  municipality fixed effects included

## Employment effects: transmission

- ▶ Large elasticity of employment with respect to credit (0.52) and even larger for multi-bank firms (0.80)
- ▶ Slightly lower overall employment impact on multi-bank firms (n.s.)
- ▶ Significantly larger than in Cingano *et al.* (2016) for Italy in the Great Recession

## Employment effects: robustness (1)

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

	WB Intensity*	Median	Third quartile
$WB_i$	-0.092*** (0.013)	-0.030*** (0.008)	-0.033*** (0.008)
$R^2$	0.177	0.177	0.177
No. obs.	149,458	149,458	149,458

Firm controls and industry  $\times$  municipality fixed effects included

(\*) Average impact: -2.1 pp

## Employment effects: robustness (2)

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

	Survivors	Alternat. measure*	Tradable goods	Loans to REI
$WB_i$	-0.014*** (0.004)	-0.034*** (0.004)	-0.058*** (0.023)	-0.030*** (0.008)
$R^2$	0.181	0.183	0.200	0.177
No. obs.	133,122	149,458	16,199	149,458

Firm controls and industry  $\times$  municipality fixed effects included

$$(*) \Delta n_{ij} = (n_{ijt} - n_{ijt-1}) / (0.5(n_{ijt} + n_{ijt-1}))$$

## Employment effects: robustness

- ▶ Continuous treatment: -2.1 pp. Why smaller? Increase with exposure: -3 pp with cutoff at median, -3.3 pp at P75
- ▶ Intensive margin: for surviving firms the effect halves → effect was larger on firms closing down
- ▶  $\Delta n_{ij} = (n_{ijt} - n_{ijt-1}) / (0.5(n_{ijt} + n_{ijt-1}))$  (Davis *et al.*, 1996): similar effect
- ▶ Mian and Sufi (2014): local demand effects should only affect output in non-tradable goods, whereas credit supply shocks should affect traded good sectors as well → restrict sample traded sectors, using concentration index and effect remains
- ▶ Alternative treatment: bank exposure to the REI (P25)
- ▶ Other checks regarding the timing

# Selection

- ▶ Lower bound: Oster (2015). If  $R^2$  increases when controls are included but coefficient does not vary much  $\rightarrow$  inclusion of unobservables would not alter it much either. With heuristic assumption that  $R_{\max} = 1.3\tilde{R}$ , where  $\tilde{R}$  is the fully-controlled  $R^2$  and  $R_{\max}$  is the maximum  $R^2$  that would be obtained if all potential determinants were included. Estimate on WB = -1.1 pp (lower bound)
- ▶ Panel with firm fixed effects: Same effect by 2010 as baseline

## Selection: panel

Dependent variable:  $\Delta_t \log(1 + n_{ij})$

$WB_i \times 2008$	-0.012 <sup>***</sup> (0.004)
$WB_i \times 2009$	-0.020 <sup>***</sup> (0.004)
$WB_i \times 2010$	-0.027 <sup>***</sup> (0.006)
$R^2$	0.789
No. obs.	653,189

Firm fixed effects, firm controls, firm and industry  $\times$  municipality  $\times$  year  
fixed effects

Note: effects are vis-à-vis 2007

## Selection: matching

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

	Propensity score	Exact	Propensity score	Exact
$WB_i$	-0.032*** (0.009)	-0.026*** (0.006)		
$WB_i$ intensity			-0.065*** (0.024)	-0.052*** (0.021)
Overall effect	—	—	-0.015	-0.012
$R^2$	0.228	0.179	0.228	0.245
No. obs.	43,587	133,816	16,199	133,816

Firm controls and industry  $\times$  municipality fixed effects included



## Selection: matching

- ▶ Propensity score: (1) probit model for the probability that a firm borrows from a WB, and (2) estimate baseline model using weights from the sample balanced on observables used for the p-score
- ▶ Exact matching: treated and non-treated firms within cells defined by: industry  $\times$  municipality and firm controls. Coarsened exact matching method (Iacus *et al.*, 2011): variables entered as 0-1 dummy variables, treatment effect is estimated using WLS
- ▶ Post-matching balance tables for both methods show no trace of significant differences in control variables across treated and control firms according to normalized difference test
- ▶ Propensity score matching delivers larger effects and, as before, continuous measure implies lower effects

## Selection: exogenous exposure

- ▶ Until 1988 savings banks could only open 12 branches outside their region of origin, at the end of December 1988 restrictions were lifted
- ▶ IV for  $WB_i$  in 2006: WB density by municipality, i.e. share of bank branches in December 1988 belonging to WBs (traditional strong market position)
- ▶ Exclusion restriction: local WB density only affects a firm's employment through its attachment to WBs
- ▶ Indirect evidence: firms in municipalities with local WB density above the median very similar to firms below the median in all respects, balance tables show no significant difference
- ▶ Problem: estimates potentially include local general equilibrium effects from having WBs → untestable

## Selection: exogenous exposure

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

Instrumented variable	$WB_i$	$WB_i$ <i>intensity</i>
	-0.076*** (0.036)	-0.320*** (0.157)
First stage		
<i>Weak bank density</i>	0.445*** (0.084)	0.105*** (0.025)
Overall effect	-0.076	-0.073
<i>F</i> test / <i>p</i> value	17.8/0.00	28.3/0.00
No. obs.	149,458	149,458

Firm controls and industry and coast fixed effects included

## Financial vulnerability (DDD)

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

Rejected applications <sub><i>i</i></sub>	-0.066 <sup>***</sup> (0.008)	log(Total Assets) <sub><i>i</i></sub>	0.009 <sup>*</sup> (0.003)
Rejected applic. <sub><i>i</i></sub> × <i>WB<sub>i</sub></i>	-0.029 <sup>**</sup> (0.012)	log(Total Assets) <sub><i>i</i></sub> × <i>WB<sub>i</sub></i>	0.003 (0.005)
Defaults <sub><i>i</i></sub>	-0.209 <sup>***</sup> (0.029)	Single bank <sub><i>i</i></sub>	0.012 <sup>**</sup> (0.007)
Defaults <sub><i>i</i></sub> × <i>WB<sub>i</sub></i>	-0.041 <sup>**</sup> (0.020)	Single bank <sub><i>i</i></sub> × <i>WB<sub>i</sub></i>	0.019 (0.015)
Short-term debt <sub><i>i</i></sub>	-0.089 <sup>***</sup> (0.013)	<i>WB<sub>i</sub></i>	-0.019 <sup>***</sup> (0.007)
Short-term debt <sub><i>i</i></sub> × <i>WB<sub>i</sub></i>	-0.036 <sup>***</sup> (0.017)	<i>R</i> <sup>2</sup>	0.176
		No. obs.	149,458

Firm controls and industry × municipality fixed effects, and levels and interactions of *WB<sub>i</sub>* with own funds, liquidity, age, exporter, temporary employment, and broad industry

## Financial vulnerability (DDD)

- ▶ Large effects on employment of bad credit history and short-term debt
- ▶ No effect of size: results in literature may be due to lack of control for creditworthiness
- ▶ No effect of single bank (consistent with our previous result)

## Margins of adjustment in surviving firms

Dependent variable	$\Delta_4 (n_{temp,ij}/n_{ij})$	$\Delta_4 \log (Wage\ bill_{ij})$
$WB_i$	-0.005 <sup>***</sup> (0.002)	-0.016 <sup>***</sup> (0.006)
$R^2$	0.174	0.205
No. obs.	122,725	87,451

Firm controls and industry  $\times$  municipality fixed effects included

# Margins of adjustment in surviving firms

## Temporary employment

- ▶ Type of contract observed for 91% of surviving firms: temp employment share fell by -0.5 pp due to WB attachment
- ▶ WB attachment caused 1.4 pp drop in total employment, initial temp share = 21% → drop in temporary employment = 3.7 pp → 56% of employment adjustment in treated firms

## Wage bill

- ▶ WB attachment caused -1.6 pp ( $v$  non-attached firms), employment effect = -1.4 pp → average wage fell by 0.2 pp
- ▶ It could be driven by composition effects (worker characteristics), but it suggests that wage adjustments did not play a meaningful role to mitigate credit supply shock

## Probability of exit

Dependent variable: Probability of exit from 2006 to 2010<sub>*i*</sub>

$WB_i$	0.011 <sup>***</sup>	
	(0.004)	
$WB \text{ Intensity}_i$		0.059 <sup>***</sup>
		(0.014)
$R^2$	0.173	0.173
No. obs.	150,442	150,442

Firm controls and industry  $\times$  municipality fixed effects included

- ▶  $WB$ : 1.1 pp  $\approx$  10.8% increase w.r.t. baseline exit (10.2%)
- ▶  $WB \text{ Intensity}_i$ : 9th v. 1st decile  $\rightarrow$  1.5% higher probability  $\approx$  14.5% w.r.t baseline exit rate



## Job loss estimates

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

Aggregate job losses in exposed firms due to WB attachment:

- ▶ Baseline: 24.4% of job losses at exposed firms  
→ 7% of overall job losses
- ▶ With separate estimates: Survivors: 48%; closing firms: 52% of job losses

# 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 size, creditworthiness and the structure of its banking relationships
- ▶ Brunt of the adjustment was borne by temporary workers, with little adjustment in wages
- ▶ 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, while some part of job losses suffered by firms attached to weak banks was probably efficient, the estimated employment effects of the credit constraints we identify, once selection has been taken into account, were inefficient.