BANCO DE ESPAÑA
Eurosistema

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

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Motivation

- **The Great Recession raised concerns about the economic implications of the current lack of credit.**

  "Policy makers want to support [credit] markets because the decline in lending is seen as a primary factor in the slow recovery" (IMF, Global Financial Stability Report, 2013)."

- **These concerns led to massive injections of capital in banks with**

  solvency problems (over €600 Bn in Europe).

- **However, recent evidence on the real effects of credit supply shocks and the economic benefits of bailouts is scarce. Why?**

  -It's difficult to find good datasets on bank credit, and

  -Also because there are challenging identification issues.

This paper

- **This paper contributes to the literature that explore the real effects of credit supply shocks.**
- **In particular, we study the impact of the fall in bank lending during the Great Recession on firm-level employment in Spain.**
  - We have access to a unique dataset with confidential information about all bank loans to non-financial firms above 6,000€ and loan applications to non-current banks.
  - These data are linked to firm and bank balance sheet data.
  - The data allow us to reconstruct the entire banking relations and credit histories of over 150,000 non-financial firms.
- **To the best of our knowledge, it is the most extensive matched firm-loan-bank data set ever assembled for the analysis of credit supply shocks.**

The Spanish experience during the Great Recession (GR)

- **The Spanish economy offers an ideal setting for exploring how shocks to credit supply affect to the real economy:**

  - Spanish firms rely heavily on bank credit.

    Loans from credit institutions to non-financial corporations represents the 86% of GDP vs 62% in EU (2006).

  - Spanish firms, mostly SMEs, are highly leveraged which made them vulnerable to the reduction in credit supply during the GR.

  - This credit supply shock was originated by a boom-bust cycle in housing prices with catastrophic effects on bank solvency.

    Interesting parallels with other countries, like Ireland and the US, that also suffered a boom-bust cycle in the housing market and an exceptional rise in unemployment.

The Basic Challenges

- **How to disentangle credit supply and credit demand shocks?**
  - A financial crisis may force banks to reduce credit supply, but it may also induce firms to reduce credit demand.
  - The economic troubles of firms may reinforce or even cause the hardship of banks, inducing problems of reversed causality.
- **The second main challenge is to control for selection effects, given that, on average, healthy banks use to work with better firms than weal banks.**

Our Approach

- **We exploit the pronounced cross-sectional differences in lender health at the onset of the crisis.**
  - We consider two types of lenders: weak banks vs healthy banks.

    Definition: a bank is considered weak if it was bailed out by the State (mostly after 2010).

    All but one of them were cajas de ahorros.
  - We exploit that *weak banks* reduced credit more than the other banks *before* their intervention.
  - Given that during period of crisis firms cannot easily switch to new funders, the reduction of loan supply from weak banks will transmit to their borrowers
  - Thus, we compare the change in employment from 2006 to 2010 at two sets of firms with a pre-crisis exposure to either weak or healthy banks.
- **We exploit the richness of our database to face the identification problems commented.**

Our Approach

- **We will start showing that weak banks cut more credit supply than non-weak banks**
  - First, we will work at firm-bank level where we can control for demand
  - Then, we will work at the level of the firm to show that companies were unable to completely offset this reduction of credit by substituting loans with the help of other banks.
- **Furthermore, we will analyze how this shock has a impact on firms' employment**
  - We will propose a diff-in-diff exercise to show that firms that worked more intensively with a weak bank at the beginning of the crisis reduced their employment more than similar firms that didn't.
    - *We will start with a reduced form*
    - *Then, we will show that results are driven by the credit channel previously discovered*
    - *Finally, we will test the robustness of the results changing:*
      - The definition of weak banks: using an ex-ante measure
      - The treatment variable
      - Using matching tecniques to be sure that firms in the control group are similar to firms in the treated group

Quasi-Experimental Techniques

- **The most recent literature exploits quasi-experimental techniques.**
  - Large external shocks to the banking sector.

    Chava and Purnanandam (2011); Benmelech et al. (2012); Ongena et al. (2013).

  - Cross-sectional differences in firms' financial vulnerability at the start of the Great Recession.

    Almeida et al. (2011), Benmelech et al. (2011), Boeri et al. (2013) and Garicano and Steinwender (2013).

  - **Cross-sectional differences in lender health at the onset of the crisis.**

    Greenstone et al (2014), Chodorow-Reich (2012).

- **All find sizeable effects on real variables, but none of them is able to reconstruct the complete banking relations of firms nor do they have such high-quality controls.**

Identification issues

- **Disentangle changes in credit supply from concurrent changes in credit demand.**
  - At the firm-bank level, we control for credit demand using the procedure of Khwaja and Mian (2008).
  - At the firm level, we use a large set of firm covariates and even firm fixed effects

- **Selection effects (since we find significant differences between firms in the treatment and control groups).**
  - We include controls for trends in large sets of municipality, industry and firm control variables.
    - *The potential endogeneity of banking relationship is additionally addressed in an IV model and with matching techniques*

Underlying assumptions

- **i.e. necessary conditions for the existence of real effects and their correct identification:**

  - A1. Weak banks reduce loan supply more than other banks during the crisis.

  - A2. There are financial market frictions: firms borrowing from weak banks at the beginning of the crisis cannot easily switch to other healthier banks.

  - A3. Firms must have been unable to foresee the solvency problems of weak banks when they formed their banking relationships.

  →**We will show that all conditions hold.**

Summary of Results

- **Our most conservative estimates show that:**

  - Controlling for selection, attachment to weak banks caused an extra employment reduction of **2.8 percentage points** between 2006 and 2010.

    This corresponds to 24% of job losses.

  - Credit constrains affect both intensive and extensive margins.

  - The results are very robust: various estimation techniques (diff in diffs, instrumental variables, exact and propensity score matching) and many robustness checks.

  - We find sizeable differences across industries and firms with different credit histories.

Plan of the talk

1. Theoretical Background
2. The financial crisis in Spain
3. Data
4. Empirical strategy
5. Robustness checks
6. Conclusions

Theoretical Background
Financial Accelerator Mechanisms

- **Shocks in credit markets may amplify, propagate or even initiate shocks to the real economy.**
  - Bernanke and Gertler (1989, 1995).
  - Bernanke et al. (1996).
  - Gertler and Kiyotaki (2010)

Theoretical Background
Credit Frictions

- **A causal relationship between the differences in lender health and differential employment growth at the firm level requires the existence of:**

  - **Credit frictions:** Firms subject to credit restrictions from their banks must not be able to (readily) switch to other banks or alternative sources of funding (Gobbi and Settle, 2014)

  - **Asymmetric information:** Most explanations for credit friction rely on the assumption of asymmetric information between borrowers and lenders (Sharpe, 1990)

Theoretical Background
Relationship Banking

- **This literature explains analyzes the advantages of stable banking relationships**
  - Stable relationships help to reduce the agency cost of lending, as banks acquire soft information on their clients (Sharpe, 1990).
  - The superior information may provide better access to credit at the same bank when capital is scarce (Bolton et al., 2013).
  - While a switch to a new bank may be costly due to a lemon‘s problem, especially in recessions (Gobbi and Sette, 2014).
  - Ambiguous predictions for the optimal number of banking relationships.

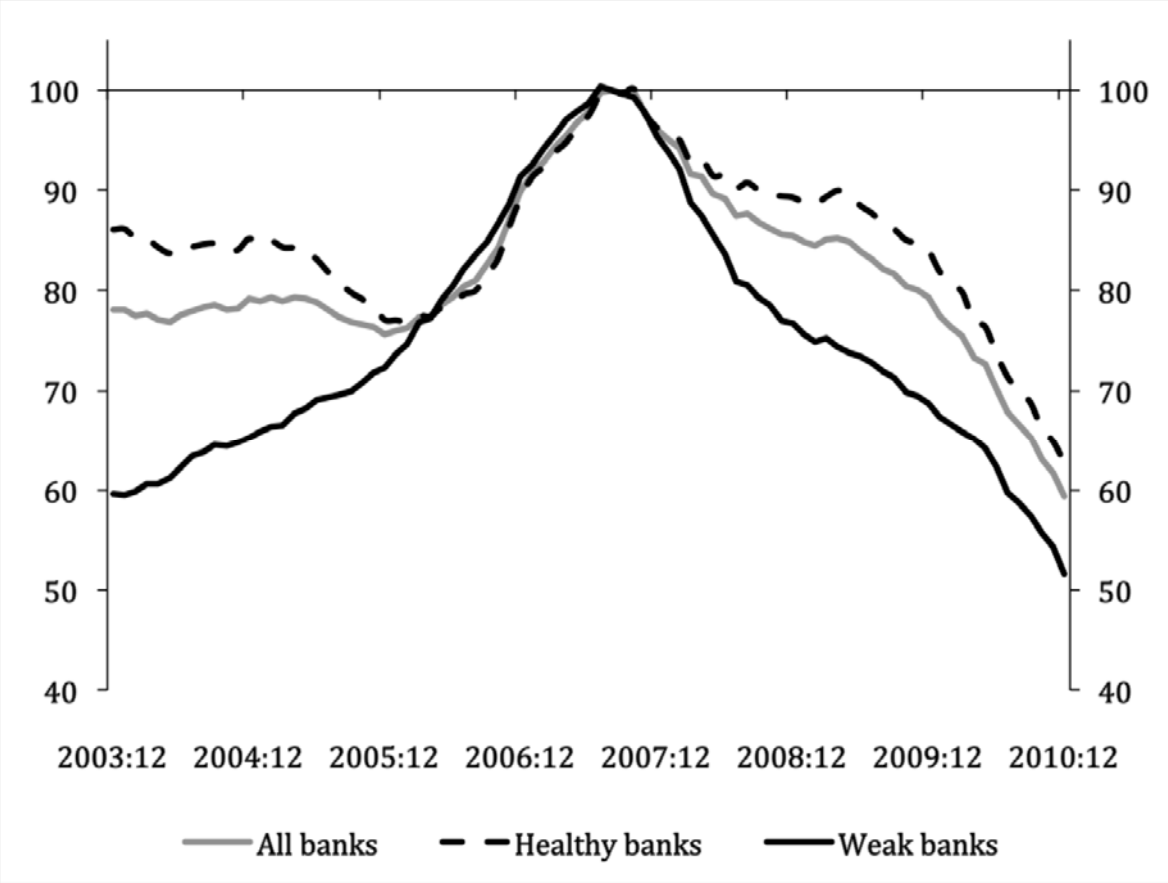
The Spanish experience

- **Spanish economy experienced a severe credit crunch during the GR.**

- **GDP and Employment**
  - Expansion, 1996-2007: GDP 3.7%; employment 4.1%.
  - Recession, 2008-2010 : GDP -1.1%; employment -3.2%.
- **A boom-bust cycle in housing priced by cheap credit.**
- **Heterogeneous exposure to real estate across banks:**
  - *Much larger share of loans to REI in weak banks (in 2006, 68% of loans to non financial firms vs 37%).*
- **Different evolution of credit flows at the two sets of banks**
  - *New credit grew more at weak banks during the boom (69% vs 12% in 2002-2007).*
  - *The fall in the slump was more pronounced in weak banks too (46% vs 35%).*
  - *This affects both intensive and extensive margins.*

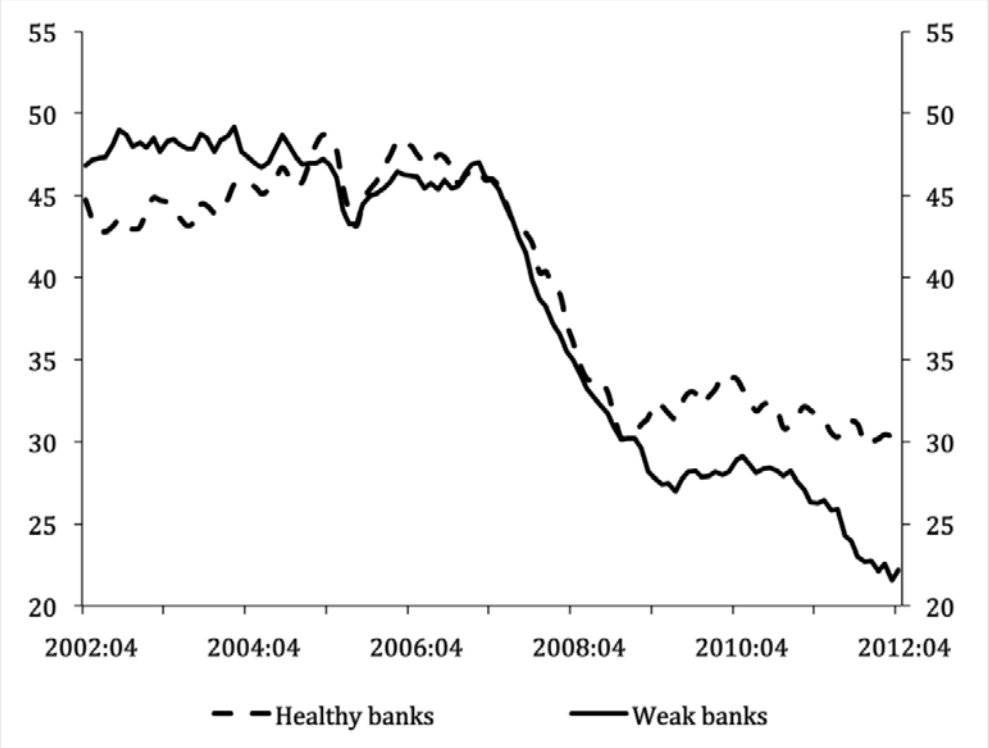
The financial crisis in Spain:
The credit collapse. Testing for Hypotehis A1

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



The financial crisis in Spain:
The credit collapse. Testing for Hypotehesis A2

Acceptance rates of loan applications by non-current clients, by bank type (%)
[Firms applying to at least one bank of each type]



Anticipation Effects
Testing for Hypothesis A3

- **Could firms anticipate differences in bank insolvency risk?**

  -We look at risk premia on securitizations by Spanish banks in 2006.

  -We want to test whether risk premia was set by the market without taking into account the type of bank (weak ore healthy)

  -Risk Premium = F[*type* of securitization (mortgage backed security (MBS), asset backed securities (ABS)), *risk category* (AAA, AA+ to BBB-,BB+ to D), *collateral type*, *guarantor type*, *years to maturity*, and *month of issue, Weak Bank Dummy)*.

  - WB Dummy=1 for bailed-out banks (p-value: 0.55).

- **We cannot reject the hypothesis that financial markets failed to recognize differential risk at weak banks, as late as 2006!**

- **We take this as evidence for claiming that private firms could not possibly have predicted them either.**

Data

- **Firms' loan information from Central Credit Register of the Bank of Spain:**
  - All loans above €6,000: identity of bank, collateral, maturity, etc.
  - Firms' credit history: non-performing loans and potentially problematic loans.

- **Firms' loan applications at non-current banks.**

- **Firms' annual balance sheets and income statements from Spanish Mercantile Registers.**

- **Firm entry and exit from Central Business Register.**

- **Banks' balance sheets and income statements from regulatory and supervisory Bank of Spain database and branches location from the Bank of Spain Branches Registry.**

Sample

- **We exclude financial firms**
- **To avoid the problem of reseverse causality:**
  - We exclude firms in the REI
  - We also exclude those firms that sold more than 20% of their value added to the REI in 2000
- **We exclude firms with no loans in 2006, given that we are interested in shocks to bank credit**
- **Our final sample represented in 2006**
  - 19% of firms
  - 28% of value added
  - 42% of private sector employees
- **98% of firms are SMEs according to the European Comission definition**

The Treatment Variable

- **Aim**

  - We want to measure the impact of credit constraints on employment during the GR.

- **How?**

  - In order to do that, we compare the evolution of employment in 2010 (**post**) vs. 2006 (**pre-crisis**) between firms working with weak banks vs. firms working with healthy banks.

- **Treatment**

  - WB_i: Dummy variable that takes value 1 if the firm had a significant attachment with a weak bank in 2006 (the ratio of weak-bank loans/Total assets is above the first quartile of the sample distribution of firms with non-zero exposure)

    -We consider alternative specifications for the threshold: >0, median, third quartile

    -We also consider the continuous version

The Treatment Variable
Selection Bias

- **Are firms comparable in the treatment and control groups?**

No, treated firms are on average:

- Younger and smaller .

- Financially worse: less capitalized, liquid, and profitable, more indebted with banks.

-More defaults, more loan applications to new banks, more defaults.

- Their banks: smaller, less capitalized, liquid, higher share of loans in mortgages, and more non-performing loans.

- Their employment grew more in the boom and fell more in the recession.

Different unconditional trends -> Need to control for firm characteristics.

Credit Channel
Firm-Bank (Local) Level

- **Khwaja and Mian (2008)**

$$\Delta_4 \log(1 + Credit_{ib}) = \theta_i + \vartheta WB_b + FB_{ib}\kappa + \epsilon_{ib}$$

  - *Firm controls*: set of 18 firm financial characteristics (size, age, ROA, own funds ratio, debt ratio, credit history, past loan applications…)
  - *Bank Controls*: ln(total assets), leverage ratio, liquidity ratio, ROA, Doubtful ratio
  - *Firm-bank controls*: length of the bank-firm relationship and past defaults
  - Firm fixed effects (θ_i): implies restricting the sample to firms working with at least two banks in 2006
    - *Doing that we are able to* ***control perfectly for credit demand***

Credit Channel
Firm-Bank Level. Intensive Margin

Dependent variable: $\Delta_4 \log(1 + Credit_{ijb})$				
	(1)	(2)	(3)	(5)
	All firms	Multi-bank	Fixed effects	Positive credit
WB_b	-0.232***	-0.256***	-0.255***	-0.079**
	(0.088)	(0.094)	(0.008)	(0.034)
Firm fixed effects	no	no	yes	yes
Firm controls	yes	yes	–	–
Bank fixed effects	no	no	no	yes
Bank controls	yes	yes	yes	yes
Firm-bank controls	yes	yes	yes	yes
Ind.×Prov. f.e.	yes	yes	–	–
Several banks	no	yes	yes	yes
R^2	0.060	0.059	0.407	0.394
No. obs.	304,089	236,691	236,691	126,863
No. firms	139,685	72,287	72,287	42,630

Credit Channel
Firm-Bank Level. Intensive Margin

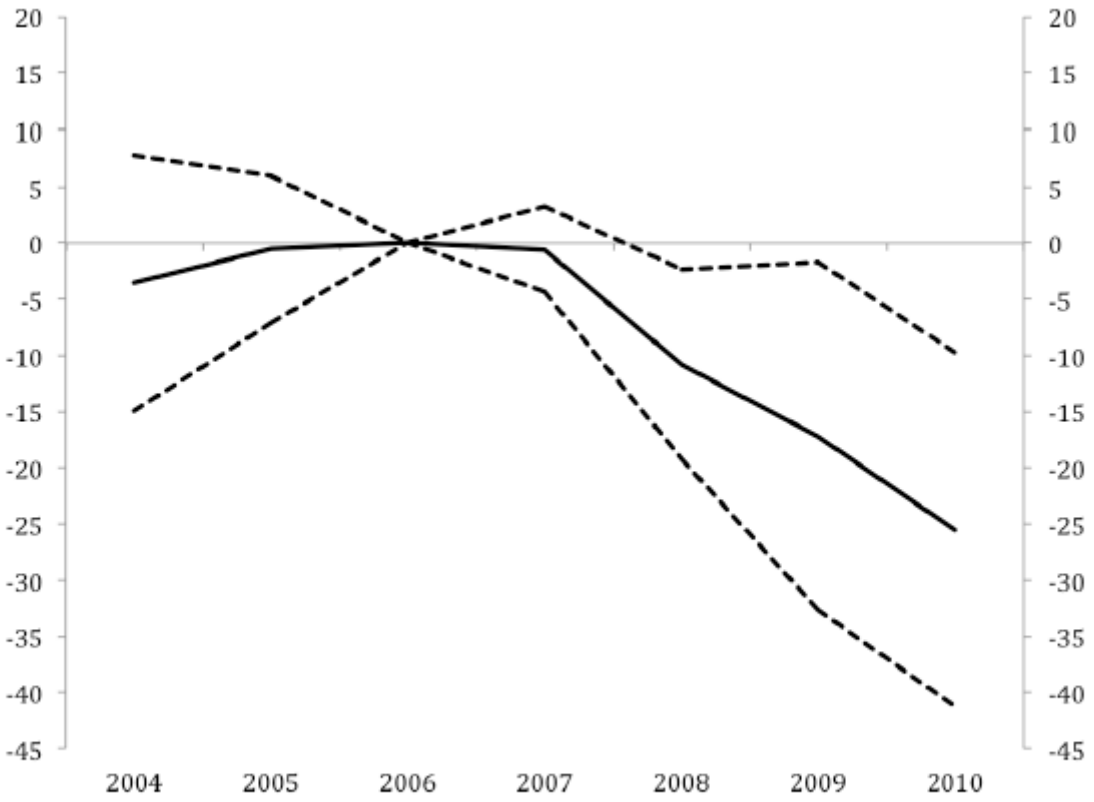


Figure 4a. Effect of weak-bank attachment on credit at the local level, 2002-2010 (pp)

Credit Channel
Firm Level (Aggregate)

Table 4. Credit rationing at the firm level

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

	(1) All firms	(2) Multi-bank
WB_i	-0.053***	-0.031***
	(0.015)	(0.011)
Firm controls	yes	yes
Industry×Municipality fixed effects	yes	yes
Multiple banking relationships	no	yes
Balance-sheet data	yes	yes
R^2	0.215	0.246
No. obs.	149,458	74,045

- **Treated firms managed to offset a substantial part of the reduction in credit supply by weak banks**

Credit Channel
Firm. Intensive Margin

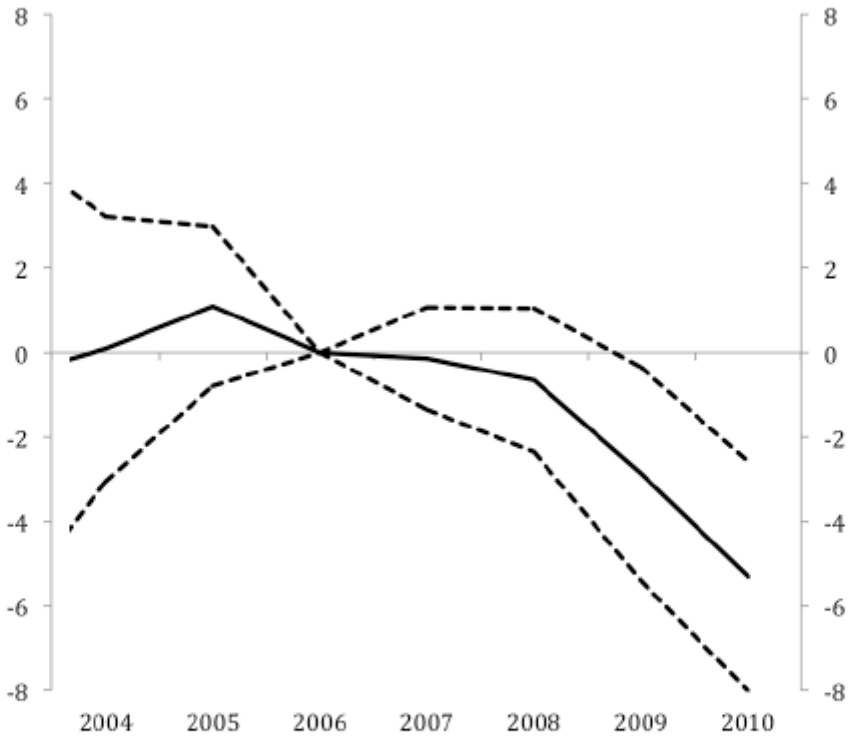


Figure 4b. Effect of weak-bank attachment at the firm level, 2002-2010 (pp)

The Effect on Employment of Firm Level

Diference in differences approach (DD)

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

- Δ_4 denotes four year differences taken in 2010.

- X_i: a set of firm controls (18 variables).

-d_j and d_k : Municipality and industry set of dummy variables, respectively.

-WB_i is a dummy variable for treated firms.

–β **measures the differential impact of credit constraints arising from attachment to weak banks.**

The estimation in first diferences implies an aggregate trend and also trends by municipality industry and firm characteristics.

Difference in Differences

Table 5. The employment effect of weak-bank attachment. Difference in Differences

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

	(1)	(2)	(3)	(4)	(5)	(6)
				Baseline		Placebo
WB_i	-0.074***	-0.076***	-0.067***	-0.028***	-0.028**	0.006
	(0.013)	(0.010)	(0.009)	(0.006)	(0.013)	(0.007)
Firm controls (1)	no	no	yes	yes	yes	yes
Firm controls (2)	no	no	no	yes	yes	yes
Municipality fixed effects	yes	–	–	–	–	–
Industry fixed effects	yes	–	–	–	–	–
Industry×Municipal. f.e.	no	yes	yes	yes	yes	yes
Main bank fixed effects	no	no	no	no	yes	no
R^2	0.046	0.150	0.163	0.177	0.179	0.203
No. obs.	149,458	149,458	149,458	149,458	149,458	112,933

Firm controls (1): age, size, rate of return and temporary employment rate

Firm controls (2)= Firm controls (1) + Other controls in 2006

Difference in Differences

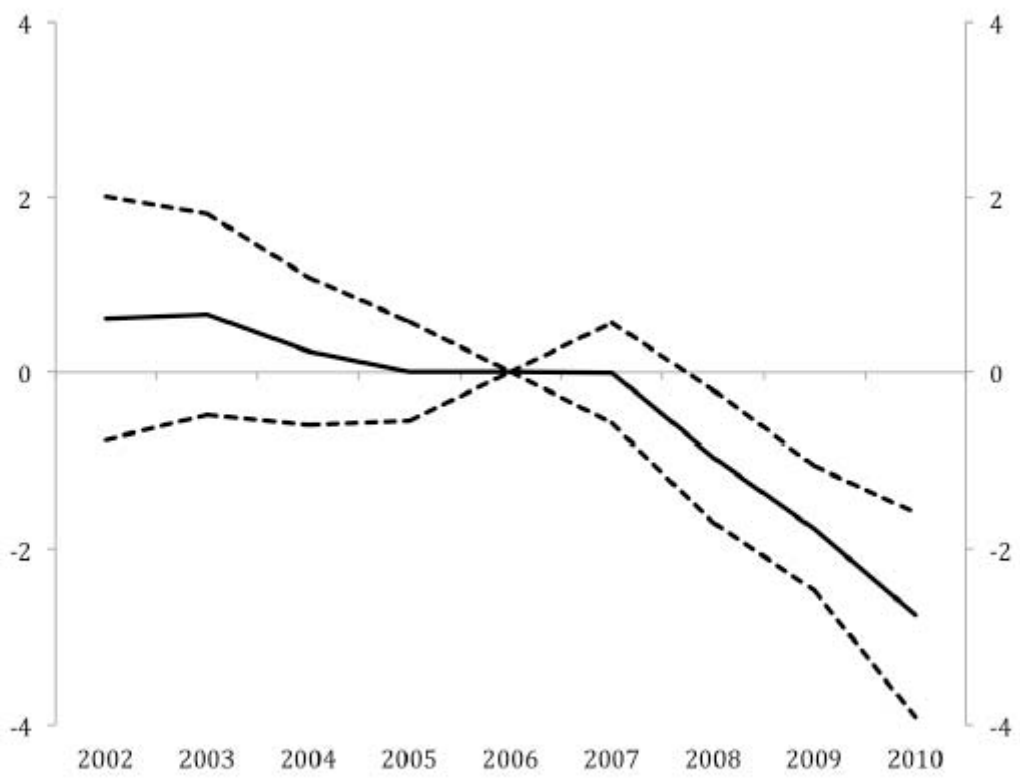


Figure 5. Employment effect of weak-bank attachment, 2002-2010 (pp)

Alternative specifications

Table 7. The employment effect of weak-bank attachment. Difference in Differences

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

	(1) WB Intensity	(2) Median	(3) Third quartile	(4) Survivors	(5) Alternat. measure	(7) Loans to REI	(8) 2007 ex-ante	(9) 2002
WB_i	-0.092***	-0.030***	-0.033***	-0.014***	-0.034***	-0.030***	-0.019***	-0.015**
	(0.020)	(0.008)	(0.008)	(0.004)	(0.004)	(0.008)	(0.006)	(0.006)
Firm controls	yes	yes	yes	yes	yes	yes	yes	yes
Industry × Municipality f.e.	yes	yes	yes	yes	yes	yes	yes	yes
R^2	0.177	0.177	0.177	0.181	0.182	0.177	0.130	0.188
No. obs.	149,458	149,458	149,458	133,122	129,246	149,458	145,322	71,703

(5): alternative dependent variable $(n_{ijt}-n_{ijt-1})/(0.5*(n_{ijt}+n_{ijt-1}))$

Robustness checks

- **To deal with the selection problem:**
  - The specifications include an exhaustive set of controls for observable firm characteristics
  - We also run a panel fixed effect model to allow for firm-specific trends:

$$\Delta \log(1 + n_{ijkt}) = \alpha_i' + WB_i d_t \beta' + X_i d_t \gamma' + d_j d_t \delta' + d_k d_t \lambda' + d_t \phi + v_{ijkt} \qquad (2)$$

- α_i *is a set of firm fixed effects.*
- d_t *is a set of time dummy variables.*

  - We use matching techniques to directly compare similar firms in the treated and in the control group

Credit channel

- **Is credit the transmission mechanism?**

- **Instrumental variable**

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

– μ is the differential impact of weak banks on credit.
– β'' is the pass-through from credit to employment.
– Thus, $\mu\ \beta''$ is equivalent to β.

Credit Channel
Instrumental Variables

Table 6. The employment effect of weak-bank attachment. Instrumental Variables

Dependent variable: $\Delta_4 \log(1+n_{ij})$	(1)
	All firms
Instrumented variable	$\Delta_4 \log(1+Credit_{ijk})$
	0.519***
	(0.179)
First stage	
WB_i	-0.053***
	(0.015)
Firm controls	yes
Industry×Municipality fixed effects	yes
Overall effect ($\mu\phi$)	-0.028
F test / p value	13.1 / 0.00
No. obs.	149,458

Instrumental variables

- **The choice of bank is an endogenous choice.**
- **Here we exploit a 1988 legal change to generate exogenous variation in exposure to weak-banks.**
  - The legal change allowed savings banks to expand beyond their region of origin.
  - We use the density of weak-bank branches in 1988 at the municipal level as instrument for WB.
    - *Independence assumption: proximity in 1988 to banks that required state intervention in 2008 is orthogonal to firm characteristics before the onset of the boom-bust cycle in the 2000s.*
    - *Exclussion restriction: local weak bank density only affects a firm's employment through its exposure to weak banks*
      - Not so clear because a weak bank could have a different performance in its province of origin in terms of credit during the boom.
      - It cannot be tested.

More Results
Financial vulnerability (DDD)

Table 11. The employment effect of weak-bank attachment. Triple Differences

Dependent variable: $\Delta_4 \log(1+n_{ijt})$		
WB_i	-0.019***	(0.007)
Rejected application$_i$	-0.066***	(0.008)
$WB_i \times$ Rejected application$_i$	-0.029**	(0.012)
Past Defaults$_i$	-0.209***	(0.029)
$WB_i \times$ Past Defaults$_i$	-0.041**	(0.020)
Short-term debt$_i$	-0.089***	(0.013)
$WB_i \times$ Short-term debt$_i$	-0.036***	(0.011)
Bank debt$_i$	-0.096***	(0.017)
$WB_i \times$ Bank debt$_i$	-0.081***	(0.022)
Own funds ratio$_i$	0.061***	(0.026)
$WB_i \times$ Own funds ratio$_i$	0.134***	(0.027)
Liquidity ratio$_i$	0.118***	(0.022)
$WB_i \times$ Liquidity ratio$_i$	0.050	(0.061)
Single bank$_i$	0.012**	(0.005)
$WB_i \times$ Single bank$_i$	0.019	(0.015)
log(Total Assets$_i$)	0.009*	(0.005)
$WB_i \times$ log(Total Assets$_i$)	0.003	(0.005)
log(1+Age$_i$)	-0.054***	(0.006)
$WB_i \times$ log(1+Age$_i$)	0.027***	(0.008)
I(Exporter$_i$)	0.176***	(0.011)
$WB_i \times I$(Exporter$_i$)	0.062***	(0.020)
I(Temporary employees$_i$)	-0.112***	(0.010)
$WB_i \times I$(Temporary employees$_i$)	-0.027***	(0.014)
$WB_i \times I$(Services$_i$)	0.019	(0.017)
Industry×Municipality fixed effects	yes	
Firm controls	yes	
R^2	0.176	
No. obs.	149,458	

A Deeper Analysis

- **Previously, we have quantified the additional job losses due to credit-rationing by weak banks.**
  - 1. We also are interested in the type of jobs that are more at risk (temporary employees vs. fixed employees)
  - 2. We also want to test whether the firm used alternative margins of adjustment, like changes in wages, to alleviate the impact on employment.
- **1. We analyze how weak-bank attachment affected the share of temporary workers at the firm level.**
  - We observe that temporary jobs accounted for 56% of employment adjustment in treated firms, given the lower termination costs of these contracts
- **2. We analyze how weak-bank attachment affected the evolution of the total wage bill.**
  - We observe that wage adjustments have no played a role in alleviating the impact of credit constraints

More Results
Firm exit

- **The speed of the recovery is not the same if a large fraction of firms close down than if they downsize**

Table 13. Effect of weak-bank attachment on firm exit

Dependent variable: Probability of exit		
	(1)	(2)
WB_i	0.011***	
	(0.004)	
WB_i *Intensity*		0.059***
		(0.014)
Firm controls	yes	yes
Municipality×Industry fixed effects	yes	yes
R^2	0.173	0.173
No. obs.	150,442	150,442

Conclusions

- **Aim: We study the impact of credit constraints on employment during the Great Recession in Spain outside the real estate industry.**
- **Identification: We exploit differences in lender health at the onset of the crisis, as evidenced by the bailout of savings banks.**
- **We construct a large dataset that allows us to control almost perfectly for demand factors reducing selection bias.**
- **Finally, controlling for selection we find sizeable effects of being attached to a weak bank prior to the recession: additional job losses due to weak bank attachment around 2.8 pp in 2006-2010.**
  - It represents around 24% of job losses at firms attached to weak banks in our sample.

GRACIAS POR SU ATENCIÓN