When Credit Dries Up:
Job Losses in the Great Recession

Samuel Bentolila

CEMFI

Gabriel Jiménez

Banco de España

Marcel Jansen

U. Autónoma de Madrid

Sonia Ruano

Banco de España

Motivation

Policymakers in Europe and the US are concerned about the

- ▶ Economic implications of the current lack of credit, and
- ▶ Economic benefits from the bailout of banks

Yet, so far there is scant recent evidence on both issues. Why?

- ▶ A lack of good credit data, notably for the US
- ▶ Tricky identification issues

In this paper we use a *unique data set with confidential loan data* to identify credit supply shocks in Spain during the GR and to estimate their impact on employment.

The Spanish experience during the Great Recession

The Spanish economy offers an ideal setting to explore the real effects of credit supply shocks:

▶ Bank lending to non-financial firms (their primary source of funding) contracted significantly during the crisis.

▶ An unprecedented decline in employment

▶ Boom-bust cycle in housing prices fueled by cheap bank credit
  → Large effect on bank solvency (parallels with US, Ireland)

▶ The exceptional quality of the Spanish credit register (CIR).
  → We are able to reconstruct the complete credit history and banking relations of over 200,000 firms.

The basic challenge

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 demand for credit.

- ▶ Reverse causality: the economic troubles of firms may reinforce or even cause the hardship of banks rather than the other way around.

- ▶ Selection: bad firms may be over-represented among the client firms of bad banks.

In recent years most studies exploit *quasi-experimental techniques* to overcome these issues.

Our approach

Our identification strategy exploits the pronounced cross-sectional differences in lender health at the onset of the crisis.

- ▶ Some banks, all but one of them savings banks (*Cajas de Ahorros*), have been bailed out by the State –mostly after 2010–. The rest survived without financial assistance.

- ▶ Bailed-out or *weak banks* reduced credit more than the other banks.

- ▶ We compare the change in employment from the end of the boom (2006) to well within the recession (2010) at firms with high and low exposure to weak banks.

All our estimations include an exhaustive set of firm controls to account for selection due to differences in the risk management of banks

Quasi-experimental techniques

The most recent literature exploits quasi-experimental techniques

- ▶ Large external shocks to the banking sector: Chava and Purnanandam (2011)
- ▶ Cross-sectional differences in firms' financial vulnerability at the onset of the Great Recession: Almeida *et al.* (2011), Benmelech *et al.* (2011), Garicano and Steinwender (2013), Boeri *et al.* (2013)
- ▶ Cross-sectional differences in the health of banks in the GR: Greenstone and Mas (2012), Chodorow-Reich (2013)

All find sizeable effects on real variables, but none of them have access to data of similar quality.

Summary of results

- Controling for selection, weak-bank attachment caused an extra employment reduction of 3 to 6 pp between 2006 and 2010.

- This corresponds to 12% to 35% of the extra job losses for "treated" firms.

- Firm exits account for the bulk of the differential employment losses

- The results are very robust.

- Sizeable differences depending on industry, credit history and number of banking relationships

Plan of the talk

- ▶ Theoretical background

- ▶ The financial crisis in Spain

- ▶ Data

- ▶ Empirical results: DD, IV, Matching

- ▶ Robustness checks

- ▶ Conclusions

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.

- **Asymmetric information:** Most explanations for credit friction rely on the assumption of asymmetric information between borrowers and lenders.

Theoretical background
Financial accelerator mechanisms

It is well known that endogenous changes in credit markets may amplify, propagate or even initiate shocks to the real economy

- ▶ Agency costs drive a wedge between cost of internal and external funds; This external finance premium depends negatively on borrower's net worth
- ▶ Pro-cyclical fluctuations in borrower's 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. One exception is Gertler and Kiyotaki (2010) who study agency problems between banks and *their* funders → shocks to banks' net worth can lead to a credit crunch spilling over to real sector

Theoretical background

Relationship banking

This literature explains why firms subject to credit restrictions may find it impossible to find alternative sources of funding.

- ▶ In stable relationships banks may acquire soft information about their clients. This reduces agency costs. (Freixas, 2005)
- ▶ 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.
- ▶ Ambiguous predictions for the optimal number of banking relationships:
  - ▶ A single relationship reduces transaction costs and may facilitate debt restructuring
  - ▶ Multiple relationships provide insurance against rent extraction by and liquidity problems of banks

Credit market imperfections and employment

The literature focuses mostly on investments in capital, but credit frictions are also relevant for employment:

- ▶ Turnover costs (Greenwald and Stiglitz, 1993; Sharpe, 1994)

- ▶ Search and matching frictions (Wasmer and Weil, 2004; Boeri, Garibaldi, and Moen, 2013; Petrosky-Nadeau, 2013)

- ▶ Temporary jobs serve as a buffer stock against expected future credit restrictions (Cuñat and Caggese, 2008)

The Spanish cycle and the collapse of credit

- The Spanish cycle
  - Expansion, 1996-2007 (p.a.): GDP 3.7%; employment 4.1%
  - Recession, 2008-2010 (p.a.): GDP -1.1%; employment -3.2%

  Employment is more volatile than GDP along the cycle due to extensive use of fixed-term positions.

- Bank credit boom-bust: Annual average flow of new credit to non-financial firms by deposit institutions (real terms)
  - Increased by 23% from 2003 to 2007
  - Decreased by 38% from 2007 to 2010

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

The demise of savings banks

A strong concentration of REI-related risks in the savings banks.

- Market shares and exposure to Real Estate Industry (%):

	Credit to Non-Fin. Sector	Loans to REI/Loans to NFS
Weak banks	32	64
Other banks	67	34

- Differential credit growth:
  - Expansion (2003-2007): Weak 60% v. healthy 12%
  - Recession (2008-2010): Weak -46% v. healthy -35%
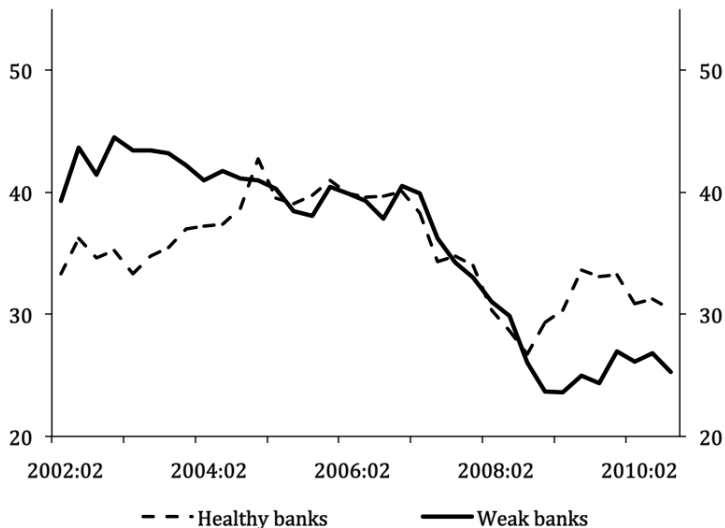- Both at intensive and extensive margins

The credit collapse

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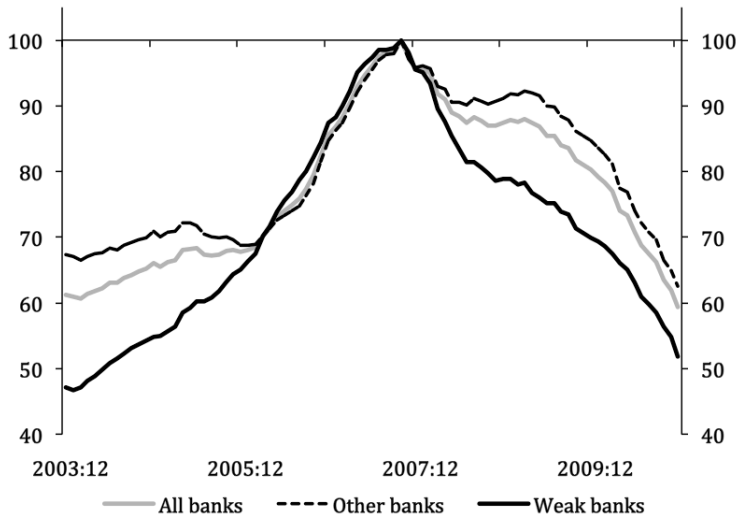
The credit collapse

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

Healthy banks · · · ·   Weak banks ⎯⎯⎯

Not much action in interest rates

Average annual interest rate for new loans to non-financial firms by bank type plus the ECB policy rate (%)
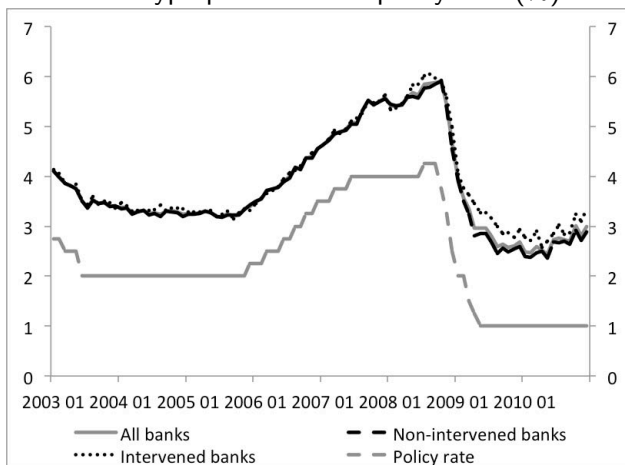
Anticipation effects?

Could private firms anticipate the solvency problems of the rather peculiar savings banks? Our answer is no, because financial markets failed to recognize the differential build-up of risks.

- ▶ Securitization/Assets (2006): 16.7% for weak banks, 13.5% for healthy banks
- ▶ 2006 securitization: Floating-rate, quarterly coupons, ref. to 3-month Euribor (303 deal-tranche obs., 24 issuers)
- ▶ Without controls, weak banks paid 7 basis points *less* than healthy banks
- ▶ Controls: type (MBS, ABS), risk category (AAA, AA+ to BBB-, BB+ to D), collateral type, guarantor type, years to maturity, month of issue
- ▶ Dummy=1 if weak bank: 2.8 basis points (p-value: 0.55)

Data

- Annual balance sheets and income statements (2006) from Spanish Mercantile Registers via SABI.
  - Exclude construction, real estate, and related industries: 217,025 firms
  - Coverage: 27% firms, 37% value added, 61% private employees
- Firm entry and exit from Central Business Register
- Loan information from Central Credit Register (B. of Spain):
  - All bank loans to non-financial firms above € 6,000: identity of bank and lender, collateral, maturity, etc.
  - Firms' credit history: non-performing loans and potentially problematic loans
- Loan applications by non-current borrowers and decisions
- Banks' balance sheets from regulatory and supervisory Bank of Spain database (226)

The treatment dummy

A firm's exposure to weak banks is measured as the ratio between the firm's *loans from weak banks* and its *book value*.

The treatment variable is the product of the debt ratio and the share of loans obtained from weak banks.

- WB_i: Dummy variable that takes value 1 if the treatment variable exceeds a predetermined threshold.
- *Default:* the third decile of the distribution of weak bank exposure (ratio of 6.3%)
  - We perform sensitivity checks w.r.t. threshold
  - We consider alternative definitions of WB_i based on banks' *pre-crisis* exposure to REI
  - We construct an instrument for WB_i based on weak bank density in 1988.

Selection

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

- ▶ Younger and smaller
- ▶ Financially worse: less capitalized, liquid, and profitable, more indebted with banks (but higher maturity)
- ▶ More loan applications to non-current banks, more frequent defaults
- ▶ Their banks: smaller, less capitalized, liquid and profitable, higher share of mortgages and more non-performing loans

The above differences give rise to different *unconditional trends*.
→ Employment at treated firms grew more in boom and fell more in recession
→ A need for firm controls

Variable (2006)	Control	Treated	T-C
No. of Firms	155,167	60,860	
Share Loans Weak Banks	0.10	0.71	0.61
Employment (employees)	24.63	18.73	-5.91
Firm Size (million euros)	5.08	3,01	-2.07
Firm Age (years)	12.16	11.01	-1.15
Own Funds	0.33	0.24	-0.10
Liquidity	0.12	0.09	-0.04
Return on Assets	0.06	0.05	-0.01
Bank Debt	0.32	0.50	0.19
Banking Relationships	1.94	2.98	1.03
Past Defaults (share)	0.02	0.03	0.01

Three takes on credit constraints

I. Difference in differences (DD): Effect of credit constraints (WB v. non-WB) in Recession v. Boom

II. Instrumental variables (IV): Check that credit is driving the results and avoid reverse causality

III. Exact matching: Selection effects

Differences in Differences

Specification

$$
\begin{aligned}
\log(1 + n_{it}) &= \alpha + \delta WB_i + \gamma Post\ WB_i + \beta Post \\
&\quad + \eta d_s + \theta Post\ d_s + X_i' \phi + u_{it}
\end{aligned}
$$

- n_{it}=employment at firm i in year t (2006, 2010), $Post$=2010
- γ measures Average Treatment effect on the Treated (ATT)
- Unbalanced panel, most observed in both years (87%)
- 8% of firms in 2006 but not in 2010 *because* they closed down $\rightarrow$ Surviving *and* closing firms (77% job losses)

Differences in Differences

Firm controls

- ▶ Province (50) and industry (9) dummies

- ▶ Main bank dummies (226)

- ▶ Other firm characteristics:

  Firm Size, Firm Age, Firm Age Squared, Own Funds, Liquidity, Return on Assets, Temporary Employment, Bank Debt, Short-Term Bank Debt, Long-Term Bank Debt, Uncollateralized Loans, Credit Line, Banking Relationships, Banking Relationships Squared, Current Defaults, Past Defaults, Loan Applications, All Applications Accepted

Difference in differences
Results

Dependent variable: $\log(1+\text{Employment}_{it})$

			Baseline	**Placebo**
$Post \times WB_i$	-0.085[**]	-0.074[**]	-0.062[**]	-0.001
	(0.013)	(0.013)	(0.009)	(0.001)
Province and Industry Dums.	yes	yes	yes	yes
Firm Controls	no	yes	yes	yes
Main Bank Dummies	no	no	yes	yes
$Post \times$ Province & Ind. Dums.	no	no	yes	yes
R^2	0.009	0.489	0.494	0.003
No. of firms	217,025	217,025	217,025	101,515
No. of observations	387,482	387,482	387,482	191.948

Extra job losses: $-(0.062 + 0.177) / (-0.177) \rightarrow 35.3\%$

Note: **=1%, *=5% significance.

Instrumental variables

1. Credit channel

$$
\begin{aligned}
\Delta \log(1 + n_{it}) &= \alpha' + \delta' \Delta \log(1 + Credit_{it}) + \beta' Post_t \\
&\quad + \eta' d_s + \sigma' d_i + u'_{it} \\
\Delta \log(1 + Credit_{it}) &= \pi + \mu Post_t WB_i + \omega Post_t + \rho d_s + \psi d_i + v_{it}
\end{aligned}
$$

- $t = 2007,..., 2010$
- Proportional change in employment on credit committed by banks (drawn and undrawn), instrumented by WB_i
- Panel with firm fixed effects to absorb firm characteristics and WB_i interacted with year dummies
- Exclusion restriction: Working with a weak bank affects employment changes only through credit changes
- Alt. measures: *I(Rejection)* and *% Applications accepted*

Instrumental variables

1. Credit channel

	First stage		
Dependent variable:	$\Delta\log(1+\text{Credit}_{it})$	$I(\text{Rejection})$	% Accepted
$d_{2008}\times WB_i$	-0.022**	0.014**	-0.005**
	(0.006)	(0.003)	(0.001)
$d_{2009}\times WB_i$	-0.095**	0.024**	-0.011**
	(0.014)	(0.004)	(0.002)
$d_{2010}\times WB_i$	-0.154**	0.029**	-0.014**
	(0.016)	(0.005)	(0.003)
$p-value$ of F test	0.00	0.00	0.00
No. of firms	196,978	196,978	138,065
No. of observations	716,678	716,678	502,331

Instrumental variables

1. Credit channel

Dependent variable:	$\Delta\log(1+\text{Employment}_{it})$		
Regressor:	$\Delta\log(1+\text{Credit}_{it})$	$I(\text{Rejection})$	% Accepted
	0.424[**]	-2.280[**]	5.364[**]
	(0.098)	(0.461)	(1.193)
Overall effect	-0.065	-0.067	-0.074

Instrumental variables

- ▶ We exploit a 1988 legal change whereby savings banks could start operating outside their region of origin

- ▶ Use high-density of weak banks at the province level (share of branches above a given threshold) as instrument for WB_i

- ▶ Alternative: Use exposure to the real estate industry in 2000 as instrument for WB_i

Instrumental variables

2. Exogenous variation in weak-bank attachment

	High weak-bank density province (1988)			Exposure to REI (2000)
	P50	P75	P90	
First stage				
Dependent variable: WB_i				
Instrument	0.034[**]	0.034[**]	0.042[**]	0.032[**]
	(0.004)	(0.004)	(0.006)	(0.004)
Dependent variable: $Post \times WB_i$				
$Post \times$ Instrument	0.104[*]	0.132[*]	0.145[*]	0.141[**]
	(0.043)	(0.054)	(0.063)	(0.038)
$p-value$ of F test	0.00	0.00	0.00	0.00
No. of firms	217,025	217,025	217,025	217,025
No. of observations	387,482	387,482	387,482	387,482

Instrumental variables

2. Exogenous variation in weak-bank attachment

|	High weak-bank density province (1988)			Exposure to REI (2000)
	P50	P75	P90	
Dependent variable: $\log(1 + \text{Employment}_{it})$				
$Post \times WB_i$	-0.487**	-0.512**	-0.485**	-0.239**
	(0.188)	(0.293)	(0.202)	(0.076)

Exact matching

- Estimate DD equation using coarsened exact matching method, *i.e.* within cells from discretizations of d_S and X_i

- Cells defined by variables chosen according to their significance in DD estimates. Each variable is split in two using: 0/1 nature, sample median, province (East Coast plus Islands), industry (Agriculture, Farming, Mining)

- 14 variables: Defaults, Bank Debt, Credit Line, Firm Age, Firm Size, Industry, Long-Term Bank Debt, Short-Term Bank Debt, No. of Banking Relationships, Own Funds, Province, Rejected Loan Application, Return on Assets, and Temporary Employment

Exact matching

Evolution of employment at firms attached to weak banks and
non-attached firms, weighted by matching (2006=0) (%)

- - · Attached to weak banks ⎯⎯ Not attached to weak banks
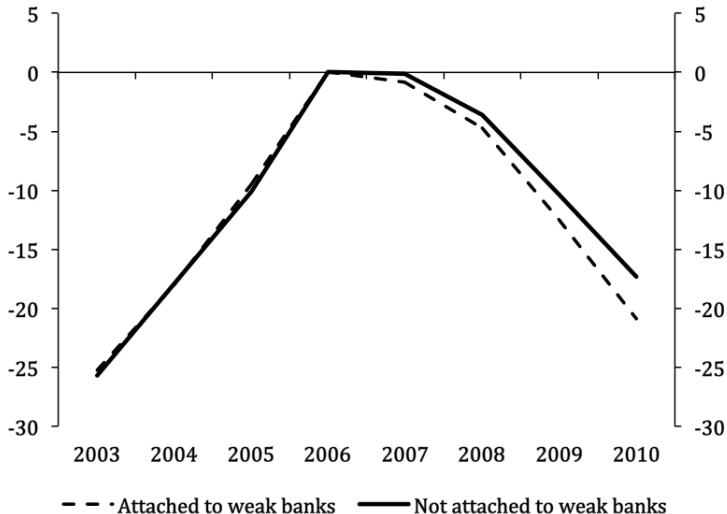
Exact matching

Dependent variable: $\log(1+\text{Employment}_{it})$

$Post_t \times WB_i$	-0.030[**]
	(0.014)
No. of strata	4,822
No. of matched strata	3,553
R^2	0.488
No. of firms	211,284
No. of observations	377,498

Extra job losses: $-(0.030 + 0.243) / (-0.243) \rightarrow 12.2\%$

Note: Estimate from DD in this sample: -0.063 (0.009).

Robustness checks

1. *Dating of effect and timing of controls*

   - timing of (i) post dummy (2) firm controls (3) bank controls

2. *Alternative definition of treatment variable*

   - REI exposure; committed loans/book value; loans from weak banks

3. *Survivors*
   - ATT drops to 1.3 pp compared to 6.2 in baseline!

4. *Differential effect by industry (DDD)*
   - Strongest effects in manufacturing, trade and R&D-intensive activities

5. *Differential effect of financial vulnerability of firms (DDD)*
   - Significant differential effects for share of short-term debt, small firms and one banking relation

4. Degree of exposure to weak banks

- ▶ Significant negative effect at all deciles of the distribution of exposure
- ▶ Reduction of effect starting in seventh decile
- ▶ DDD shows positive effect for single-bank firms
- ▶ Share of single-bank firms increases with exposure to WB (figure) → Composition effect?

→ Estimate separately for single- and multi-bank firms and for different levels of exposure

4. Single-bank dependence

Share of single-bank firms by decile of exposure to weak banks (%)
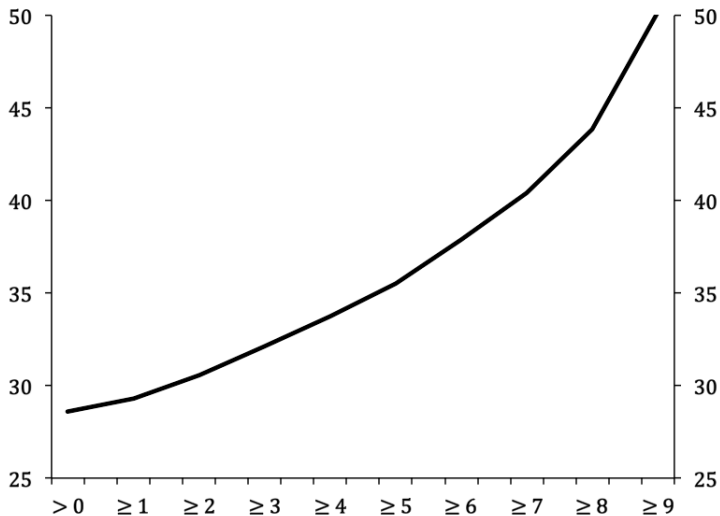
4. Degree of exposure to weak banks (DD)

The employment effect of exposure to weak banks by decile and number of banks (DD estimates with 2-s.e. bands)

---- Single-bank firms — — · Multiple-bank firms —— All firms
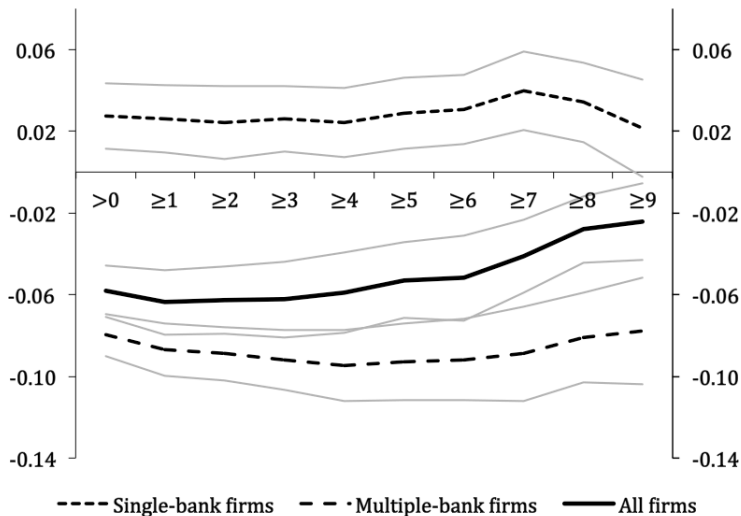
6. Degree of exposure to weak banks (Matching)

The employment effect of exposure to weak banks by decile and number of banks (matching estimates and 2-s.e. bands)

Single-bank firms — — Multiple-bank firms
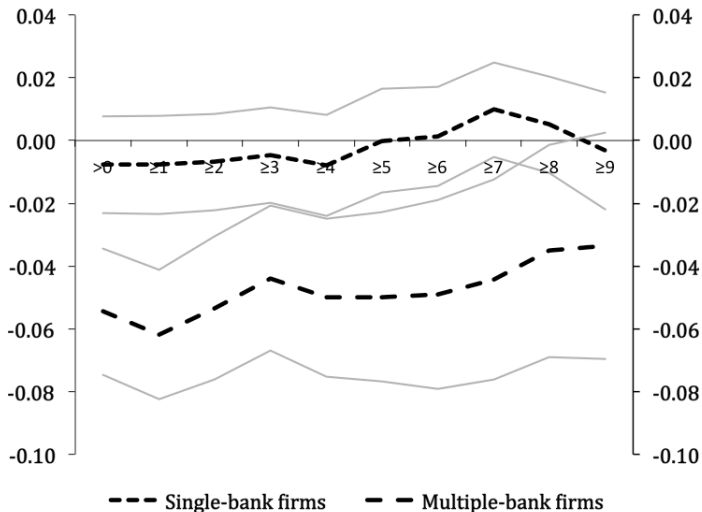
6. More on single-bank dependence

Preferential treatment?

- ▶ Estimate regression for $\Delta\log(1+\text{Credit}_{ijt})$ during the recession on the share of loans with the same bank in 2006
- ▶ Significant only for weak banks: Evergreening?

Stigma?

- ▶ Regresion for *I(Loan requested and granted$_{ijt}$)* on share of loans with weak banks (70% to 100%)

7. Alternative credit sources

- ▶ We only have data on the liability structure for a subsample (15,323 firms, i.e. 7%), for larger firms (€ thou., 2006):

	Full sample	Restricted sample
Median assets	576	9,137

- ▶ Liability structure (median, 2006): Financial institutions, 34%; Commercial credit, 34%, Other firms in the group: 0.1%.
- ▶ Molina (2012) shows no increase in commercial credit taken in 2008-2010 for a sample of 9,602 Spanish large firms

7. Alternative credit sources

Total Credit v. Bank Credit

	First stage	
Dependent variable:	$\Delta\log(1+$ Bank Credit$_{it})$	$\Delta\log(1+$ Total Credit$_{it})$
$d_{2008}\times WB_i$	0.015	-0.072[**]
	(0.012)	(0.013)
$d_{2009}\times WB_i$	-0.100[**]	-0.118[**]
	(0.020)	(0.013)
$d_{2010}\times WB_i$	-0.150[**]	-0.147[**]
	(0.025)	(0.021)
$p-value$ of F test	0.00	0.00
No. of firms	15,323	15,323
No. of observations	57,013	57,013

5 Non-bank credit sources

Total Credit v. Bank Credit

Dependent variable:	$\Delta\log(1+\text{Employment}_{it})$	
Regressor:	$\Delta\log(1+\text{Bank Credit}_{it})$	$\Delta\log(1+\text{Total Credit}_{it})$
	0.266[**]	0.301[**]
	(0.096)	(0.082)
Overall effect	-0.040	-0.044

Conclusions

- ▶ Aim: measure the impact of credit constraints on employment during the Great Recession in Spain (outside real estate)

- ▶ Identification: exploit differences in lender health at onset of the crisis (savings banks bailed out by the State) → Compare change in employment pre- v. post-crisis at firms heavily exposed to weak banks to other firms

- ▶ Strengths:
  - ▶ Large and high-quality dataset: control exhaustively for ex-ante characteristics of firms and for potential endogeneity
  - ▶ Unmatched set of robustness checks

- ▶ Effects are sizeable: controling for selection, attachment to weak banks caused a larger fall in employment from 2006 to 2010: 3.0 to 6.2 pp, i.e. 12% to 35% extra fall

- ▶ Novel results concerning single-bank firms

Future research

- Determinants of the difference in treatment of clients with a single banking relationships ("evergreening")

- Wider set of real indicators, notably investment

- Firm exits

- Evaluation of bank bailout program

- Credit demand: Importance of differences in firm-level financial vulnerability controling for banks