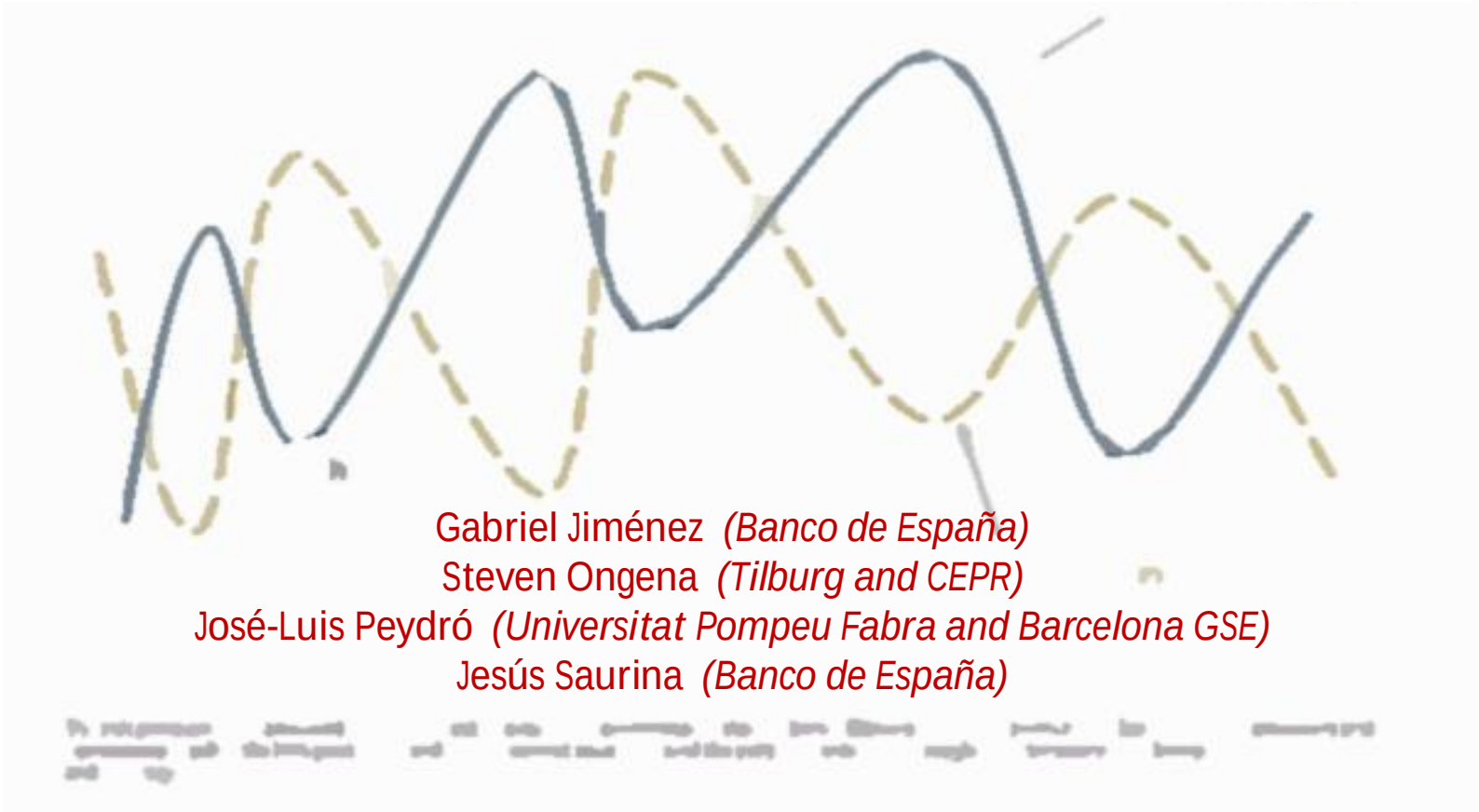
Macroprudential Policy, Countercyclical Bank Capital Buffers and Credit Supply: Evidence from the Spanish Dynamic Provisioning Experiments



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Banking crises

Western Europe and USA suffered a banking crisis, followed by a severe economic recession. These phenomena are not unique: Banking crises are recurrent, triggering deep, long-lasting recessions

Reinhart & Rogoff (2009), Schularick & Taylor (AER 2011)

The main channel by which banks' balance-sheet weaknesses affect the real sector is via a reduction in the supply of credit

Bernanke (AER 1983)

Banking crises, moreover, come after periods of very strong credit growth

Kindleberger (1978), Gourinchas & Obstfeld (AEJ Macro 2012), Bordo & Meissner (2012)

➔ crucial to understand credit cycles/ excessive bank procyclicality in good and bad times

Banking crises and credit cycles

Credit cycles due to financial frictions in:

Banks (credit supply): Rajan (QJE, 1994), Holmström & Tirole (QJE, 1997), Allen & Gale (2007), Diamond & Rajan (JPE 2001 & AER 2006), Adrian & Shin (Handbook of ME, 2011), Shleifer & Visnhy (JFE & AER, 2010), Tirole (2011), Gersbach & Rochet (2011), ...

Non-financial sector (credit demand): Bernanke & Gertler (AER, 1989), Kiyotaki & Moore (JPE, 1997), Lorenzoni (RES, 2008), Jeanne & Korinek (2011), ...

where credit growth is 7% on average in good times before banking crises and -2% after the start of the crises

Schularick & Taylor (AER 2011)

Credit supply cycles

"Excessive" bank pro-cyclicality /credit *supply* cycles due to bank frictions

In good times:

Problem: too high credit supply (seeds for the next crisis) since e.g. banks have little capital (owned funds) at stake

Holmström & Tirole (QJE 1997)

In bad times:

Problem: credit crunch by banks due to e.g. low capital since bank capital is costly, may be lower than socially optimal and affects bank funding liquidity

Freixas & Rochet (2008), Iyer & Peydro (RFS 2011), Gertler, Kiyotaki & Queralto (2011)

Macroprudential policy and credit cycles

The strong real effects from financial crisis implies that regulation needs to move into a macroprudential direction

Trichet (2010), Bernanke (2011), Yellen (2011), Hanson, Kashyap & Stein (JEP 2011), many academic papers, ...

Macroprudential policy ultimately aims at reducing the strong negative externalities from the financial to the macro-real sector

The systemic orientation of the macroprudential contrasts with the "microprudential" approach to regulation and supervision, which is concerned with the safety and soundness of individual institutions

E.g., deleveraging of a bank after a negative balance-sheet shock

Countercyclical macroprudential policy (capital/provisions) tools could be used to address cyclical vulnerabilities in systemic risk from credit cycles

One *macropru* solution: Countercyclical bank capital buffers?

Higher bank capital and provision standards in good times (and lower standards in bad times) can be beneficial both in good and bad times by reducing "excessive" bank pro-cyclicality in credit supply

In good times:

- Problem: too high bank credit availability/soft lending standards
- Solution: banks should hold more capital ("skin in the game") to internalize more potential loan costs/externalities. Moreover, since bank capital may be costly, credit supply would be reduced

In bad times:

- Problem: credit crunch by banks due to low capital
- Solution: higher bank capital buffers built in good times to support credit supply in bad times (without -- or with less -- government help)

Basel III

- Capital requirements have been a central tool of banking prudential regulation since 1980s

- Under Basel III, variation of minimum capital requirements over the cycle, the so-called countercyclical bank capital buffers:

  During boom times, capital requirements would increase and during recessions they would decline, as part of the cyclical mandate of macroprudential policies

- "*The new [capital] standards will markedly reduce banks' incentive to take excessive risks… lower the likelihood and severity of future crises, and enable banks to withstand - without extraordinary government support - stresses of a magnitude associated with the recent financial crisis.*"

  G-20 Seoul Official statement, November 2010

The bankers complain about the high cost of bank capital

- "*More equity might increase the stability of banks. At the same time however, it would restrict their ability to provide loans to the rest of the economy. This reduces growth and has negative effects for all*"

Josef Ackermann, CEO of Deutsche Bank (Nov 20, 2009)

- "*The British Bankers' Association ... calculated that demands by international banking regulators in Basle that they bolster their capital will require the UK's banking industry to hold an extra £600bn of capital that might otherwise have been deployed as loans to businesses or households*"

bba
The voice of banking & financial services

The Observer (July 11, 2010)

- "*Excess bank equity capital ... would constitute a buffer that is not otherwise available to finance productivity-enhancing capital investment*"

Allen Greenspan (FT, July 27, 2011)

Theory on bank capital impact on credit supply

The complementary rationales of bank capital, i.e., *better ex-ante incentives*, *higher buffers in bad times*, and *potential higher costs* highlighted by policy makers and bankers, respectively,

are also present in theoretical models

Holmström & Tirole (QJE 1997), Morrison & White (AER 2005), Diamond & Rajan (JF 2000, JPE 2001, AER 2006), Gale & Özgür (JEEA 2005), Freixas & Rochet (2008), Admati, DeMarzo, Hellwig & Pleiderer (2010), ...

And even the countercyclical buffers, e.g. in models:

- with agency problems: e.g. Tirole (2011), Gersbach & Rochet (2011)
- without agency problems but with investor sentiment: Shleifer & Vishny (JFE 2010 & AER 2010), Gennaioli, Shleifer & Vishny (2011)

Question?

- What is the effect of a countercyclical bank capital buffer on the supply of credit, in good and bad times?
  - Bank and firm heterogeneity
  - Real effects: Firm assets, employment and survival

Impact of macroprudential policy on credit supply cycles and the effects for the real sector?

Empirical identification

To identify the effects of countercyclical bank capital buffers on credit supply

(in good and bad times)

one needs:

Policy shocks

to countercyclical bank capital buffers that affect banks differentially

In good and bad times. Plus an unexpected crisis shock

No randomized experiments in the banking sector

Comprehensive bank-, firm-, loan- and loan application-level data

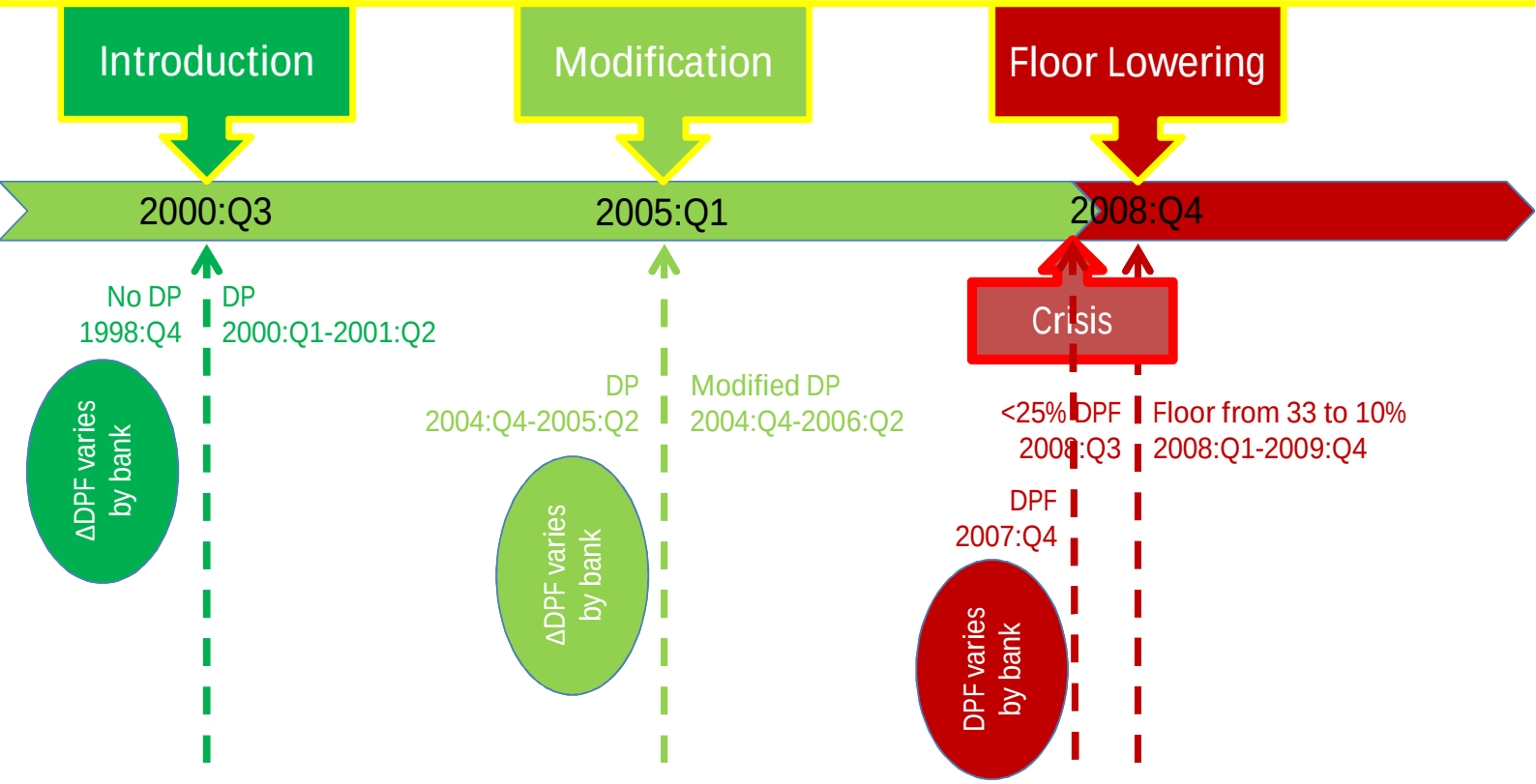
To distinguish credit supply (availability) from demand (firm fundamentals)

To obtain firm-level aggregate estimates

Dynamic provisioning in Spain: 1999-2010

Study three policy shocks that affect countercyclical bank capital buffers
Increase "banks' retained earnings" in good times to be used in bad times

see BIS, G-20, Federal Reserve, ECB, IMF, Worldbank



Comprehensive credit register matched with bank and firm characteristics
to identify credit availability and real effects employing differences-in-differences

Khwaja & Mian (AER 2008), Jiménez, Ongena, Peydró & Saurina (AER F), Jiménez, Mian, Peydró & Saurina (2011), ...

What We Find

Shock	Dynamic Provisioning	Bank-Firm Credit Availability	Firm Financing and Performance
Introduction 2000:Q3	Introduced	Lower	Unaffected
Modification 2005:Q1	Eased Somewhat	Somewhat Higher	Unaffected
Floor Lowering 2008:Q4	Loosened for Low DPF Banks	Higher	'Better'
(Unexpected) Crisis 2008:Q3	For Higher DP Funds Banks	Higher	'Better'

Empirical Studies on Bank Capital and Credit

Using Negative Shocks to Actual Bank Capital	Type
Peek and Rosengren (AER 2000)	Japan real estate shock, on US
Puri, Rocholl & Steffen (JFE 2011)	US subprime, on Germany
Mora & Logan (AE 2012)	Non-UK losses, on UK
Rice & Rose (2010)	US Security losses, on US

Using Actual Capital Ratios and Bank-Level Credit (Growth)	Method to Identify Supply
Bernanke and Lown (BPEA 1991)	Panel
Berger & Udell (JMCB 1994)	Panel
Cornett, McNutt, Strahan & Tehranian (JFE 2011)	Panel
Hancock & Wilcox (JHE 1993)	VAR
Hancock, Laing & Wilcox (JBF 1993)	VAR
Gambacorta & Mistrulli (JFI 2004)	VAR
Berrospide & Edge (IJCB 2010)	VAR
Carlson, Shan and Warusawitharana (2011)	Match

Partly based on Carlson, Shan and Warusawitharana (2011)

This Paper

- Policy experiments to countercyclical bank capital buffers that exogenously change regulatory requirements
  - Both in good and in bad times
    - Study the workings of countercyclical capital buffers in a crisis

- Comprehensive bank-, firm-, loan-, and loan application-level data to identify credit supply

- Short- and medium-run impact of bank capital buffers
  - *At the loan (bank-firm) level*: on the intensive and extensive margins of credit availability, maturity, collateralization, and cost
  - *At the firm level*: on credit availability and corporate growth and survival

The introduction of dynamic provisioning

- In July 2000, the *Banco de España* (Spain's central bank, banking supervisor and responsible for bank accounting) put in place dynamic provisioning because:

  Spain had the lowest ratio of loan loss provisions to total loans among all OECD countries in 1999

  An empirical fact: After strong credit growth in good times come the loan losses, but specific provisions are very low in good times and very high in bad times

  Laeven & Majnoni (JFI 2003)

See Saurina (2009a, 2009b) for all the details on dynamic provisioning

Dynamic provisioning

- Introduced in 2000:Q3: Contractionary shock
  - Modified in 2005:Q1: Mildly expansionary shock
  - Floor Lowering in 2008:Q4: Allow banks to use more the dynamic provision funds built up in good times

- Forward-looking: provisions before any loan loss arrives

- Countercyclical
  - Higher provision requirements in good times. The required provisioning in 2000 was over and above specific and general loan-loss provisions. In bad times, there is a regulatory reduction of this type of provisioning.

- Tier-2 Capital

Shock	Dynamic Provisioning	Bank Dynamic Provisioning Variable (Basis Period)
Introduction 2000:Q3	Introduced	Dynamic Provision (1998:Q4)
Modification 2005:Q1	Eased Somewhat	Dynamic Provision (2004:Q4 to 2005:Q2)
Floor Lowering 2008:Q4	Loosened for Low DPF Banks	d(<25% Dynamic Provision Funds) (2008:Q3)
(Unexpected) Crisis 2008:Q3	For Higher DP Funds Banks	Dynamic Provision Funds (2007:Q4)

Empirical identification

Differences-in-differences

We compare bank-firm credit before and after the different shocks

Differentiate across banks

with varying susceptibility to the shocks

Assumes that what causes banks' provisions to be differentially affected
is uncorrelated with the impact of provisions on banks' change in lending

Control for other bank, bank-firm relationship and loan characteristics,

and saturate with firm (*time) fixed effects

(to control for observed and unobserved firm heterogeneity,
in terms of the demand for credit, but also reflecting the "chosen" banks' portfolio)

→ <u>identify credit availability</u>

all margins of lending

explore bank and firm heterogeneity

Shock	Dynamic Provisioning	Loan-Level	Firm-Level	Loan-Application Level	Cross-Sectional Analysis
Introduction 2000:Q3	Introduced	Discussed here	Discussed here	See Paper	See Paper
Modification 2005:Q1	Eased Somewhat	See Paper	See Paper	See Paper	See Paper
Floor Lowering 2008:Q4	Loosened for Low DPF Banks	Discussed here	Discussed here	Discussed here	Discussed here
(Unexpected) Crisis 2008:Q3	For Higher DP Funds Banks				

Loan-Level Models

$$\Delta \log \text{Commitment(impact period)}_{bf} = \text{Bank Dynamic Provisioning(basis period)}_{bf} + \text{Controls}_{bf} + \text{Fixed Effects} + \varepsilon_{bf}$$

Other Bank Characteristics Ln(Total Assets), Capital Ratio, Liquidity Ratio, ROA, Doubtful Ratio, Commercial or Savings Bank
Bank-Firm Relationship Characteristic Ln(1+Number of Months with the bank)
Loan Characteristics Maturity <1 year, Maturity 1-5 years, Collateralized Loan, Ln(Loan Amount)
Province and Industry Fixed Effects
Firm Fixed Effects
Firm * Bank Type Fixed Effects
Sample with Multiple Bank-Firm Relationships Only
Sample with Firm Characteristics Only
Cluster at Bank Level

Dependent Variables:

Δlog Commitment
Δlog Drawn
Loan Dropped?

ΔLong-Term Maturity Rate (>1 year)
ΔCollateralization Rate
ΔDrawn to Committed Ratio

Firm-Level Models

$$\Delta \log \text{Commitment(impact period)}_f = \text{Bank Dynamic Provisioning(basis period)}_f + \text{Controls}_f + \text{Fixed Effects} + + \varepsilon_f$$

Other Bank Characteristics
Ln(Total Assets), Capital Ratio, Liquidity Ratio, ROA, Doubtful Ratio, Commercial or Savings Bank

Bank-Firm Relationship Characteristic
Ln(1+Number of Months with the bank)

Firm Characteristics
Ln(Total Assets), Capital Ratio, Liquidity Ratio, ROA, Bad Credit History, Ln(Age+1), Tangible Assets

Province and Industry Fixed effects

Sample with Multiple Bank-Firm Relationships Only

Sample with Firm Characteristics Only

Cluster at Main Bank Level

Dependent Variables:

Δlog Commitment
Δlog Drawn

Δlog Total Assets
Δlog Employees
Firm Death?

INTRODUCTION IN 2000:Q3

ΔLOG COMMITMENT ON DYNAMIC PROVISION

Table 3

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Level	Loan								
Dependent Variable	Δlog Committment (2000:Q1-2001:Q2)	Δlog Committment (2000:Q1-2001:Q2)	Δlog Committment (2000:Q1-2001:Q2)	Δlog Committment (2000:Q1-2001:Q2)	Δlog Committment (2000:Q1-2001:Q2)	Δlog Committment (2000:Q1-2001:Q2)	Δlog Committment (2000:Q1-2001:Q2)	Δlog Committment (2000:Q1-2001:Q2)	Δlog Committment (2000:Q1-2001:Q2)
Dynamic Provision(for 1998:Q4)$_b$	-0.024	-0.253	-0.336 **	-0.366 **	-0.366 **	-0.357 ***	-0.259 **	-0.389 ***	-0.397 ***
	(.164)	(.176)	(.164)	(.186)	(.168)	(.123)	(.12)	(.147)	(.106)
Other Bank Characteristics	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Firm Relationship Characteristic	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Characteristics	No	No	No	No	No	No	Yes	No	No
Province and Industry Fixed effects	No	No	Yes	Yes	Yes	--	--	--	--
Firm Fixed Effects	No	No	No	No	No	Yes	Yes	Yes	--
Firm * Bank Type Fixed Effects	No	No	No	No	No	No	No	No	Yes
Sample with Multiple Bank-Firm Relationships Only	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Sample with Firm Characteristics Only	No	No	No	Yes	No	No	No	Yes	No
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Number of Observations	666,698	666,698	666,698	313,234	416,611	416,611	416,611	237,905	416,611

A one standard deviation (0.10 percent) increase in Dynamic Provision contracts committed credit growth by 3.9 percentage points

(mean bank-firm level committed loan growth equals -2.0 percent)

Table 3

Model	(10)	(11)	(12)
Level			
Dependent Variable	Δlog Drawn (2000:Q1-2001:Q2)	Loan Dropped?	Loan Dropped?
Dynamic Provision(for 1998:Q4)$_b$	-0.451 ***	0.115	0.104
	(.108)	(.117)	(.123)
Other Bank Characteristics	Yes	Yes	Yes
Bank-Firm Relationship Characteristic	Yes	Yes	Yes
Loan Characteristics	No	No	Yes
Province and Industry Fixed effects	--	--	--
Firm Fixed Effects	--	Yes	Yes
Firm * Bank Type Fixed Effects	Yes	No	No
Sample with Multiple Bank-Firm Relationships Only	Yes	Yes	Yes
Sample with Firm Characteristics Only	No	No	No
Cluster	Bank	Bank	Bank
Number of Observations	366,364	571,007	571,007

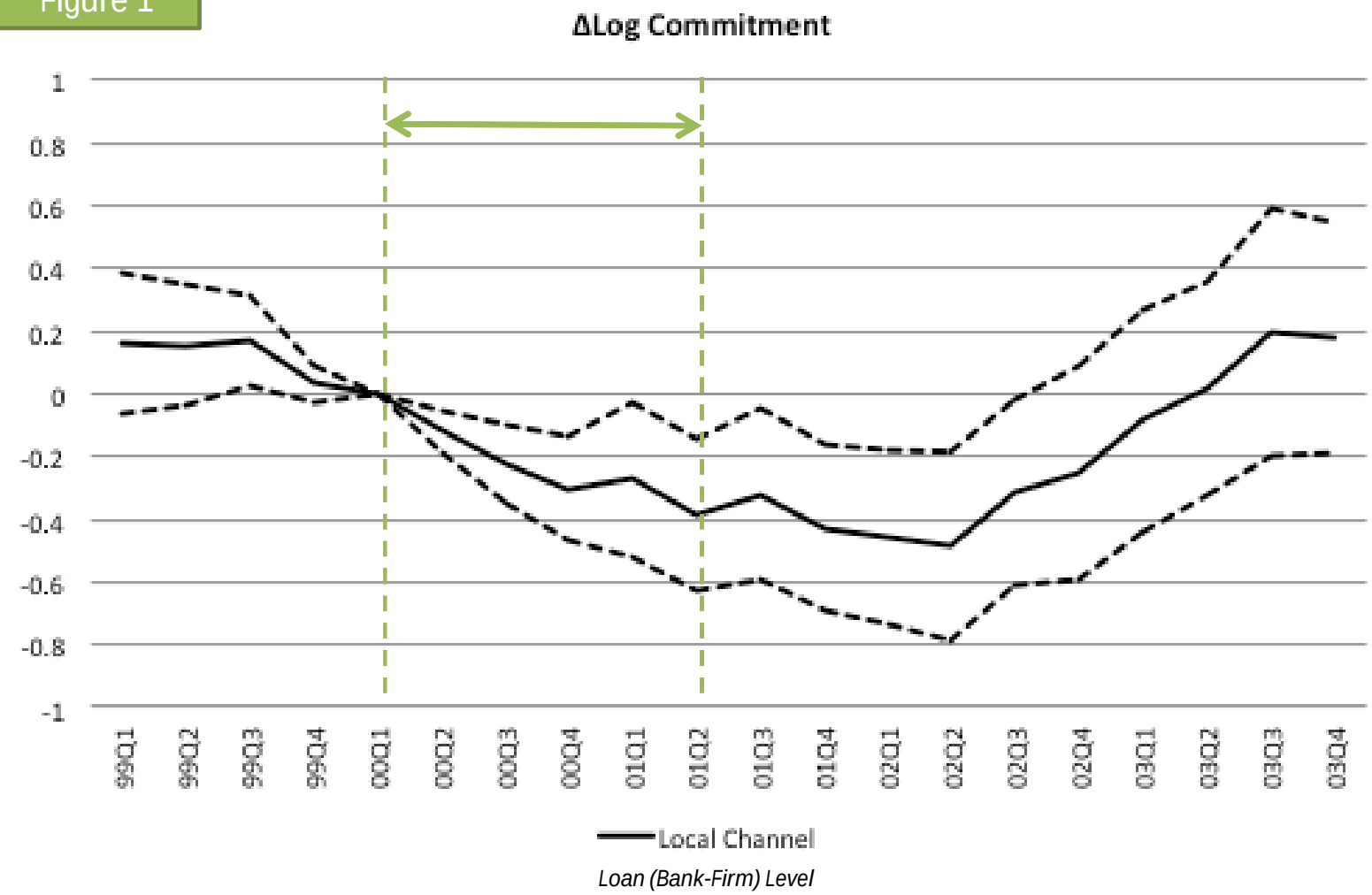
Similar results for credit drawn (and extensive margin)

Table 3

Model	(13)	(14)	(15)
Level	Loan		
Dependent Variable	ΔLong-Term Maturity Rate (>1 year) (2000:Q1-2001:Q2)	ΔCollateralization Rate (2000:Q1-2001:Q2)	ΔDrawn to Committed Ratio (2000:Q1-2001:Q2)
Dynamic Provision(for 1998:Q4)$_{t}$	-0.163 ***	0.082 ***	-0.030
	(.049)	(.03)	(.04)
Other Bank Characteristics	Yes	Yes	Yes
Bank-Firm Relationship Characteristic	Yes	Yes	Yes
Firm Characteristics	--	--	--
Loan Characteristics	Yes	Yes	Yes
Province and Industry Fixed effects	--	--	--
Firm Fixed Effects	Yes	Yes	Yes
Sample with Multiple Bank-Firm Relationships Only	Yes	Yes	Yes
Sample with Firm Characteristics Only	No	No	No
Cluster	Bank	Bank	Bank
Number of Observations	416,611	416,611	416,611

Similar results for credit maturity, collateral (and cost)

Figure 1



Loan (Bank-Firm) Level

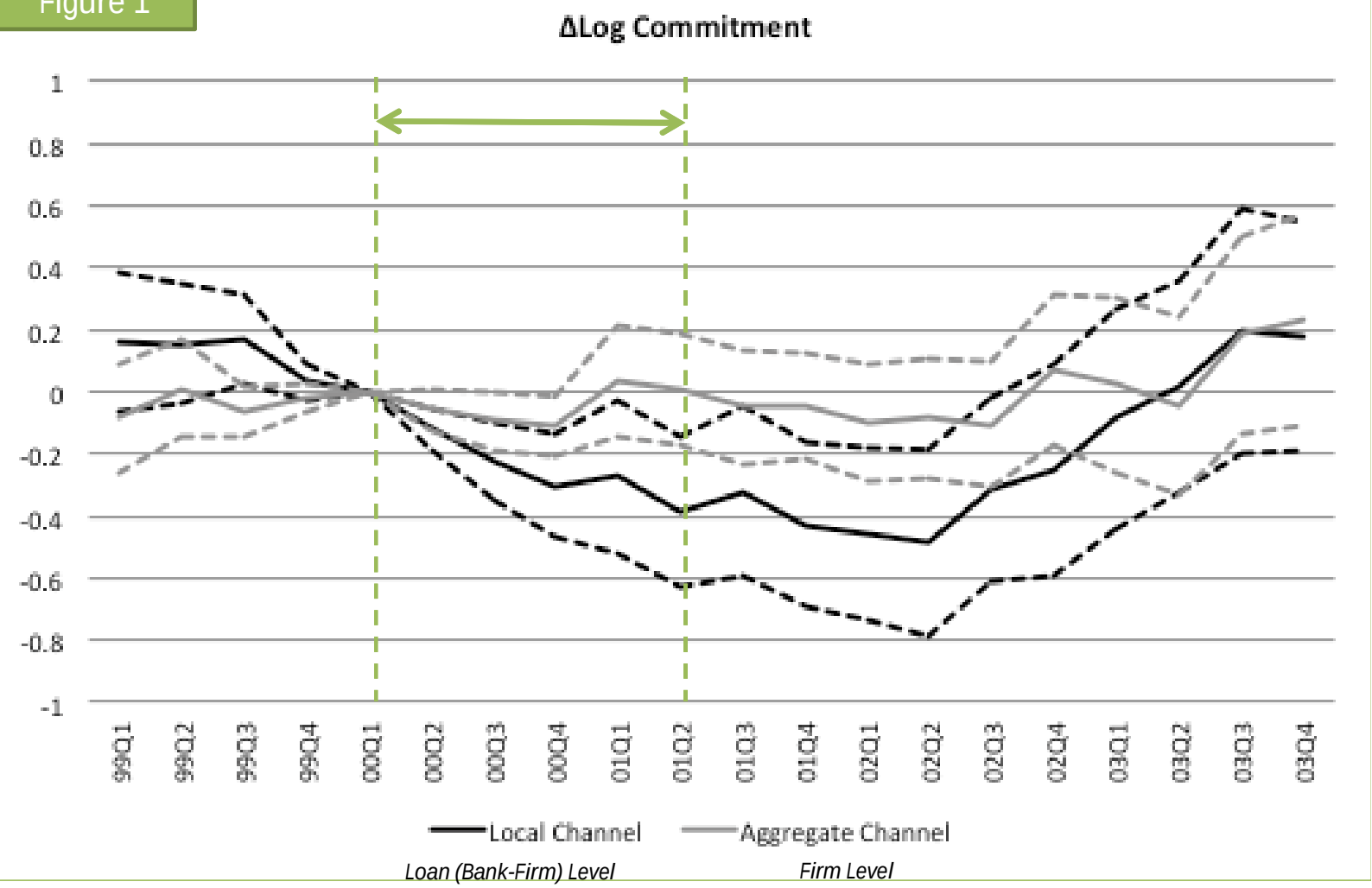
Similar results for extensive margin and for credit maturity, collateral and cost

Table 3

Model	(16)	(17)	(18)	(19)	(20)	(21)	(22)
Level				Firm			
Dependent Variable	Δlog Commitment (2000:Q1-2001:Q2)	Δlog Commitment (2000:Q1-2001:Q2)	Δlog Commitment (2000:Q1-2001:Q2)	Δlog Drawn (2000:Q1-2001:Q2)	Δlog Total Assets (1999:Q4-2001:Q4)	Δlog Employees (1999:Q4-2001:Q4)	Firm Death? (in 2001)
Dynamic Provision(for 1998:Q4)$_b$	0.031	0.010	0.014	-0.073	-0.001	-0.099	0.000
	(.1)	(.109)	(.103)	(.098)	(.002)	(.067)	(.013)
Other Bank Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Firm Relationship Characteristic	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Characteristics	No	Yes	Yes	Yes	Yes	Yes	Yes
Loan Characteristics	No	No	Yes	No	No	No	No
Province and Industry Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	><	><	><	><	><	><	><
Sample with Multiple Bank-Firm Relationships Only	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample with Firm Characteristics Only	No	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Main Bank	Main Bank	Main Bank	Main Bank	Main Bank	Main Bank	Main Bank
Number of Observations	144,203	76,593	76,593	59,449	59,449	41,146	92,576

No impact at the firm level!

Figure 1



Loan (Bank-Firm) Level *Firm Level*

No impact at the firm level!

FLOOR LOWERING IN 2008:Q4
CRISIS SHOCK IN 2008:Q3

ΔLOG COMMITMENT
ON
D(<25% DYNAMIC PROVISION FUNDS)
AND
DYNAMIC PROVISION FUNDS

Table 9

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Level						Loan			
Dependent Variable	Δlog Commitment (2008:Q1-2009:Q4)	Δlog Commitment (2008:Q1-2009:Q4)	Δlog Commitment (2008:Q1-2009:Q4)	Δlog Commitment (2008:Q1-2009:Q4)	Δlog Commitment (2008:Q1-2009:Q4)	Δlog Commitment (2008:Q1-2009:Q4)	Δlog Commitment (2008:Q1-2009:Q4)	Δlog Commitment (2008:Q1-2009:Q4)	Δlog Commitment (2008:Q1-2009:Q4)
d(<25% Dynamic Provision Funds)(2008:Q3)	0.018	0.069 ***	0.070 ***	0.077 ***	0.086 ***	0.094 ***	0.098 ***	0.096 ***	0.100 ***
	(.027)	(.022)	(.023)	(.028)	(.028)	(.026)	(.024)	(.03)	(.031)
Dynamic Provision Funds (2007:Q4)	0.032	0.088 *	0.096 *	0.144 **	0.130 **	0.160 ***	0.172 ***	0.201 ***	0.191 ***
	(.045)	(.051)	(.05)	(.066)	(.066)	(.059)	(.058)	(.069)	(.07)
Other Bank Characteristics	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Firm Relationship Characteristic	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Loan Characteristics	No	No	No	No	No	No	Yes	No	No
Province and Industry Fixed effects	No	No	Yes	Yes	Yes	--	--	--	--
Firm Fixed effects	No	No	No	No	No	Yes	Yes	Yes	--
Firm * Bank Type Fixed Effects	No	No	No	No	No	No	No	No	Yes
Sample with Multiple Bank-Firm Relationships Only	No	No	No	No	Yes	Yes	Yes	Yes	Yes
Sample with Firm Characteristics Only	No	No	No	Yes	No	No	No	Yes	No
Cluster	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank	Bank
Number of Observations	1,101,806	1,101,806	1,101,806	510,582	687,408	687,408	687,408	379,821	687,408

Being in closest quartile to Dynamic Provision Fund floor expands credit growth by 9.6 percentage points.
A one standard deviation increase (0.23) in Dynamic Provision Funds expands credit growth by 4.6 percentage points.

Table 9

Model	(10)	(11)	(12)
Level			
Dependent Variable	Δlog Drawn (2008:Q1-2009:Q4)	Loan Dropped?	Loan Dropped?
d(<25% Dynamic Provision Funds)(2008:Q3)	0.100 ***	-0.046 ***	-0.038 ***
	(.029)	(.014)	(.014)
Dynamic Provision Funds (2007:Q4)	0.198 ***	-0.054 *	-0.057 *
	(.061)	(.03)	(.03)
Other Bank Characteristics	Yes	Yes	Yes
Bank-Firm Relationship Characteristic	Yes	Yes	Yes
Loan Characteristics	No	No	Yes
Province and Industry Fixed effects	--	--	--
Firm Fixed effects	--	Yes	Yes
Firm * Bank Type Fixed Effects	Yes	No	No
Sample with Multiple Bank-Firm Relationships Only	Yes	Yes	Yes
Sample with Firm Characteristics Only	No	No	No
Cluster	Bank	Bank	Bank
Number of Observations	622,824	1,018,699	1,018,699

Similar results for credit drawn and extensive margin

Table 9

Model	(13)	(14)	(15)
Level	Loan		
Dependent Variable	ΔLong-Term Maturity Rate (>1 year) (2008:Q1-2009:Q4)	ΔCollateralization Rate (2008:Q1-2009:Q4)	ΔDrawn to Committed Ratio (2008:Q1-2009:Q4)
d(<25% Dynamic Provision Funds)(2008:Q3)	-0.074 ***	0.012 ***	0.028 ***
	(.021)	(.004)	(.007)
Dynamic Provision Funds (2007:Q4)	-0.175 ***	0.031 ***	0.013
	(.047)	(.01)	(.015)
Other Bank Characteristics	Yes	Yes	Yes
Bank-Firm Relationship Characteristic	Yes	Yes	Yes
Firm Characteristics	--	--	--
Loan Characteristics	Yes	Yes	Yes
Province and Industry Fixed effects	--	--	--
Firm Fixed Effects	Yes	Yes	Yes
Sample with Multiple Bank-Firm Relationships Only	Yes	Yes	Yes
Sample with Firm Characteristics Only	No	No	No
Cluster	Bank	Bank	Bank
Number of Observations	687,408	687,408	687,408

And lower cost. But credit-granting banks shorten credit maturity and increase collateral, to compensate for risk taken during the crisis?

Table 9

Model	(16)	(17)	(18)	(19)	(20)	(21)	(22)
Level				Firm			
Dependent Variable	Δlog Commitment (2008:Q1-2009:Q4)	Δlog Commitment (2008:Q1-2009:Q4)	Δlog Commitment (2008:Q1-2009:Q4)	Δlog Drawn (2007:Q4-2009:Q4)	Δlog Total Assets (2007:Q4-2009:Q4)	Δlog Employees (2007:Q4-2009:Q4)	Firm Death? (in 2009)
d(<25% Dynamic Provision Funds)(2008:Q3)	0.059 ***	0.058 ***	0.051 ***	0.064 ***	0.007 **	-0.005	0.002
	(.017)	(.015)	(.014)	(.016)	(.004)	(.006)	(.001)
Dynamic Provision Funds (2007:Q4)	0.055	0.105 ***	0.111 ***	0.093 **	0.025 **	0.027 *	-0.008 *
	(.04)	(.0363)	(.035)	(.038)	(.011)	(.014)	(.004)
Other Bank Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank-Firm Relationship Characteristic	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Characteristics	No	Yes	Yes	Yes	Yes	Yes	Yes
Loan Characteristics	No	No	Yes	No	No	No	No
Province and Industry Fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Fixed Effects	><	><	><	><	><	><	><
Sample with Multiple Bank-Firm Relationships Only	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sample with Firm Characteristics Only	No	Yes	Yes	Yes	Yes	Yes	Yes
Cluster	Main Bank	Main Bank	Main Bank	Main Bank	Main Bank	Main Bank	Main Bank
Number of Observations	229,348	118,616	118,616	49,137	79,183	71,532	149,304

Real effects at the firm level
for firm credit, assets, employment, and survival!

Figure 3

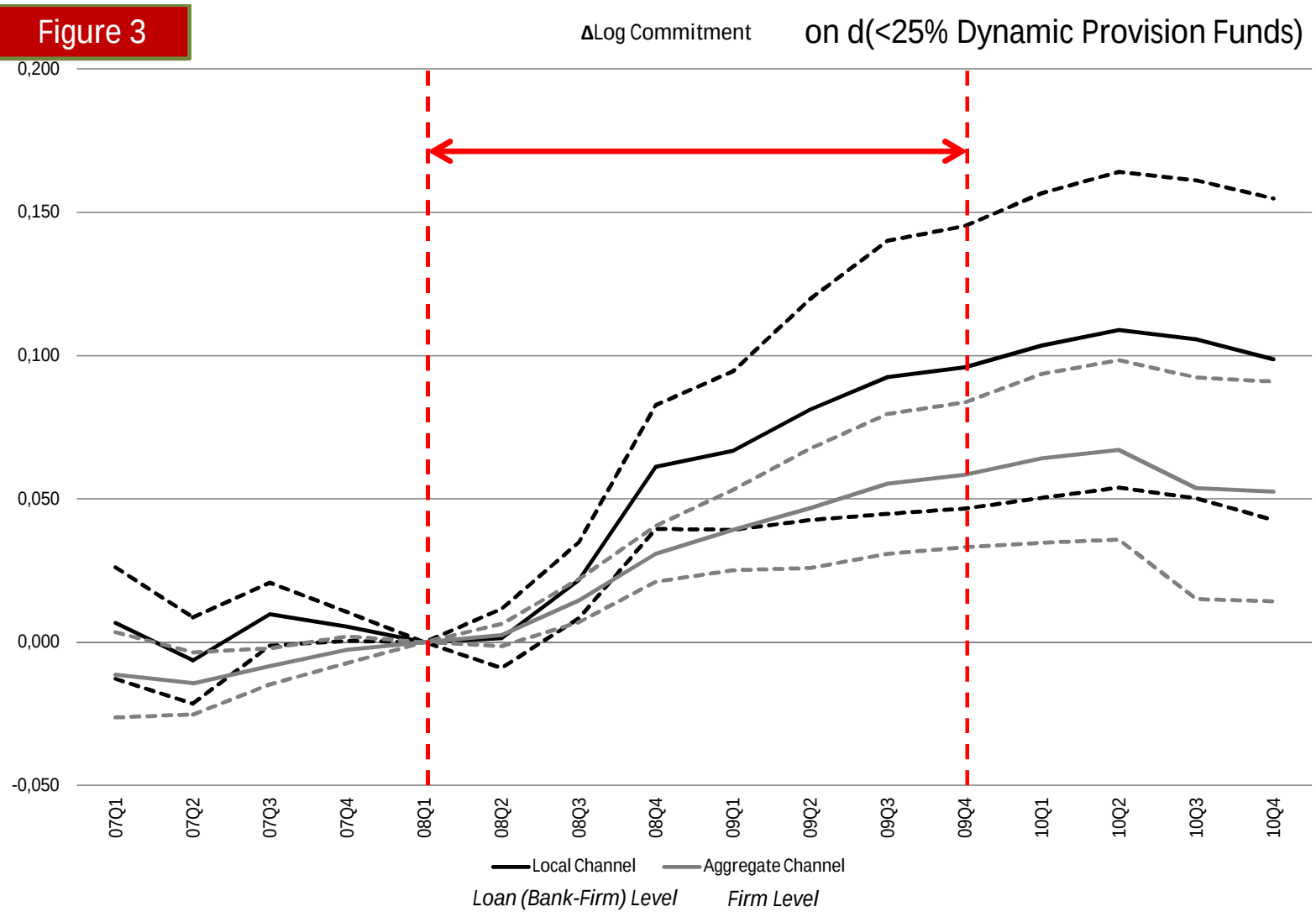
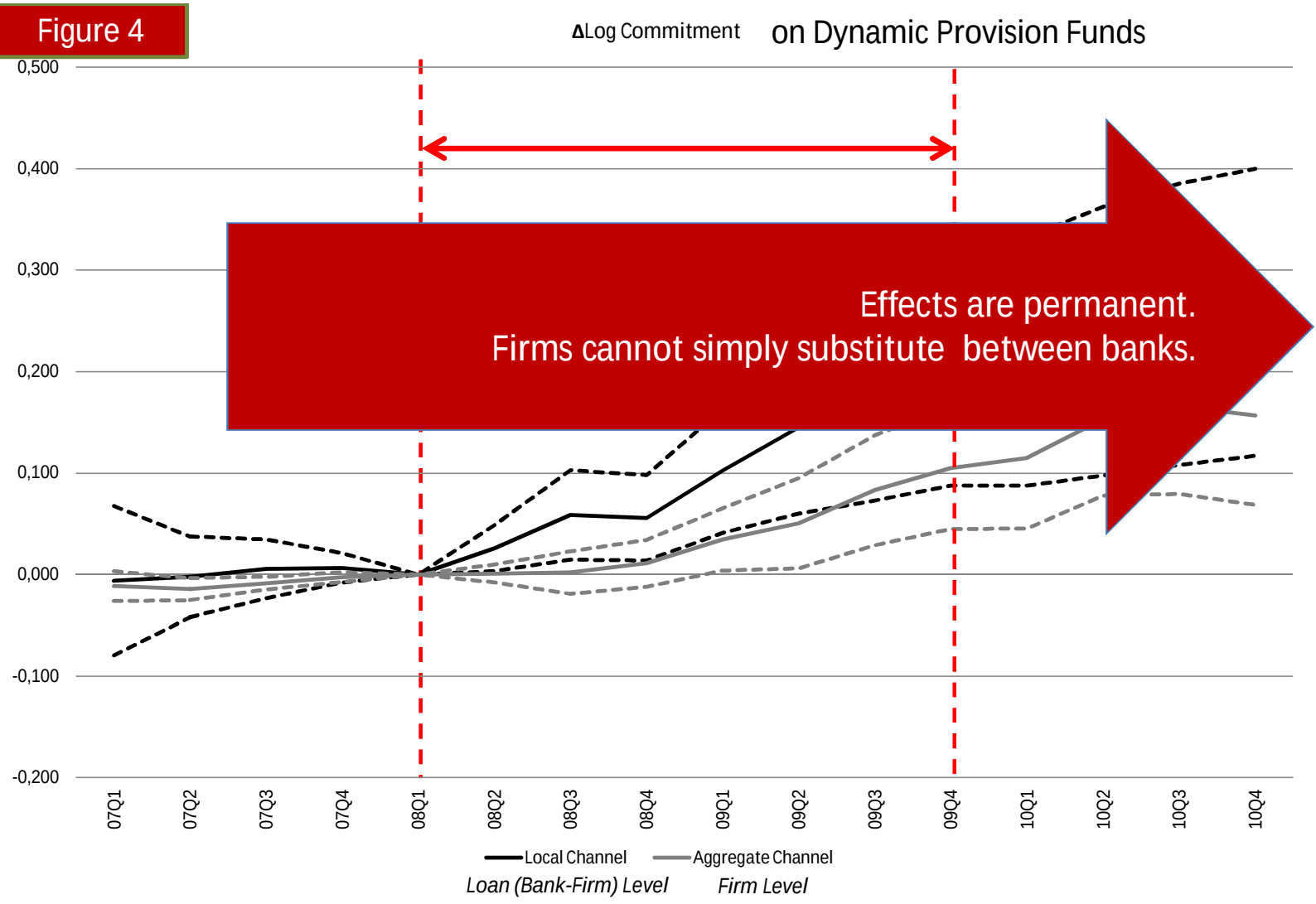

ΔLog Commitment
on d(<25% Dynamic Provision Funds)
0,200
0,150
0,100
0,050
0,000
-0,050
07Q1
07Q2
07Q3
07Q4
08Q1
08Q2
08Q3
08Q4
09Q1
09Q2
09Q3
09Q4
10Q1
10Q2
10Q3
10Q4
Local Channel
Aggregate Channel
Loan (Bank-Firm) Level
Firm Level

Figure 4



Similar effects at the firm level for firm assets, employment, and survival!

Table 9

If no floor lowering would have taken place, firms at banks in lowest quartile of *Dynamic Provision Funds* would have faced:

- 5 percentage points lower committed credit growth
- 1 percentage point lower total asset growth

If banks' *Dynamic Provision Funds* would have dropped from its mean (1.17) to zero in 2007:Q4, then firms would have faced:

- 12 percentage points lower committed credit growth
- 3 percentage points lower total asset growth
- 3 percentage points lower employment growth
- almost 1 percentage point lower likelihood of firm survival

In the other (earlier tabulated) studies:
A similar drop in the capital ratio cuts bank-level credit growth by 0 to 4 percentage points

Our study:
- Dynamic provision fund: Built-up (for these purposes, i.e., to be released in bad times)
- Firm-level: Different weighting? Other credit?
- In Bad times: Effect of capital ratio 3x as large in Carlson, Shan and Warusawitharana (2011)

Loan Application-Level Model

Loan Application is Accepted and Granted

$(\text{impact period})_{bf}$ =

Bank Dynamic Provisioning$(\text{basis period})_{bf}$

+ Controls_{bf} + Fixed Effects + ε_{bf}

Other Bank Characteristics
Ln(Total Assets), Capital Ratio, Liquidity Ratio, ROA, Doubtful Ratio, Commercial or Savings Bank
Bank-Firm Relationship Characteristic
Ln(1+Number of Months with the bank)
Firm * Time Fixed Effects
Loan Application Sample
Cluster at Bank Level

Table 9

If no floor lowering would have taken place, non-current firms at banks in lowest quartile of *Dynamic Provision Funds* would have faced:

- 6 percentage points *higher* probability of getting a loan application accepted and granted there

If banks' *Dynamic Provision Funds* would have dropped from its mean (1.17) to zero in 2007:Q4, then non-current firms would have faced:

- 9 percentage points lower probability of getting a loan application accepted and granted there

Following the floor lowering, the <25%-provisioned banks
lend relatively less to
non-current borrowers.

Well provisioned banks
lend relatively more to the
non-current borrowers.

(recall that it is overall difficult for firms to substitute credit)

Cross-Sectional Loan-Level Models

$$\Delta \log \text{Commitment(impact period)}_{bf} = \text{Bank Dynamic Provisioning(basis period)}_{bf} + [BDP_{bf} * Controls_b] + [BDP_{bf} * Controls_f] + Controls_{bf} + \text{Fixed Effects} + \varepsilon_{bf}$$

Other Bank Characteristics Ln(Total Assets), Capital Ratio, Liquidity Ratio, ROA, Doubtful Ratio, Commercial or Savings Bank
Bank-Firm Relationship Characteristic Ln(1+Number of Months with the bank)
Firm Fixed Effects
Sample with Multiple Bank-Firm Relationships & Firm Characteristics Only
Cluster at Bank, Firm Level

Table 10

Following the floor lowering, the <25%-provisioned banks
with low non-performing loan ratios, or
that are small
lend more to
firms that are lowly capitalized.

Well provisioned banks
with low non-performing loan ratios
lend more to
firms that are lowly capitalized, or
with a good credit history, or
that have been with the bank for a longer time.

(despite also engaging relatively more non-current borrowers)

Intended contributions

We exploit macroprudential policy shocks to bank capital (countercyclical buffers)

both in good and bad times

to identify the impact of bank capital on the supply of credit

1. Unique (in the world) policy experiments with countercyclical capital buffers changing taking place before Basel III and the new macroprudential policies → key contribution
   - Many new theory papers on this

2. In Jiménez, Ongena, Peydró and Saurina (AER f) we find that credit supply is pro-cyclical in GDP and monetary conditions and stronger for banks with a lower capital ratio
   - We used lagged bank capital. But bank capital is a key strategic variable and → likely endogenous
   - Our innovation: to exploit the policy shocks affecting bank capital: *causality* from bank capital to the supply of credit

Conclusions and policy implications

- Identify countercyclical bank capital buffers effects on credit supply
- Experimental setting: Spain 1999-2010
  - Dynamic provisioning policy shocks, crisis shock, and credit register
- Results
  - Countercyclical bank capital buffers mitigate credit supply cycles, at least have positive impact on firm-level credit availability and performance
  - Corporate finance implications for firms and banks
  - Individual bank capital (not only aggregate) matters in crises for macro real effects
- Important policy implications for:
  - Basel III, bank bailouts, monetary policy and for macroprudential policy
  - Contingent convertible bonds attractive