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

**G. Jiménez; S. Ongena; J.L. Peydró and Jesús Saurina**

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FINANCIAL STABILITY DEPARTMENT

# Caveat

**The views expressed here are those of the author and not necessarily those of the Banco de España or the Eurosystem**

# Outline

- **Introduction**
  - Lending cycles and macroprudential policy
- **Policy shocks: dynamic provisioning experiments**
  - How does it work?
  - Different policy shocks (2000 and 2008) and the crisis shock
- **Empirical strategy and data**
  - Empirical strategy
  - Loan, firm and bank datasets
- **Results**
  - 2000 policy shock and the crisis shock
  - Loan- and firm-level results
- **Conclusions**
  - Contribution to the literature
  - Implications for policy and theory

# Banking crises

- **Western Europe and USA suffered a banking crisis, followed by a strong 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 of credit supply** (Bernanke, AER 1983)

- **Banking crises, moreover, come after periods of very strong credit growth** (Kindleberger, 1978; Schularick & Taylor, AER 2011; Gourinchas & Obstfeld, AEJ Macro 2012; Bordo & Meissner, 2012)

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

- **Credit growth is 7% on average in good times before banking crises and -2% after the start of crises** (Schularick & Taylor, AER 2011)

# Credit supply cycles

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

- **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)**

- **In good times:**

  **Problem: too high credit supply (seeds for the next crisis) since e.g. banks have little capital (owned funds) at stake (Holsmtrom & Tirole, QJE 1997)**

# Macroprudential policy and credit cycles

- **The strong real effects from financial crisis implies that regulation needs to move into a macroprudential direction (see e.g. 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 each individual institutions**
- **Countercyclical macroprudential policy (capital/provisions) tools could be used to address cyclical vulnerabilities in systemic risk from credit cycles**

# One macroprudential 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 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)**

- **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**

# Basel III

- **Significant step forward:**
  - **It includes a countercyclical tool in prudential policy**
  - **The so-called countercyclical bank capital buffers, which increases during boom times and declines during recessions**
  - **From 0% to 2.5% of RWA**

***"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

# Question

**What are the effects of countercyclical bank capital buffers on credit supply, in good and in crisis times?**

- **Bank and firm heterogeneity**
- **Real effects: firm employment, assets and survival**
- **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) is <u>needed</u>:**

1. **Policy shocks to countercyclical bank capital buffers that affect banks differentially**
2. **An unexpected crisis shock (to test the good and bad times)**
3. **Comprehensive loan-, firm- and bank- level data**

**Crucial to disentangle credit supply (availability) from demand (firm fundamentals)**

**To obtain firm level aggregate estimates**

# Experimental setting: Dynamic Provisioning in Spain (1999-2010)

- **Policy experiments with dynamic provisioning exogenously increase banks' retained profits in good times to be used during crisis times**
- **Exploit policy shocks in good times: the contractionnary introduction in 2000**
- **Exploit the unexpected 2008 crisis shock along with the (ex-ante) pre-crisis provision buffers and a policy shock inside the crisis**
- **Policy and crisis shocks affected banks differently**
- **Comprehensive credit register matched with bank and firm characteristics to identify credit availability and real effects**
  - ***Empirical strategy: Difference-in-differences (banks more/less affected by shocks and before/after shocks) and comprehensive data allow for identification*** **(see: Khwaja & Mian, AER 2008; Jimenez, Ongena, Peydro & Saurina, AER forthcoming; Jimenez, Mian, Peydro & Saurina, 2011)**

# The introduction of dynamic provisions

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

- **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 follows high NPLs, but specific provisions are very low in good times and very high in bad times** **(see Laeven & Majnoni, JFI 2003) (see Saurina et al (2000), Saurina (2009a) and Saurina (2009b) for all the details on dynamic provisioning)**

# Dynamic provisions: policy shocks and basic idea

- **Introduced in mid-2000 (contractionary shock)**

  **modified in 2008:Q4 (to allow banks to use more the provision funds built up in good times)**

- **Forward-looking: provisions before any loss arrives**

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

- **Tier-2 Capital**

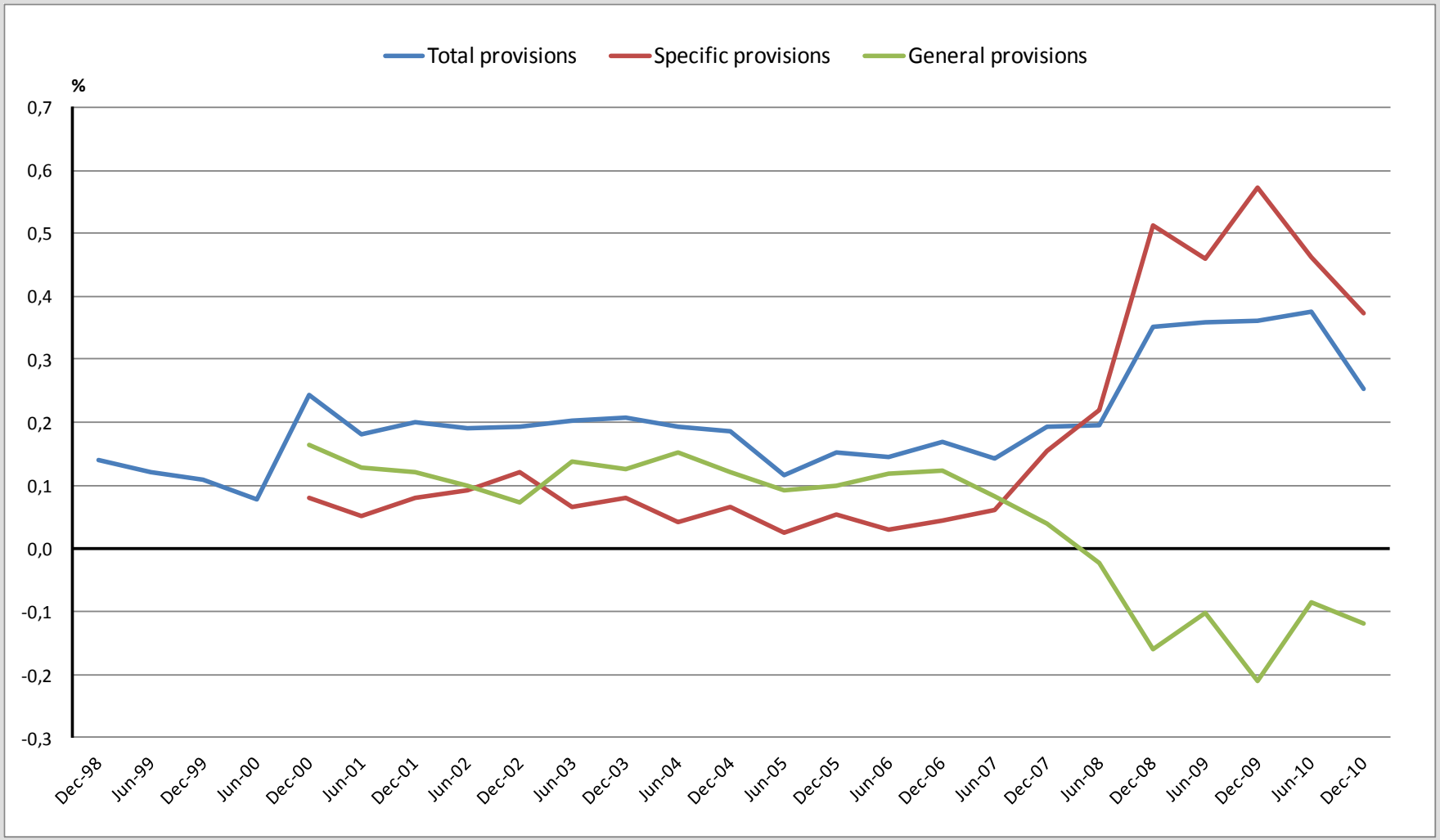
# A simple countercyclical mechanism

- **In periods of expanding credit, a buffer of provisions is being built up to be used in crisis times**
  - Analyze the introduction in 2000

- **In periods when specific losses materialize in individual loans (bad times), the banks can draw down from the previously built-up buffer of provisions**
  - Analyze the pre-crisis built-up buffers in the unexpected 2008 crisis
  - The Spanish dynamic provision also includes an upper and lower limit in the amount of the fund being built. The lower limit was relaxed in the crisis and we also exploit this policy shock

- **Formula: Automatic increase of dynamic provisions when current specific provisions are lower than average value over the cycle (good times); a decrease when it is higher (bad times)**
  - Same formula for everybody, but treatment intensity is different depending on each bank's loan portfolio

# Flow of provisions



# Empirical identification

- **Using a difference-in-difference approach, we compare bank lending before and after the different shocks:**
  - policy shocks in good times: introduction in July 2000 of the new regulation
  - exploit crisis shock: provision funds before the start of the 2008:Q3 crisis (2007:Q4) and policy change of the lower floor of provision funds in 2008:Q4

- **We differentiate across banks with varying susceptibility to the shocks and employ firm*time fixed effects to control for time-varying observed and unobserved firm heterogeneity fundamentals → identify credit availability**
  - control also for other key bank characteristics
  - all margins of lending, firm and bank heterogeneity

# Bank's susceptibility to shocks: Buffers

- **For the policy shock in good times:**

  new formula applied to the existing loan portfolio for each bank yielding a bank-specific amount of new funds to be provisioned (over total assets) (we use 1998:Q4 loan data to avoid self-selection)

- **For the 2008:Q3 crisis shock:**

  how much each bank had built up as dynamic (general) provisions just prior to the onset of the crisis (2007:Q4) over total assets

  policy change of lower floor of provision funds in 2008:Q4 affects more the banks with lowest provision funds in 2008:Q3

# Credit register

- **Credit register from Spain matched with firm and bank relevant information (e.g. in 2007:Q2: 600,000 loans; 100,000 firms; 175 banks)**
- **Exhaustive loan (bank-firm) level data on *all* outstanding business loan contracts (including loan applications) at a quarterly frequency matched with supervisory bank data and firm level balance sheet data**
- **We calculate the total exposures by each bank to each firm in each quarter from 1999:Q1 to 2010:Q4**

  **The sample period includes one year before the initial shock (to run placebo tests) and we analyze 2 years of data on the crisis**
- **We analyze changes in (log) credit volume (commitment or drawn), maturity, collateral and the cost of lending (proxied by the percentage of drawing down to total committed loans)**

  **Intensive and extensive margin of lending**

# Benchmark loan-level equations and hypotheses

$$\Delta Credit_{b,f} = a + b_f + d_b + e_{b,f}$$

- **Simple model: credit change due to a (i) secular trend, (ii) firm fundamentals/demand and (iii) bank capital shock (credit supply), (iv) idiosyncratic shock**
- **LHS is change (after-before shock) in credit: log credit volume (commitment or drawn), short-term loans, collateralized loans, and drawn to committed loans**
- **Bank capital buffer shocks (called buffers):**
  - **Good times: policy shocks of mid 2000**
  - **Bad times: crisis shock with pre-crisis provision buffers (from 2007:Q4) and policy shock in 2008:Q4**
- **Buffers is our main variable on dynamic provisions**
  - **Firm fixed effects to control also for unobserved heterogeneity**
  - **Bank controls are bank size, capital, NPL, ROA, liquidity, real estate exposure and bank type (commercial, saving and coop banks)**
  - **We test whether the coefficient of buffers (δ) is different from 0**

(see Khwaja and Mian, AER 2008; Jimenez, Ongena, Peydro and Saurina, AER forthcoming)

# Benchmark firm-level equations and hypotheses

$$\Delta Credit_f = a + \bar{d}_f + e_f$$

- **Estimate similar firm-level regression to check firm-level effects in credit availability and real effects**
- **We use the weighted average at the firm-level of the bank supply shocks stemming from**

  **capital buffers (weighted by the importance of each bank to the firm by the loan size)**
- **We control for firm observable characteristics as firm industry, location, size, leverage, profits, liquidity, tangible assets, and credit history**
- **Still if unobservable firm characteristics are correlated with the bank shock, then OLS is**

  **biased. However, if the coefficient in the loan level regressions with firm fixed effects and the one with only firm observables are not statistically different, then the <u>firm level coefficient is unbiased</u>** (see Jimenez, Mian, Peydro and Saurina, 2011)
- **If substitution effects are important, the firm level coefficient (δ) should be lower than the loan level coefficient in absolute value**

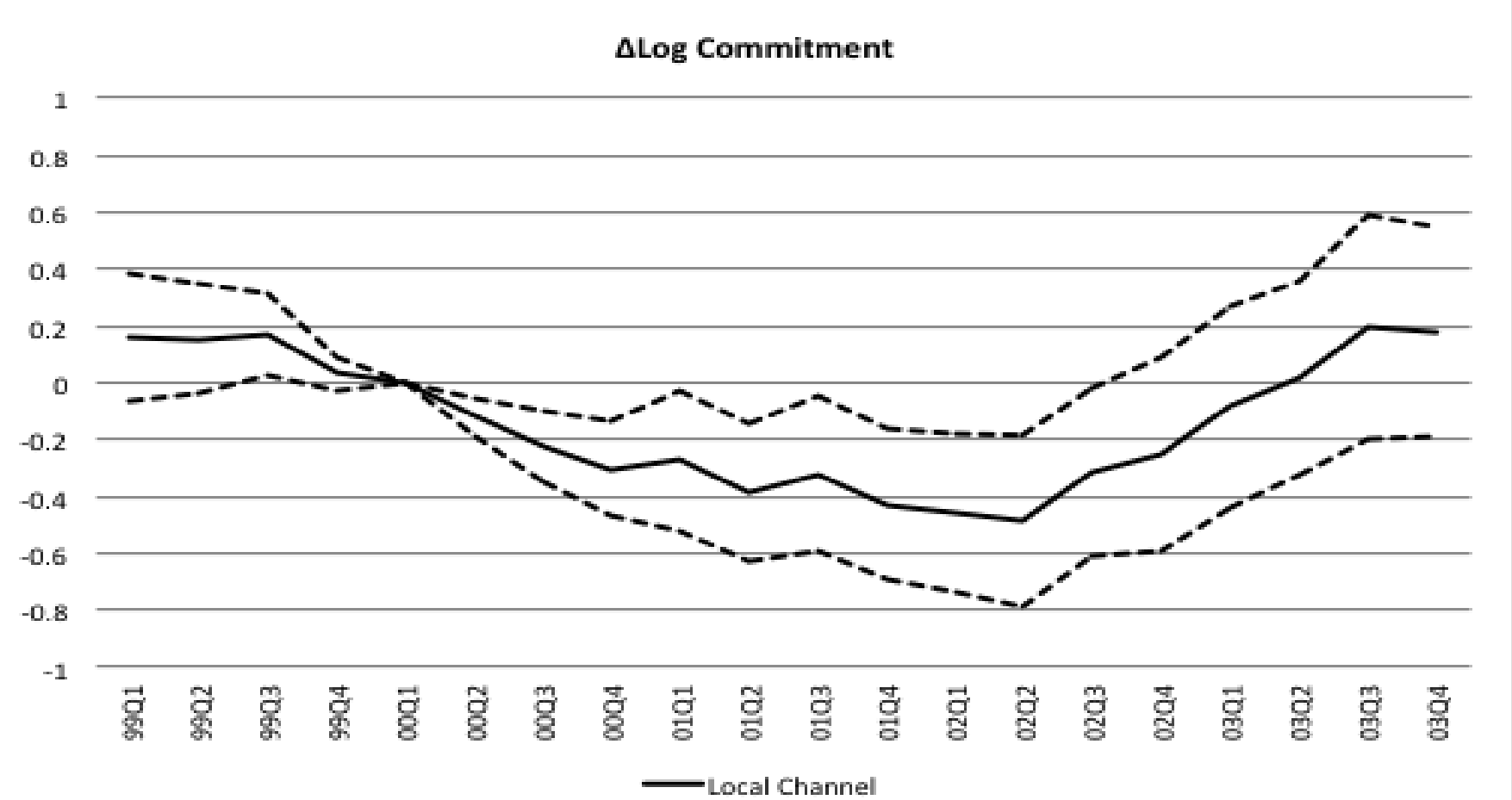
# Policy shock of July-2000, loan-level data
# impact of DP buffers on log credit commitment

TABLE 3
LOAN-LEVEL ANALYSIS OF THE EFFECTS OF THE INTRODUCTION OF DYNAMIC PROVISIONING IN 2000:Q3

| Model | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
|---|---|---|---|---|---|---|---|---|---|
| **Level** | **Loan** | | | | | | | | |
| Dependent Variable | Δlog Commitment (2000:Q1-2001:Q2) | Δlog Commitment (2000:Q1-2001:Q2) | Δlog Commitment (2000:Q1-2001:Q2) | Δlog Commitment (2000:Q1-2001:Q2) | Δlog Commitment (2000:Q1-2001:Q2) | Δlog Commitment (2000:Q1-2001:Q2) | Δlog Commitment (2000:Q1-2001:Q2) | Δlog Commitment (2000:Q1-2001:Q2) | Δlog Commitment |
| Dynamic Provision(for 1998:Q4)$_b$ | -0.024 | -0.253 | -0.336 ** | -0.366 ** | -0.366 ** | -0.357 *** | -0.259 ** | -0.389 *** | -0.390 *** |
| | ( .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 |
| Multiple Banks Only | No | No | No | No | Yes | Yes | Yes | Yes | Yes |
| Larger Firms Only | No | No | No | Yes | No | No | No | Yes | No |
| Cluster | Bank | Bank | Bank | Bank | Bank | Bank | Bank | Bank | Bank |
| # Obs | 666,698 | 666,698 | 666,698 | 313,234 | 416,611 | 416,611 | 416,611 | 237,905 | 416,611 |

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

# Policy shock of July-2000, loan-level data
# time-varying coefficients of DP buffers on log credit commitment

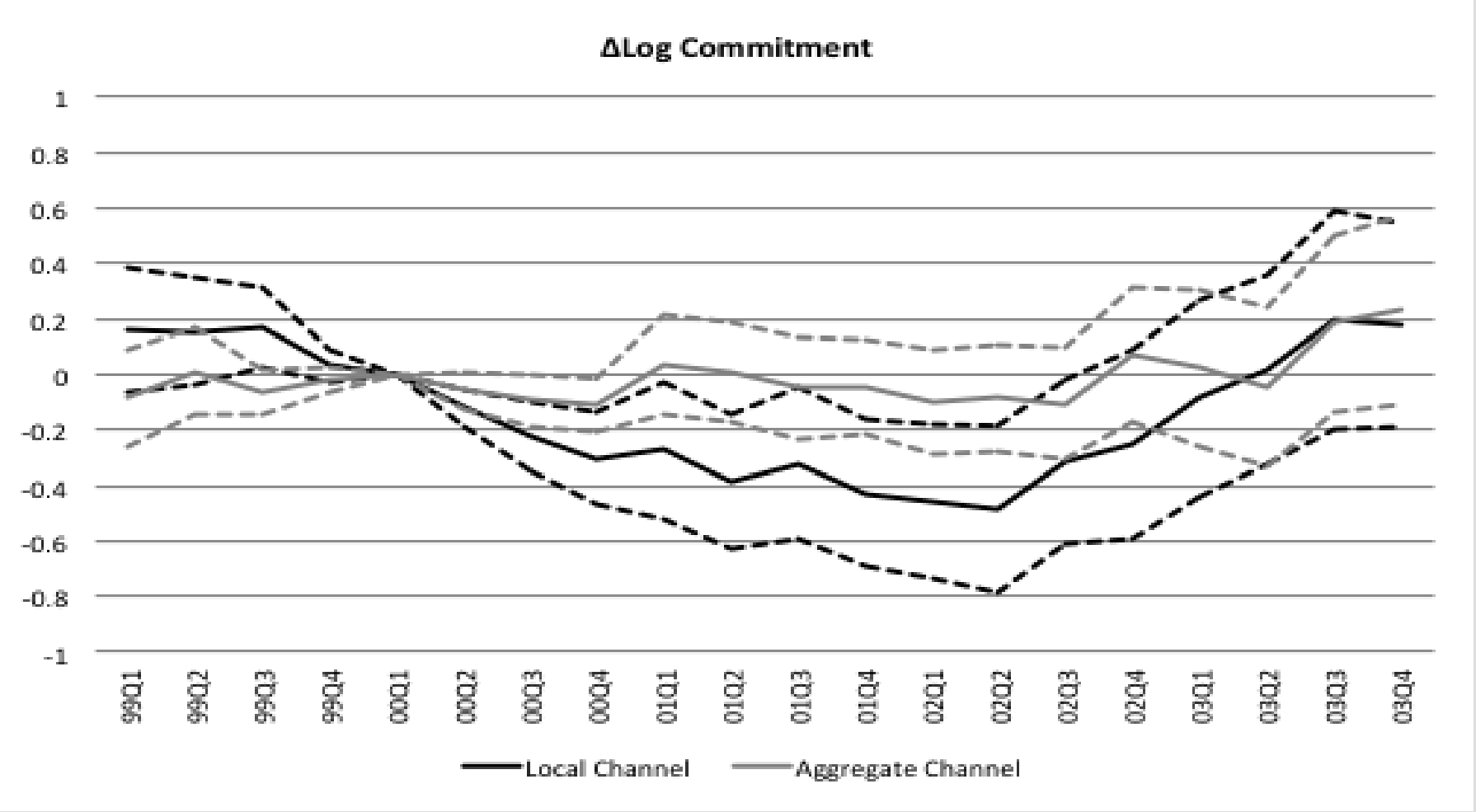



**Similar results for extensive margin and for credit cost, maturity and collateral**

# Policy shock of July-2000, firm-level data
# impact of DP buffers on log credit commitment

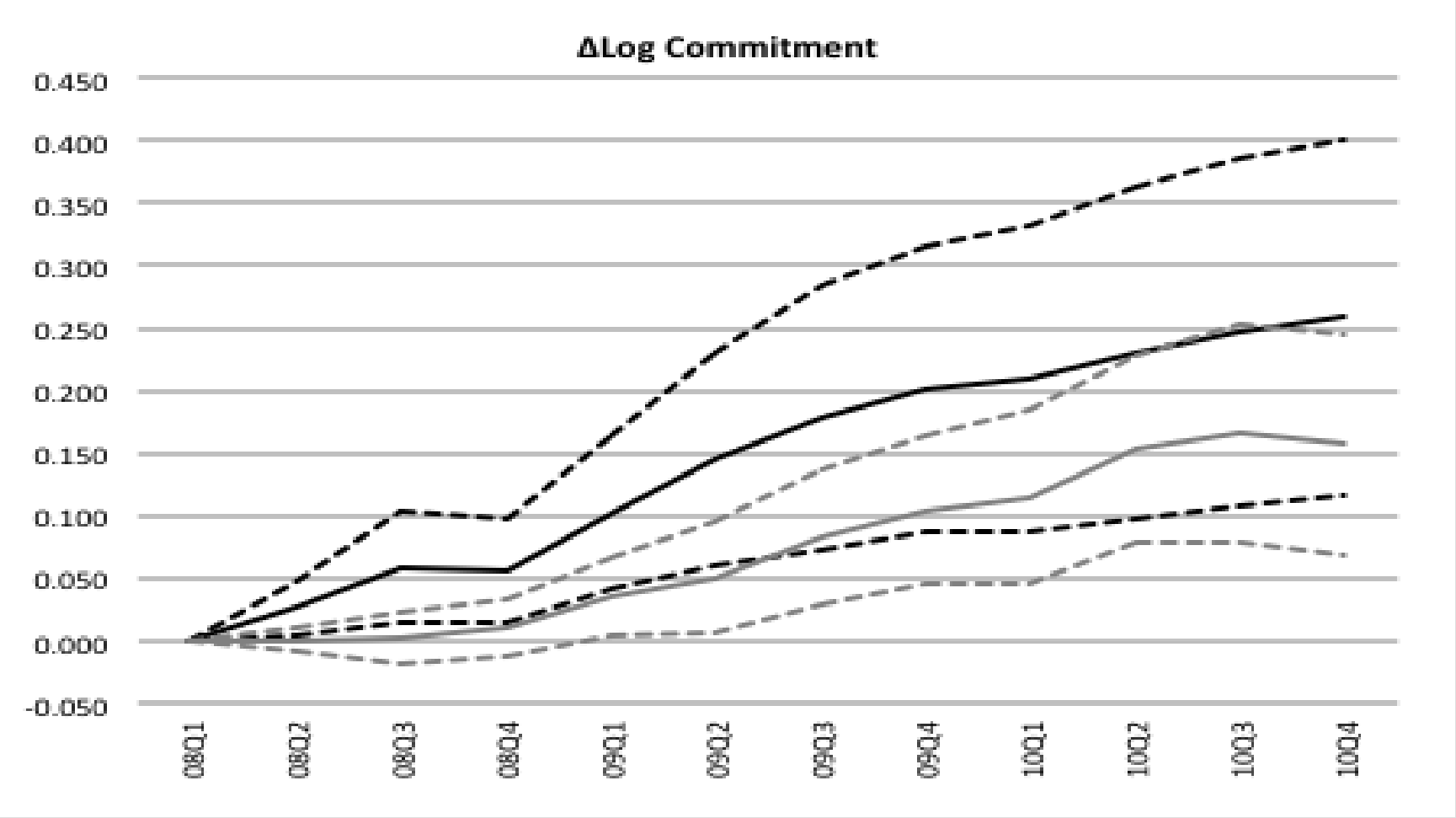
| Model | (16) | (17) | (18) | (19) | (20) | (21) | (22) |
|---|---|---|---|---|---|---|---|
| **Level** | **Firm** | | | | | | |
| Dependent Variable | Δlog Commitment (2000:Q1-2001:Q2) | Δlog Commitment (2000:Q1-2001:Q2) | Δlog Commitment (2000:Q1-2001:Q2) | Δlog Drawn (2000:Q1-2001:Q2) | Δlog Total 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 |

# Policy shock of July-2000, loan & firm-level data
# time-varying coefficients of DP buffers on log credit commitment



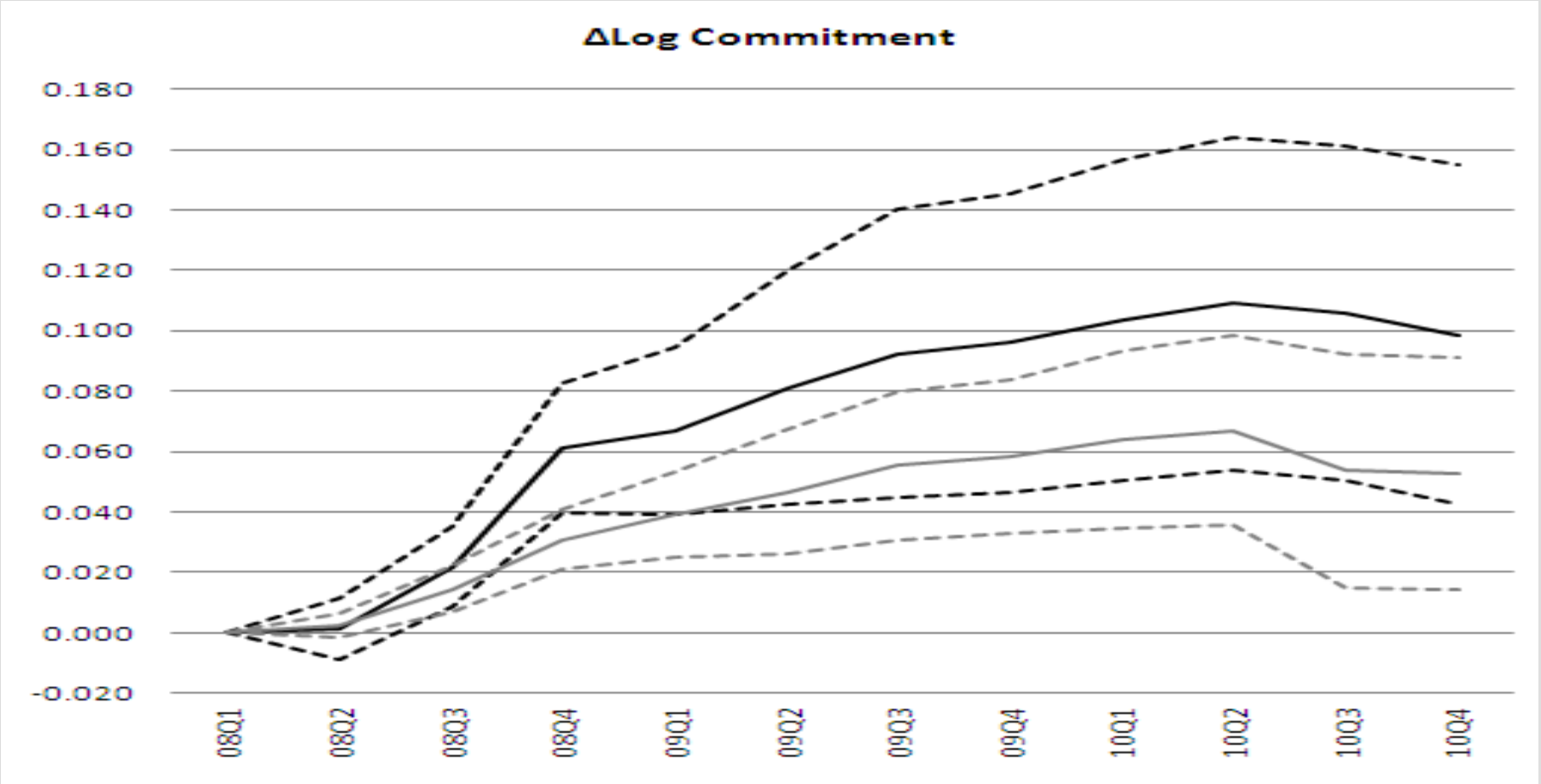

**No real effects at the firm level!**

# Crisis shock, loan & firm-level data
# time-varying coefficients of pre-crisis buffers on log credit




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

# Policy shock, loan & firm-level data
# time-varying coefficients of policy shock on log credit




**Real effects at the firm level!**

# Economic significance

- **1% point lower ex-ante ratio of general provisions implies at the firm-level:**
  - ➢ **less credit availability by 10% point**
  - ➢ **lower total assets by 2.5% point**
  - ➢ **less employment by 2.7% point**
  - ➢ **almost 1% point lower likelihood of firm survival**
  - ➢ **similar results for the policy shock in the crisis for credit availability and assets (taking into account the standard deviation of the two shocks)**
  - ➢ **results are binding and do not drop over time consistent with the difficulty in obtaining new credit from new banks in the crisis**

# Results: summary

**Countercyclical bank capital buffers lead to:**

- **Changes in bank credit availability**

  **During good times they strongly contract credit availability (volume and cost) at the *loan (bank) level*, but strongly expand it during the 2008-10 crisis!**

  - **Some differences between the different shocks**
  - **Heterogeneous effects for bank size and NPLs**
  - **Heterogeneous effects for firm risk (i.e. bank risk-taking)**

- **Strong, positive aggregate firm-level credit availability and real effects**

  **Firm bank credit availability (almost) NOT affected in good times (no real effects)!!**

  **But strong and permanent POSITIVE impact in crisis times for firm credit availability, employment, total assets, and survival**

# Conclusions and policy implications

- **We exploit macroprudential policy shocks to bank capital (countercyclical buffers) both in good and bad times to identify the impact of capital on credit supply:**
  - **Unique (in the world) policy experiments on countercyclical capital buffers taking place before Basel III and the new macroprudential policies**
  - **Lots of new theory papers on this issue**
- **Experimental setting: Spain 1999-2010**
  - **Dynamic provisioning policy shocks, crisis shock, and credit register**
- **Results**
  - ➢**Countercyclical bank capital buffers mitigate credit supply cycles and have positive aggregate firm-level credit availability and real effects**
  - ➢**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**

Gabriel Jiménez Zambrano
gabriel.jimenez@bde.es

# THANK YOU FOR YOUR ATTENTION

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