The Economic Effects of a Borrower Bailout:
Evidence from an Emerging Market

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Motivation

What do economic stimulus programs do?

1. Economic stimulus programs have a long history
   → Great Depression and New Deal Era in the United States
   → Direct subsidies to stimulate demand
   → Debt moratoria and restructuring programs
   → Examples from the recent financial crisis:
   → Direct subsidies for investment or consumption
   → Credit market interventions
   → Tax policy

2. But effects on economic activity remain poorly understood
   → Effects on real economic activity
   → Time pattern of effects
   → Externalities
Motivation

Stimulus programs through the credit market

1. The case for interventions into debt contracts
   - address credit constraints; stimulate investment and consumption directly
   - Insurance against otherwise uninsurable aggregate shocks
     (Bolton and Rosenthal, 2002)
   - mitigate deadweight losses from large scale default and foreclosure
     (Guiso, Sapienza and Zingales, 2009; Breza 2013; Giné et al 2013)

2. The case against interventions into debt contracts
   - Distort incentives for banks (Diamond and Rajan 2000; Gianetti and Simonov, 2009; Phillipon and Schnabl 2013)
   - Distort contracting environment and incentives for borrowers
   - may lead to ex-post credit rationing
Use natural experiment to trace the effects of large stimulus program

- Stimulus enacted through an ex-post intervention in the credit market
  - Provide causally identified evidence
  - Quantify credit market and real effects

Moral hazard consequences

- Political interventions into debt contracts and moral hazard (Guiso, Sapienza and Zingales, 2009; Breza, 2013; Giné et al 2013)
  - Estimate moral hazard costs directly
  - Distinguish between impact on bank and borrower risk-taking

Interaction with the political cycle

- Political cycles in lending and loan performance (Dinç 2005, Cole 2009)
  - Identify mechanisms perpetuating moral hazard
Main findings

1. **Post-program credit supply**: Indian districts with greater exposure to the bailout experienced a significant post-program slowdown in new lending.

2. **Ex-post moral hazard**: Districts with a greater exposure to the bailout saw significantly faster growth in non-performing loans after the program.

3. **Bank versus borrower moral hazard**: The results suggest that deterioration in loan performance is due to borrower-not bank moral hazard.

4. **Real effects**: Our estimates on agricultural productivity identify a precise zero.

5. **Mechanism – moral hazard and the electoral cycle**: The program magnified default cycles around election years, suggesting the anticipation of politically motivated credit market interventions as a key mechanism that reinforces moral hazard in loan repayment.
India’s Bailout for Rural Households
The program
India’s bailout for rural households

Why is this an interesting program to study?

- Possibly the largest household level bailout program in history
- **Economically significant**
  - US$ 16 - 17 billion
  - 1.7 - 2% of India’s GDP
  - Benefit to approximately 50 million rural households
- **Representative of a common class of stimulus programs**
  - Ex-post restructuring of debt contracts
  - Examples from the United States
    - Debt moratoria in the 1930s
    - Mortgage restructuring
  - Examples from developing economies
    - Thailand: US$ 2.9 billion bailout for rural households
    - Brazil: restructuring of more than US$ 10 billion farm debt
The program

India’s bailout for rural households

The **Agricultural Debt Waiver and Debt Relief Scheme (ADWDRS)**

- Partial or full bailout of all agricultural loans outstanding and overdue
  - Covers all ag loans originated Dec 31, 1997 – Dec 31, 2007
  - Loan must be 90+ DPD on February 28, 2008
  - Loans at private, public sector, cooperative and regional rural banks
  - Eligibility depends on land pledged as collateral
  - Banks refinanced by the Reserve Bank of India

- What was the policymaker’s motivation?
  - Stimulate demand and investment
  - Transfer to rural voters ahead of national elections
  - Resolve accumulated bad loans in the books of state banks
The natural experiment
India’s bailout for rural households

Identification challenge: endogeneity of program exposure
- Land-based eligibility rules generate exogenous variation in bailout exposure
- Benefit depends on land pledged as collateral several years prior to program
- Program rules were unanticipated, applied retrospectively
  → no prior debt relief program based on landholding

Natural experiment

Land $\leq$ 2 hectares $\rightarrow$ 100% unconditional bailout

Land $> 2$ hectares $\rightarrow$ 25% conditional bailout
The natural experiment
India’s bailout for rural households

Exogenous variation in program exposure

- Two sources of **exogenous variation at the district level** are key to our identification strategy:

  A. **Share of credit that is below collateral threshold and could have qualified** is determined by a district’s historical land distribution

  B. **Time series of weather shocks determines credit share actually in default**
The natural experiment

Timeline

- December 1997 to December 2007

1997 - Dec 31, 2007 - Feb 28, 2008 - 2010
The natural experiment

Timeline

- **December 1997 to December 2007**
  - Households take up loans
  - Pledge land as collateral

Map of India showing the distribution of loans originated from December 1997 to December 2007.

Timeline:
- 1997
- Dec 31, 2007
- Feb 28, 2008
- 2010

Legend:
- 97
- 98
- 99
- 00
- 01
- 02
- 03
- 04
- 05
- 06
- 07
- No data

- Loans originated

Map colors represent the number of loans originated: dark red indicates a higher number of loans.
The natural experiment

Timeline

- **December 1997 to December 2007**
  - Households take up loans
  - Pledge land as collateral

- **March 28, 2008**
  - Debt relief program is announced
The natural experiment

Timeline

- **December 1997 to December 2007**
  - Households take up loans
  - Pledge land as collateral

- **March 28, 2008**
  - Debt relief program is announced
  - Loan has to be in default as of December 31, 2007, and until February 28, 2008
  - Eligibility is based on collateral
The natural experiment

Timeline

- **December 1997 to December 2007**
  - Households take up loans
  - Pledge land as collateral

- **March 28, 2008**
  - Debt relief program is announced
  - Loan has to be in default as of December 31, 2007, and until February 28, 2008
  - Eligibility is based on collateral

- **June 2008: program implemented**
  - Borrowers with collateral $\leq$ 2 ha get 100%, borrowers $>2$ ha get 25% conditional relief

- **December 2010: program ends**

```
1997

Dec 31, 2007  Feb 28, 2008  2010
```
Dataset

Overview

▸ **Panel of 491 (of 593) Indian districts 2001-2012**
  ▸ Data at the level of India’s 2001 census districts
  ▸ Districts in the data account for
    ▸ 94% of the Indian population
    ▸ 89% of total bank credit in the base year

▸ **Program exposure**
  ▸ Amount of credit qualifying for the program
  ▸ Amount of debt relief claimed under the program

▸ **Data on credit**

▸ **Data on loan performance**

▸ **Additional controls**
  ▸ Rain, monsoon precipitation as percentage of long-run mean
  ▸ Electoral cycle
Dataset

District-level credit

- **Panel of bank lending at the district level**
  - The Reserve Bank of India BSR dataset
  - Data by district and type of credit
    - Total credit,
    - ag credit
    - consumer credit
  - Covers all commercial bank lending in India
  - Based on census of loans at branch level
  - Reported annually

- **Panel of loan performance**
  - Based on proprietary data from India’s largest four public sector banks
    - agricultural credit and NPLs
    - 27,678 branches in base year
    - approximately 62% of rural credit
Dataset

Additional controls

- **Rainfall, deviation from normal**
  - Monsoon rainfall (variation in credit demand)
    - as percentage of 50 year district average
    - Indian meteorological department data
    - District level gauge data for coverage to 2011
  - control for variation in credit demand

- **Electoral cycle**
  - state elections are staggered in time
    - 5 year election cycle
    - state governments can call early elections
    - full set of election dummies $\sum_{t=0}^{4} e_t$ Program exposure
    - years until next scheduled state election
  - control for political cycles in credit
Empirical Strategy
Empirical strategy

Reduced form difference-in-differences

\[
y_{dt} = \alpha + \gamma (\text{Bailout}_\text{share} \cdot \text{post}) + \delta_d + \vartheta_t + X' \psi_{dt} + \epsilon_{dt}
\]

- Difference-in-Differences (DD) around program date
- Three specifications
  1. District fixed effects and year dummies
  2. Regional credit cycles ⇒ δ_d * region_k
  3. Unit time trends
- Additional controls: rain, electoral cycle dummies
Empirical strategy

Identification

Program exposure

\[
\text{Bailout}_\text{share} = \frac{(1 - \eta) \left[ \text{credit}^S_{dt} + .25\kappa \text{credit}^L_{dt} \right]}{\text{Total credit}_{dt}}
\]

- where \(1 - \eta\) is the share of non-performing loans
- \(\text{credit}^S\) is the amount of credit below the collateral threshold
- \(\text{credit}^L\) is the amount of credit above the collateral threshold
- Let \(\kappa = 1\), estimate ITT effect
Empirical strategy

Identification
Empirical strategy

Identification

Summary statistics

<table>
<thead>
<tr>
<th></th>
<th>Bailout share [N=489]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>.326</td>
</tr>
<tr>
<td>Median</td>
<td>.284</td>
</tr>
<tr>
<td>StDev</td>
<td>.224</td>
</tr>
<tr>
<td>Min</td>
<td>.002</td>
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<td>Max</td>
<td>.991</td>
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</table>
Effects of the Bailout
## T1 Effect on credit supply

### Intensive and extensive margin

<table>
<thead>
<tr>
<th></th>
<th>Δ Amount</th>
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<th>Δ Accounts</th>
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<tbody>
<tr>
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<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
<td>(6)</td>
</tr>
<tr>
<td>Bailout_share*post</td>
<td>-0.025**</td>
<td>-0.024*</td>
<td>-0.102***</td>
<td>-0.018</td>
<td>-0.025**</td>
<td>-0.037*</td>
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<tr>
<td></td>
<td>[0.013]</td>
<td>[0.014]</td>
<td>[0.021]</td>
<td>[0.012]</td>
<td>[0.013]</td>
<td>[0.022]</td>
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<td>4,941</td>
<td>4,941</td>
<td>4,941</td>
<td>4,941</td>
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<td># clusters</td>
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<td>489</td>
<td>489</td>
<td>489</td>
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<td>489</td>
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<tr>
<td>R-squared</td>
<td>0.909</td>
<td>0.912</td>
<td>0.921</td>
<td>0.700</td>
<td>0.717</td>
<td>0.716</td>
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<td>Year fixed effects</td>
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<tr>
<td>Year*region effects</td>
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<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>District time trends</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
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<td>Yes</td>
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</tbody>
</table>

- Persistently lower credit in high-bailout districts
- Bank lending slows down in districts with high program exposure
- Consistent with “evergreening” in pre-bailout period [Peek and Rosengren, 2005]
T1 Effect on credit supply

Intensive and extensive margin

<table>
<thead>
<tr>
<th></th>
<th>Δ Amount</th>
<th></th>
<th></th>
<th>Δ Accounts</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
<td>(5)</td>
</tr>
<tr>
<td>Bailout_share*post</td>
<td>-0.138***</td>
<td>-0.138***</td>
<td>-0.251**</td>
<td>-0.055*</td>
<td>-0.066**</td>
<td>-0.097</td>
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<tr>
<td></td>
<td>[0.027]</td>
<td>[0.030]</td>
<td>[0.123]</td>
<td>[0.031]</td>
<td>[0.032]</td>
<td>[0.091]</td>
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<td>4,918</td>
<td>4,918</td>
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<td># clusters</td>
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<td>489</td>
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<tr>
<td>R-squared</td>
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<td>0.285</td>
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<td>0.107</td>
<td>0.141</td>
<td>0.081</td>
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<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Year*region effects</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>District time trends</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

- Persistently slower credit growth in districts with high program exposure
- Consistent with “evergreening” in pre-bailout period [Peek and Rosengren, 2005]

Placebo – program timing  Placebo – type of credit  Incentives for evergreening
T2 Effect on credit supply

Is there active reallocation?

<table>
<thead>
<tr>
<th></th>
<th>Low-bailout districts</th>
<th>High-bailout districts</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<td>(2)</td>
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<td>Eligible_amount*post</td>
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<td>0.465***</td>
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<td></td>
<td>[0.120]</td>
<td>[0.134]</td>
</tr>
<tr>
<td># observations</td>
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<td>2,478</td>
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<tr>
<td># clusters (districts)</td>
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<td>224</td>
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<tr>
<td>R-squared</td>
<td>0.288</td>
<td>0.344</td>
</tr>
<tr>
<td>Year fixed effects</td>
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<td>No</td>
</tr>
<tr>
<td>Year*region effects</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>District time trends</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

- Significant reallocation of credit in the post-program period
- $1.3 of new lending for every $1 of debt relief in low-bailout districts
- $.16 of new lending for every $1 of debt relief in high-bailout districts
- Post-program bank lending goes to observably less risky districts
## T3 Effect on loan performance

<table>
<thead>
<tr>
<th></th>
<th>1 if ( \Delta \text{NPA} &gt; 0 )</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>All districts</td>
<td>High bank competition</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
<td>(3)</td>
<td>(4)</td>
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<tr>
<td>Bailout_share*post</td>
<td>0.074***</td>
<td>0.088***</td>
<td>0.080*</td>
<td>0.092***</td>
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<tr>
<td></td>
<td>[0.021]</td>
<td>[0.022]</td>
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<tr>
<td>R-squared</td>
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<td>0.276</td>
<td>0.297</td>
<td>0.214</td>
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<tr>
<td>Year fixed effects</td>
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<td>No</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Year*region effects</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>District time trends</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

- What is the impact on moral hazard in loan repayment?
- Bank lending becomes more conservative, new credit goes to lower risk borrowers
- But: unambiguous post program decline in loan performance in high-bailout districts
T4 Real effects: productivity
Revenue per hectare

- Key motivation of bailout programs
  - stimulate demand and investment directly
  - resolve debt overhang, disincentives for productive investment
  - limited evidence that stimulus programs achieve this (Mian and Sufi, 2012)

- Test using district panel of agricultural productivity
  - Crop yields for 20 most common crops in India (yield $r$, area $a$)
  - Wholesale prices of agricultural commodities in base year 2001 $\bar{p}$
  - Panel 2001-2011

Measuring productivity

$$\pi_{dt} = \frac{\sum_{c} r_{dt}^{c} \cdot \bar{p}_{d,2001}^{c}}{\sum_{c} a_{dt}^{c}}$$
## T4 Real effects: productivity

**Revenue per hectare**

<table>
<thead>
<tr>
<th>Log revenue per hectare</th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
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</thead>
<tbody>
<tr>
<td>Bailout_share*post</td>
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<td>0.004</td>
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<td>0.003</td>
<td>0.004*</td>
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<td>[0.003]</td>
<td>[0.002]</td>
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<td>[0.002]</td>
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<td>4,182</td>
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<td># clusters</td>
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<td>488</td>
<td>488</td>
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<tr>
<td>R-squared</td>
<td>0.098</td>
<td>0.181</td>
<td>0.411</td>
<td>0.105</td>
<td>0.187</td>
<td>0.396</td>
</tr>
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</table>

| Year fixed effects      | Yes | No  | No  | Yes | No  | No  |
|                        |     |     |     |     |     |     |
| Year*region effects     | No  | Yes | No  | No  | Yes | No  |
| District time trends    | No  | No  | Yes | No  | No  | Yes |

- No significant effect of bailout on agricultural productivity
- Debt relief does not resolve debt overhang; increase productivity
- Consistent with micro-evidence
Mechanism: Moral Hazard and the Electoral Cycle
Mechanism

Moral hazard and the electoral cycle

- **State elections in India**
  - Electoral cycle affects incentives for default
    - Promises of lenient enforcement (Examples: Haryana, Uttar Pradesh)
    - Political interventions into the credit market (Andhra Pradesh)
- **Political cycles in credit and default**
- **Was this mechanism magnified by the program?**
### T5 Mechanism

Moral hazard and the electoral cycle

<table>
<thead>
<tr>
<th></th>
<th>All districts</th>
<th>High bank competition</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1)</td>
<td>(2)</td>
</tr>
<tr>
<td>Years_to_election*post</td>
<td>-0.011</td>
<td>-0.035**</td>
</tr>
<tr>
<td></td>
<td>[0.014]</td>
<td>[0.017]</td>
</tr>
<tr>
<td># observations</td>
<td>2,913</td>
<td>2,913</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.234</td>
<td>0.273</td>
</tr>
</tbody>
</table>

|                      | (3)           | (4)                   |
|                      | -0.154***     | -0.023                |
|                      | [0.012]       | [0.021]               |
| # observations       | 2,913         | 1,506                 |
| R-squared            | 0.344         | 0.208                 |

|                      | (5)           | (6)                   |
|                      | -0.051**      | -0.120***             |
|                      | [0.026]       | [0.017]               |
| # observations       | 1,506         | 1,506                 |
| R-squared            | 0.257         | 0.324                 |

|                      | (7)           | (8)                   |
|                      | -0.023        | -0.051**              |
|                      | [0.021]       | [0.026]               |
| # observations       | 2,913         | 1,506                 |
| R-squared            | 0.194         | 0.265                 |

|                      | (9)           | (10)                  |
|                      | -0.120***     | -0.120***             |
|                      | [0.017]       | [0.017]               |
| # observations       | 1,506         | 1,506                 |
| R-squared            | 0.265         | 0.324                 |

- Significant negative effect on loan performance
- Effect due to borrower moral hazard; no change in loan size around elections
- Time pattern: effect persistent over time. Do borrowers “learn” to expect renegotiation?
## T5 Mechanism

Moral hazard and the electoral cycle

<table>
<thead>
<tr>
<th>Model</th>
<th>1 if $\Delta$ NPA &gt; 0</th>
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<td>-0.011</td>
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<tr>
<td></td>
<td>[0.014]</td>
</tr>
<tr>
<td># observations</td>
<td>2,913</td>
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<tr>
<td>R-squared</td>
<td>0.234</td>
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</table>

**Model 1**

<table>
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<tr>
<th></th>
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<th>(3)</th>
</tr>
</thead>
<tbody>
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<td>-0.008</td>
<td>-0.010</td>
</tr>
<tr>
<td>*Bailout_share</td>
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<td>[0.012]</td>
<td>[0.014]</td>
</tr>
<tr>
<td># observations</td>
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<td>2,205</td>
<td>2,205</td>
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<tr>
<td>R-squared</td>
<td>0.255</td>
<td>0.284</td>
<td>0.370</td>
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</table>

**Model 2**

<table>
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<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Post*Years_to_election</td>
<td>0.271</td>
<td>-0.296</td>
<td>0.638</td>
</tr>
<tr>
<td>*Bailout_per_capita</td>
<td>[1.082]</td>
<td>[1.127]</td>
<td>[1.213]</td>
</tr>
<tr>
<td># observations</td>
<td>2,205</td>
<td>2,205</td>
<td>2,205</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.261</td>
<td>0.283</td>
<td>0.377</td>
</tr>
</tbody>
</table>

Year fixed effects: Yes, No, No
Year*region effects: No, Yes, No
District time trends: No, No, Yes
Summary

1. Bailout has significant impact on the allocation of credit and post-program moral hazard.

2. We distinguish bank from borrower moral hazard. Bank lending after the bailout becomes more conservative: no extensive margin lending to high-bailout districts.

3. Strong negative effect on loan performance. One standard deviation increase in bailout leads to 7-10% faster growth in non-performing loans. Effect persists.

4. Estimates on productivity identify a zero effect.

Thank you!
Indian census districts