# Monitoring Matters:
## Debt Seniority, Market Discipline and Bank Conduct


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# Introduction

- Debt priority has implications for monitoring incentives.
  - If junior claimants are exposed to greater losses in the event of bankruptcy, they should have greater incentives to increase ex ante monitoring efforts.
- Exploiting an unexplored natural experiment in the U.S. banking industry, we provide novel insights into market discipline in banking.
- Market discipline: Cornerstone of the financial safety net
  - Monitoring dimension: Typically reflected in risk pricing of bank debt.
  - Influencing dimension: Changes in bank conduct.
- We investigate if changes to the priority structure of claims on bank assets affect junior-debtholders (i.e., non-depositors) incentive to monitor and influence conduct.

# Experiment

- Staggered introduction of depositor preference laws (DPLs) in 15 U.S. states between 1983 and 1993.
- Assets of failed bank are paid out to creditors based on a claims structure.
- DPLs change the claim structure on a failed bank's assets by assigning a priority claim to all depositors by subordinating non-depositors.
- DPLs only apply to *state-chartered* but not to *nationally-chartered* banks.

The Banking Act of 1935 specified a claims structure …

| without DPLs | with DPLs |
|---|---|
| 1. Receiver | 1. Receiver |
| 2. Secured creditors | 2. Secured creditors |
| 3. Insured depositors | 3. **Insured & uninsured depositors** |
| 4. **Uninsured depositors & general creditors** | 4. General creditors |
| 5. Shareholders | 5. Shareholders |

# DPLs: Changes in debt seniority

- Subordinating claims of general creditors to those of depositors eradicates costly duplication of monitoring.
- DPLs reallocate monitoring to more efficient monitors, which have more efficient monitoring technologies (Birchler 2000 RFS).

**Empirical predictions:**

Monitoring dimension

- (Uninsured) depositors require a lower interest rate which reduces funding costs and translates into higher bank profits (pricing effect).
  - *Shift in liability structure towards increased deposit funding (quantity effect).*
- Non-depositors seek compensation for higher risk. (pricing effect).
  - *Shift in liability structure away from non-deposit funding (quantity effect).*

Influencing dimension

- Increase in monitoring incentivizes banks to reduce risk.
  - *Reductions in bank risk taking.*

# Contrasting views on DPL

- Proponents from the policy community argue this will:

  1. *Prevent bank runs*
  2. *Engender more stable banking through increased market discipline*

- But the banking industry is sceptical arguing DPL will:

  1. *Raise costs of funding for banks*
  2. *Raise costs for customers*

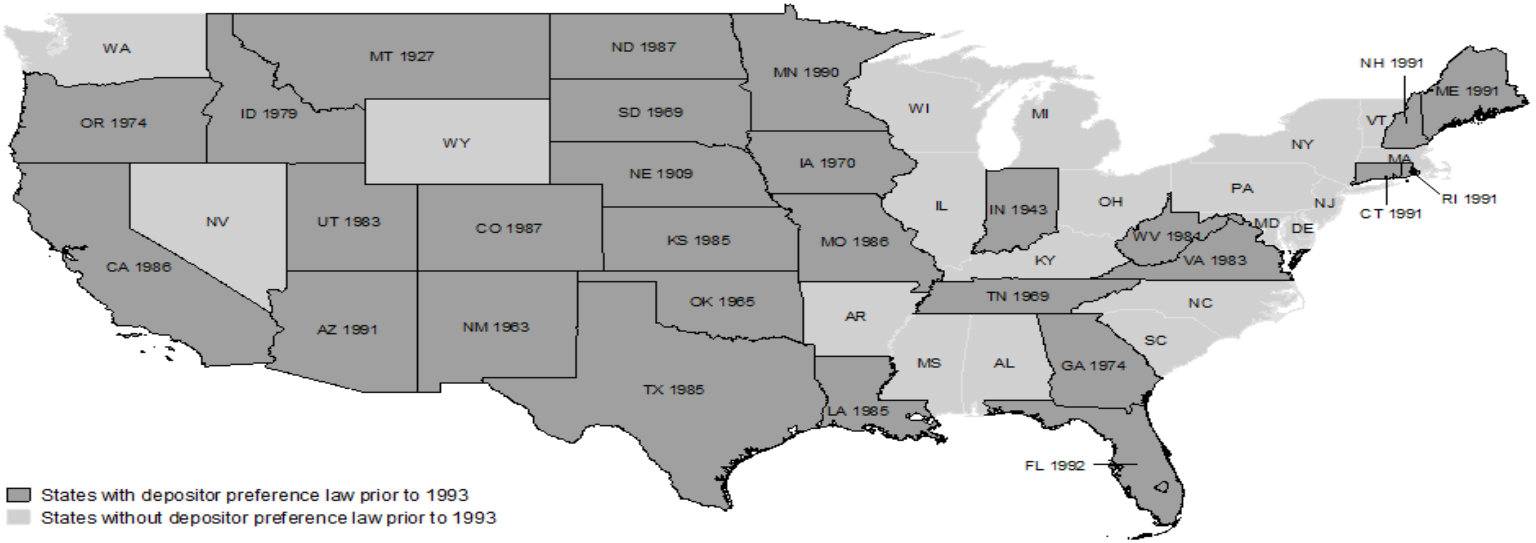
# Why bother?

- Jury is still out on whether private sector agents reliably engage in risk monitoring and preventative influence of bank behavior.
  - Flannery and Sorescu (1996 JF); Bliss and Flannery (2000 WP); Martinez Peria and Schmukler (2001 JF); Goldberg and Hudgins (2002 JFE); Krishnan, Ritchken, and Thomson (2005 JF); Ashcraft (2008 JFI).
- Crisis raised counter concerns that market discipline has lost much of its appeal in the years.
  - Acharya, Anginer, and Warburton (2014 WP)
- New insights for policy and regulation.
  - DPLs as a policy tool received little attention in the past few decades.
  - Debate about such legislation in EU after the crisis with policymakers and academics advocating the use of bail-in provisions where debtholders contribute to bank resolutions (Flannery 2010 WP).
  - ECB called for the introduction of depositor preference laws in all member states of the EU in the aftermath of the crisis in Cyprus (implemented by the end of 2014 in EU member countries).
  - Independent Commission on Banking in the UK recommended the introduction of such laws.
- Implications in a broader corporate finance context.
  - Loan contracts need to be structured in a way to provide incentives for the lender to monitor the borrower (Rajan and Winton 1995 JF).
  - Assigning priority claims to depositors: alternative to contractual devices to motivate monitoring in context of banking regulation.

# Setting (I)

- Ideal experiment to establish causality arising from seniority of debt claims.
  - Exploit variation across states over time in the introduction of depositor preference laws – allows a valid counterfactual.
  - Successive adoption of DPLs states constitutes a plausibly exogenous change in the monitoring incentives of non-depositors.
  - Difference-in-difference estimations to compare key dependent variables among state-chartered banks with observationally similar control group of nationally-chartered banks from same state unaffected by DPLs.
  - Panel data with quarterly frequency allow bank-fixed effects and state-quarter fixed effects.
  - 30 states opted to implement DPLs between 1909 and 1993.
  - In 1993, Clinton administration introduced DPLs for all banks, irrespective of the charter.

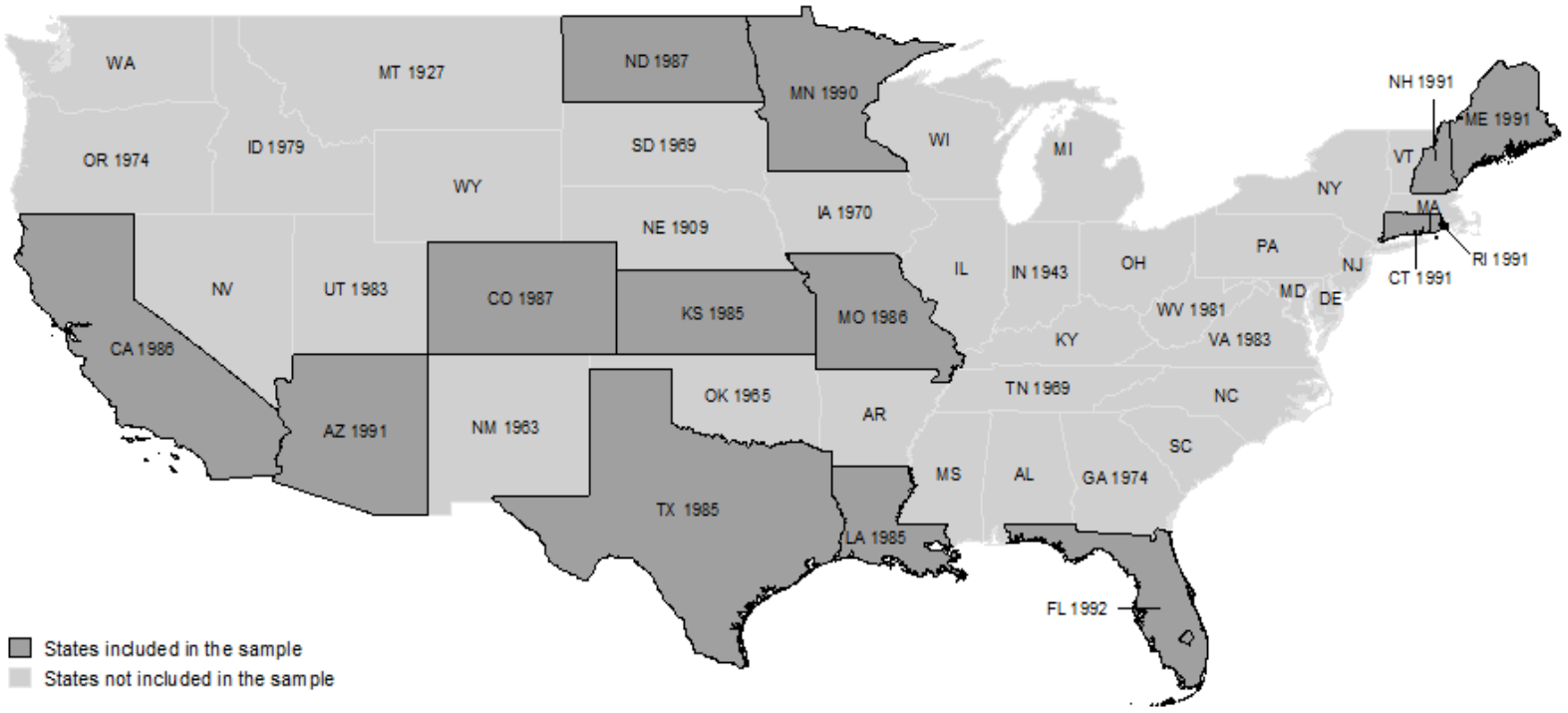
Figure 1a



# Setting (II)

- Quarterly Call Report data for commercial and savings banks in the U.S.
- Sample covers 1983Q1 to 1993Q2 for banks in 15 enacting states and includes 199,698 observations for 5,506 banks

Figure 1b



# Representativeness and exogeneity of DPL

- Representativeness:
  - Comparing banks in 15-state sample with average bank in the U.S. using the population suggests no significant differences in asset size and profits. Weakly significant difference at the ten percent level for soundness.

- Exogeneity:
  - We survey
    - state legislative councils
    - legislative council's digests
    - concurrencies of the state amendments
    - assembly laws, and
    - Lexis/Nexis, Factiva, and American Banker:

  Sources do not suggest banking sector conditions or lobbying by interest groups drive implementation of DPLs.

- Linear probability models and Cox proportional hazard models empirically refute adoption of DPLs is endogenous with respect to the outcomes we study.

# Identification strategy

- We exploit plausibly exogenous variation in DPL enactment across states and time using a difference-in-difference estimator
- We estimate

$$y_{ist} = \alpha + \beta(DPL_{st} * Charter_i) + \delta X_{ist} + \gamma_i + \gamma_{st} + \varepsilon_{ist}$$

- Dependent variables measure
  - cost of funds [Total interest expenses, deposit interest expenses, non-deposit interest expenses to total liabilities]
  - liability structure [market shares for insured, uninsured deposits, and non-deposits]
  - Soundness [Z-score (ln), non-performing loans ratio, leverage],
  - Profitability [ROE, Total interest income to total income].
- $X_{ist}$ is a vector of bank-time varying controls; $\gamma_i$ bank fixed effects; $\gamma_{st}$ are state-quarter fixed effects.
- Dummy variables rule out all
  - unobservable time-invariant bank-specific factors, and
  - state-time-varying forces at the state and national levels, and
- Clean identification of the average treatment effect - we exploit cross-charter variation within the state-quarter dimension of the data set, i.e.. we compare banks in the same macro environment.
- Errors clustered at the bank level.

# Pricing effects: Monitoring

**Pricing effects – funding costs**

| Dependent variable | Total interest expenses | Interest on deposits | Interest on non-deposits |
|---|---|---|---|
| Charter | 0.0169 | 0.0195 | -0.0822 |
| | (1.38) | (1.52) | (-1.39) |
| ***Charter*DPL*** | ***-0.0192****** | ***-0.0219****** | ***0.1388****** |
| | ***(-4.06)*** | ***(-4.56)*** | ***(6.31)*** |
| Bank size | 0.1490*** | 0.1585*** | 0.0897*** |
| | (12.29) | (13.14) | (3.47) |
| Capital ratio | -0.0347*** | -0.0373*** | 0.0249** |
| | (-11.33) | (-10.83) | (2.31) |
| Bank FE | YES | YES | YES |
| State*Quarter FE | YES | YES | YES |
| Observations | 199,731 | 199,731 | 199,731 |
| $R^2$ | 0.6797 | 0.6855 | 0.0271 |
| Number of banks | 5,509 | 5,509 | 5,509 |

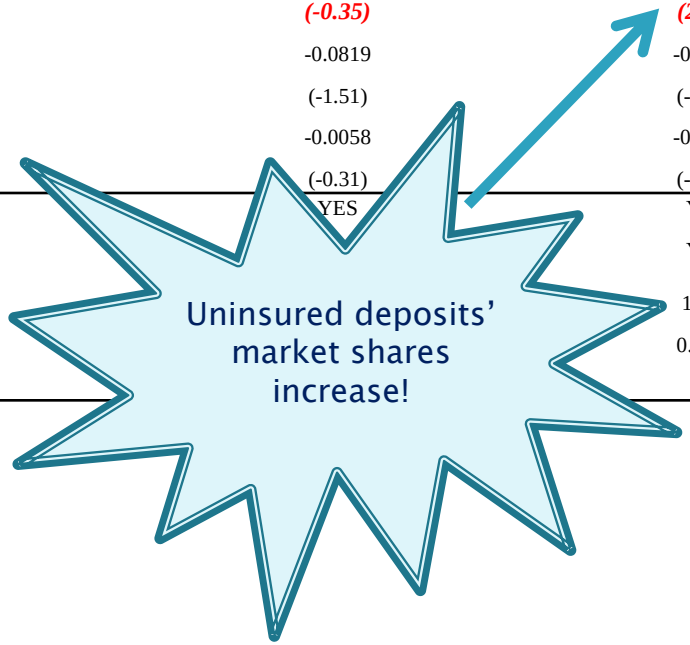
Total interest expenses and interest on deposits decline as deposits priority increases!
**Economically significant**

Heightened exposure to losses causes an increase in non-deposit costs
**Evidence of monitoring!**

These effects persist in the long run!

# Quantity effects: Market shares

| Dependent variable | Insured deposits | Uninsured deposits | Non-deposits |
|---|---|---|---|
| ***Charter*DPL*** | ***-0.0080*** | ***0.1305**** | ***0.0172*** |
| | ***(-0.35)*** | ***(2.26)*** | ***(0.27)*** |
| Bank size | -0.0819 | -0.0388 | 0.1385 |
| | (-1.51) | (-1.14) | (1.75) |
| Capital ratio | -0.0058 | -0.0312 | -0.0198 |
| | (-0.31) | (-0.48) | (-0.32) |
| State-charter FE | YES | YES | YES |
| State*Quarter FE | | YES | YES |
| Observations | | 1,286 | 1,286 |
| $R^2$ | | 0.8396 | 0.0416 |
| Number of state-charters | | 30 | 30 |




- No effect on state-chartered banks' market share of insured deposits.
  - Insured depositors' position is unaffected by DPLs.
- Economically large (13 percent) increase in state-chartered banks' market share of uninsured deposits.
  - Risk-averse uninsured depositors increase supply to state-chartered banks.

# Bank health and profits: Influencing

| | Panel A: Banks' risk and decomposed Z-Score (ln) | | | | | | Panel B: Banks' profitability | |
|---|---|---|---|---|---|---|---|---|
| **Dependent variable** | **ZSCORE(ln)** | **ROASD(ln)** | **ROA(ln)** | **ETA(ln)** | **NPL** | **LEV** | **ROE(ln)** | **TIINC(ln)** |
| Charter | 0.3901** | -0.1105* | 0.1033** | 0.1416*** | -0.0006 | 0.1080 | 0.0797 | -0.0441*** |
| | (2.45) | (-1.72) | (2.42) | (2.87) | (-0.37) | (0.35) | (1.04) | (-2.77) |
| ***Charter * DPL*** | ***0.2249****** | ***-0.0310*** | ***0.0394****** | ***0.0964****** | ***-0.0009**** | ***-0.1763**** | ***0.0406**** | ***0.0151**** |
| | ***(5.26)*** | ***(-1.58)*** | ***(3.20)*** | ***(7.12)*** | ***(-1.78)*** | ***(-1.78)*** | ***(1.99)*** | ***(2.51)*** |
| Bank size | 0.2083*** | -0.1616*** | 0.2253*** | -0.2877*** | 0.0[illegible]3** | 2.6[illegible]*** | 0.5[illegible]9*** | [illegible]0189 |
| | (2.58) | (-7.76) | (11.91) | (-12.6[illegible]) | (-6.00) | ([illegible]4.04) | ([illegible]2.48) | (-1.28) |
| Bank FE | YES | YES | YES | YES | YES | YES | YES | YES |
| State*Quarter FE | YES | YES | YES | YES | YES | YES | YES | YES |
| Observations | [illegible]99,731 | 1[illegible]9,731 | 199,731 | [illegible]99,73[illegible] | 199,731 | 199,731 | 199,73[illegible] | 199,731 |
| R-squared | 0.[illegible] | 0.0[illegible]25 | 0.397 | 0.1372 | 0.1[illegible] | 0.14[illegible]4 | 0.6[illegible] | 0.9526 |
| Number of banks | 5,509 | 5,509 | [illegible] | [illegible] | 5,[illegible]09 | [illegible]5,509 | [illegible] | 5,509 |

Improved health: Z-scores (ln), non-performing loans, and leverage improve!
**Evidence of influencing!**

Improved profitability!
**Evidence of influencing!**

Results are consistent with Birchler (2000 RFS) and Hardy (2013 WP)

- Non-depositors have stronger incentives to monitor banks' risk exposure due to their junior claim.
- More skin in the game.
- These actions put constraints on the risk-taking behavior of banks' asset allocation choices.

# Identification concerns (I)

**Potential confounds and omitted variables**

- 15 difference-in-differences estimates in the paper – staggered nature.
- Omitted variable has to coincide temporarily with all 15 treatments and has to only affect state-chartered banks.
- Nevertheless, a set of plausible factors warrant investigation.

1. Bank size correlates with funding structure and funding costs
   - Triple interaction terms between size, DPL, and state-chartered bank dummy remains insignificant.
2. Banks may want to avoid being subject to DPLs and switch charter.
   - Only 3.8 percent of banks switch charters
     - Charter switches are not significantly associated with DPL adoption.
     - Omitting banks that switch charters has no effect on our results.

# Identification concerns (II)

**Potential confounds and omitted variables**

3. The U.S. experienced a string of banking problems in the 1980s and 1990s.
   - Texas banking crisis
   - New England banking crisis (Connecticut, Maine, New Hampshire, and Rhode Island)
     - Omitting Texas and the New England States has no effect on our findings.
   - S&L crisis
     - Triple interaction terms that consider the intensity of the S&L crisis leaves our results unchanged.
4. Regulators react to the banking turmoil.
   - FIRREA (1989): More resources to deal with failing banks.
     - Removing observations 1989Q4 to 1993Q2 during which FIRREA has no effect on key coefficients.
   - FDICIA (1991): Introduces least cost resolution provision - suggests effect on key coefficients because purchase and assumption transactions which tend to be associated with lower resolution costs are easier in states with depositor preference. If no FDICIA, key coefficients should be smaller in magnitude.
     - Omitting observations 1991Q4 to 1993Q2 yields indeed smaller key coefficients.
5. Deregulation: Lifting of inter- and intrastate branching restrictions.
   - Triple interaction terms to consider inter- and intrastate deregulation with the charter dummy and the dummy for depositor preference.
   - Interaction terms remain insignificant, and our main results are unaffected, although the magnitude of the coefficients declines.

# Other sensitvity checks

- Placebo tests to examine the validity of the parallel trends assumption.
  - Changes in conduct should only be observed when DPLs affects state-chartered banks but can neither be observed at other points in time, nor in other types of banks which are not subject to treatment.
  - Random assignment of placebo treatments to nationally-chartered banks.
  - Anticipation effects are ruled out by assigning treatment randomly to state-chartered banks prior to the treatment.
    - All placebo tests remain insignificant!
- Magnitudes of the coefficients should remain unaffected irrespective of control variables.
  - Main tests excluding time-varying bank-specific control variables indeed show very similar coefficient magnitudes.
- Clustering of standard errors.
  - Collapsing observations before and following enactment of DPLs does not affect inferences.
  - Double-clustering of the standard errors at bank and year level has no effect.
- Other tests show that including all 50 states, accounting for a charter time trend, and survivorship bias also leave the inferences unchanged.

# Falsification and external validity

## Falsification test

- Monte Carlo simulations with 1,000 replications to check whether state- chartered banks were affected by federal DPL in 1993.
  - Sample consists of state-chartered banks from the 15 states because a suitable control group does not exist.
  - Random assignment of banks to placebo treatment in 1993Q3 and all subsequent quarters or zero otherwise.
  - Specification estimates how much higher/lower the dependent variable was within the same bank following the introduction of federal DPL.
  - Null of zero effect is true.
    - This analysis confirms that state-chartered banks affected by state depositor preference law remained unaffected by the subsequent introduction of national depositor preference.

## External validity

- State-chartered banks in states with DPLs are ideal control group for an alternative setup.
- Extend sample period to 1997Q3.
- Treatment group are all banks in states that had not implemented DPLs prior to 1993Q3 and nationally-chartered banks in states that had introduced depositor preference legislation.
  - We obtain the same effect now on the newly treated banks.
  - Test highlights the external validity of our inferences.

# Concluding remarks

- Unexplored natural experiment to inform the debate about market discipline.
- Timely importance for policy and regulation.
  - Australia, Argentina, Hong Kong, Malaysia, and the U.S. already have some form of DPL in place.
  - EU policy makers introduced priority to depositors' claims in a bank failure in 2014 after intensive debates with the industry.
- Key findings illustrate that non-depositors are a credible source of market discipline.
  - We document both pricing and quantity effects.
  - We not only find evidence of monitoring but also show creditors influence conduct in terms of risk taking.
  - As treatement is plausibly exogenous, results are highly robust.
- From a policy perspective, findings justify proposals put forward in policy community and implemented in EU to introduce DPLs.
- Notes of caution:
  - Bank business models have undergone changes over the past few decades and the nature of our experimental setting renders it infeasible to use more recent data.
  - Results may not extend to banks that are subject to the SSM due to different liability composition.
  - We do not claim that depositor preference is a panacea to constrain bank risk taking.
- Step-by-step adoption of DPLs can be considered a useful source of exogenous variation in the monitoring incentives of debtholders for further empirical work.

# Backup slides

# Exogeneity of DPL (I)

| **Political economy of enacting depositor preference laws (Linear probability models)** | | | | |
|---|---|---|---|---|
| **Dependent variable: Depositor preference law dummy** | | | | |
| State-chartered assets | -0.2461 | | | -0.2675 |
| | (-0.47) | | | (-0.53) |
| S&L crisis | | 0.5110 | | 0.4901 |
| | | (1.25) | | (1.18) |
| Assets in all failed banks | | 0.0013 | | 0.0013 |
| | | (1.15) | | (1.10) |
| Bank profitability | | 0.0365 | | 0.0330 |
| | | (0.61) | | (0.53) |
| Democrat governor | | | -0.0392 | -0.0361 |
| | | | (-0.82) | (-0.77) |
| State FE | YES | YES | YES | YES |
| Quarter FE | YES | YES | YES | YES |
| Observations | 2,056 | 2,056 | 2,056 | 2,056 |
| $R^2$ | 0.8080 | 0.8100 | 0.8083 | 0.8112 |

| **Treatment and control group in quarter prior to depositor preference** | | | | |
|---|---|---|---|---|
| | **Treatment** | **Control** | **Difference** | ***t*-Statistic** |
| Total interest expenses | 0.0145 | 0.0141 | -0.0003 | -0.31 |
| Interest on deposits | 0.0146 | 0.0141 | -0.0005 | -0.46 |
| Interest on non-deposits | 0.0069 | 0.0086 | 0.0017 | 1.56 |
| Bank size | 11.0949 | 11.3033 | 0.2085 | 0.53 |
| Equity | -0.2645 | -2.8834 | -0.2589 | -1.21 |

- Neither state-level banking conditions nor the political environment nor the collective importance of state-chartered banks predict the adoption of depositor preference.

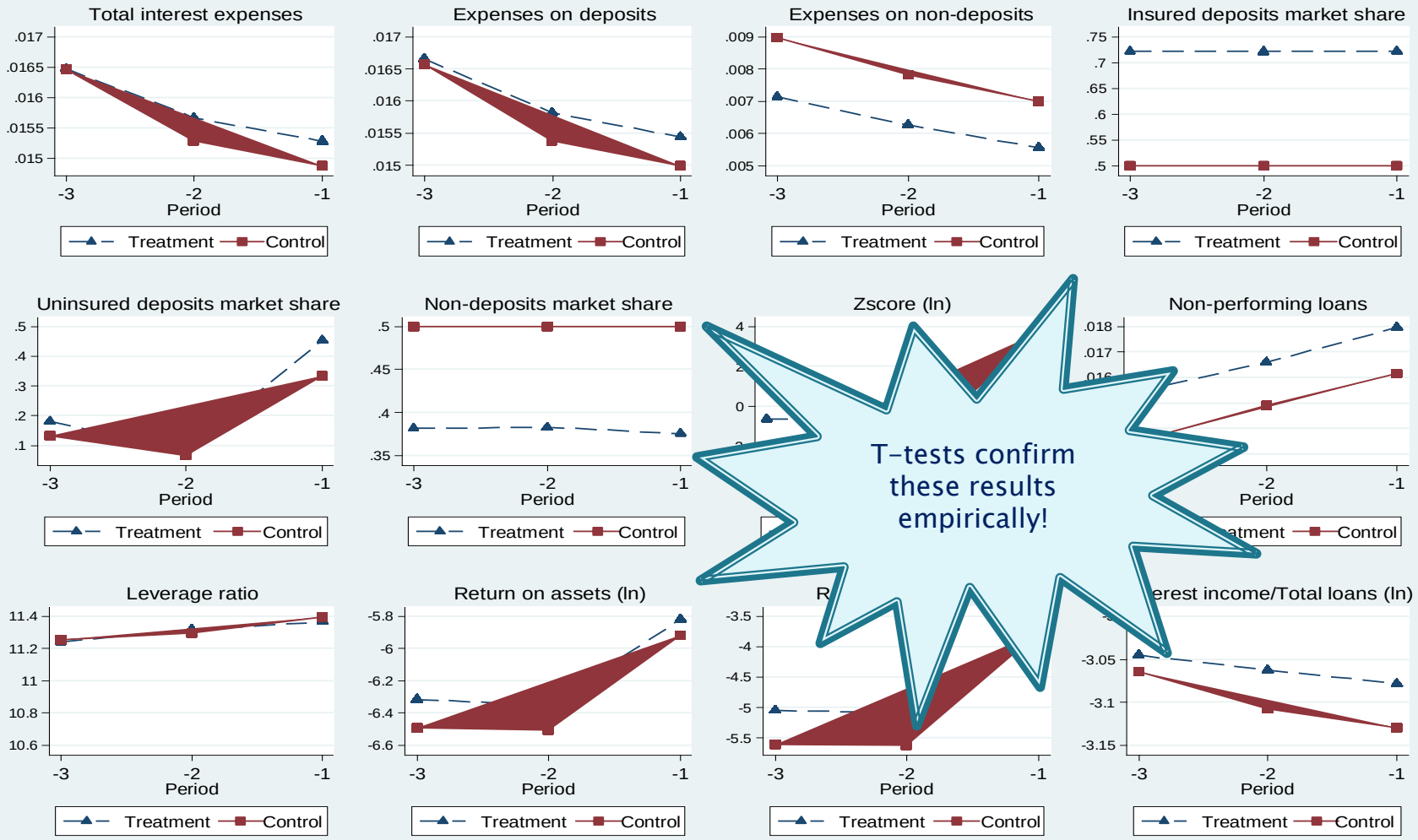
# Exogeneity of DPL (II)

**Exogeneity Tests: Cox Proportional Hazards Model**

| | Total liabilities expenses | Expenses on deposits | Expenses on non-deposits | Insured deposits market share | Uninsured deposits market share | Non-deposits market share |
|---|---|---|---|---|---|---|
| Coefficient | 1 | 1 | 1 | 1 | 1.001 | 1 |
| Z-stat | (0.99) | (1.27) | (0.34) | (0.86) | (0.93) | (0.35) |
| Controls | YES | YES | YES | YES | YES | YES |
| State FE | YES | YES | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES | YES | YES |
| Observations | 1,196 | 1,196 | 1,196 | 1,196 | 1,196 | 1,196 |
| | Z-score (ln) | Non-performing loans | Leverage Ratio | Return on assets (ln) | Return on equity (ln) | Interest income (ln) |
| Coefficient | 3.177 | 1.376 | 1.001 | 2.565 | 0.618 | 1.622 |
| Z-stat | (1.37) | (1.64) | (0.89) | (0.39) | (-0.37) | (1.19) |
| Controls | YES | YES | YES | YES | YES | YES |
| State FE | YES | YES | YES | YES | YES | YES |
| Year FE | YES | YES | YES | YES | YES | YES |
| Observations | 1,196 | 1,196 | 1,196 | 1,196 | 1,196 | 1,196 |

- Adoption of depositor preference is exogenous with respect to the outcomes we study.
- No reverse causality.

# Nationally-chartered banks: A valid counterfactual?



# Nationally-chartered banks: A valid counterfactual (cont'd)?

**Table 4**
**Parallel Trends Tests**

| | *t-1 to t-3* | | *t-1* | | *t-2* | | *t-3* | |
|---|---|---|---|---|---|---|---|---|
| *Variable* | *Difference* | *Wilcoxon p-value* | *Difference* | *Wilcoxon p-value* | *Difference* | *Wilcoxon p-value* | *Difference* | *Wilcoxon p-value* |
| Δ Total interest expenses | -0.002 | 0.702 | -0.003 | 0.819 | 0.001 | 0.788 | -0.005 | 0.724 |
| Δ Interest expenses on deposits | 0.000 | 0.945 | 0.000 | 0.984 | -0.001 | 0.756 | 0.002 | 0.984 |
| Δ Interest expenses on non-deposits | -0.015 | 0.984 | 0.047 | 0.724 | -0.122 | 0.468 | 0.031 | 0.724 |
| Δ Total liabilities | 0.000 | 0.907 | -0.001 | 0.756 | 0.001 | 0.885 | 0.001 | 0.521 |
| Δ Total domestic deposits | 0.001 | 0.267 | 0.001 | 0.443 | 0.001 | 0.373 | 0.002 | 0.521 |
| Δ Total non-deposits | -0.025 | 0.575 | 0.025 | 0.724 | -0.056 | 0.917 | -0.044 | 0.468 |
| Δ Insured deposits | 0.008 | 0.581 | -0.006 | 0.663 | 0.002 | 0.443 | 0.029 | 0.395 |
| Δ Market share of insured deposits | 0.011 | 0.707 | -0.003 | 0.373 | 0.028 | 0.468 | 0.008 | 0.373 |
| Δ Uninsured deposits | 0.000 | 0.977 | -0.029 | 0.439 | 0.056 | 0.758 | -0.023 | 0.917 |
| Δ Market share of uninsured deposits | -0.001 | 0.884 | -0.048 | 0.439 | 0.059 | 0.999 | -0.024 | 0.917 |
| Δ Federal funds sold and repos | -0.153 | 0.913 | 3.432 | 0.958 | 0.129 | 0.886 | -2.941 | 0.959 |
| Δ Pledged securities | 1.257 | 0.952 | 1.118 | 0.797 | 0.281 | 0.917 | 2.337 | 0.951 |
| Δ Zscore (ln) | -0.128 | 0.308 | -0.072 | 0.263 | -0.251 | 0.867 | -0.061 | 0.901 |
| Δ Non-performing loans to total loans | 0.552 | 0.977 | 0.239 | 0.513 | 0.002 | 0.541 | 1.366 | 0.600 |
| Δ Leverage ratio (Debt to equity ratio) | 0.001 | 0.818 | -0.023 | 0.548 | -0.002 | 0.951 | 0.026 | 0.272 |
| Δ Return on equity (ln) | -0.003 | 0.268 | 0.001 | 0.967 | -0.032 | 0.279 | 0.021 | 0.169 |
| Δ Total interest income to total loans (ln) | 0.002 | 0.501 | 0.007 | 0.101 | 0.001 | 0.885 | -0.003 | 0.885 |