Do Government Guarantees Help Financial Stability? Evidence from an Emerging Market

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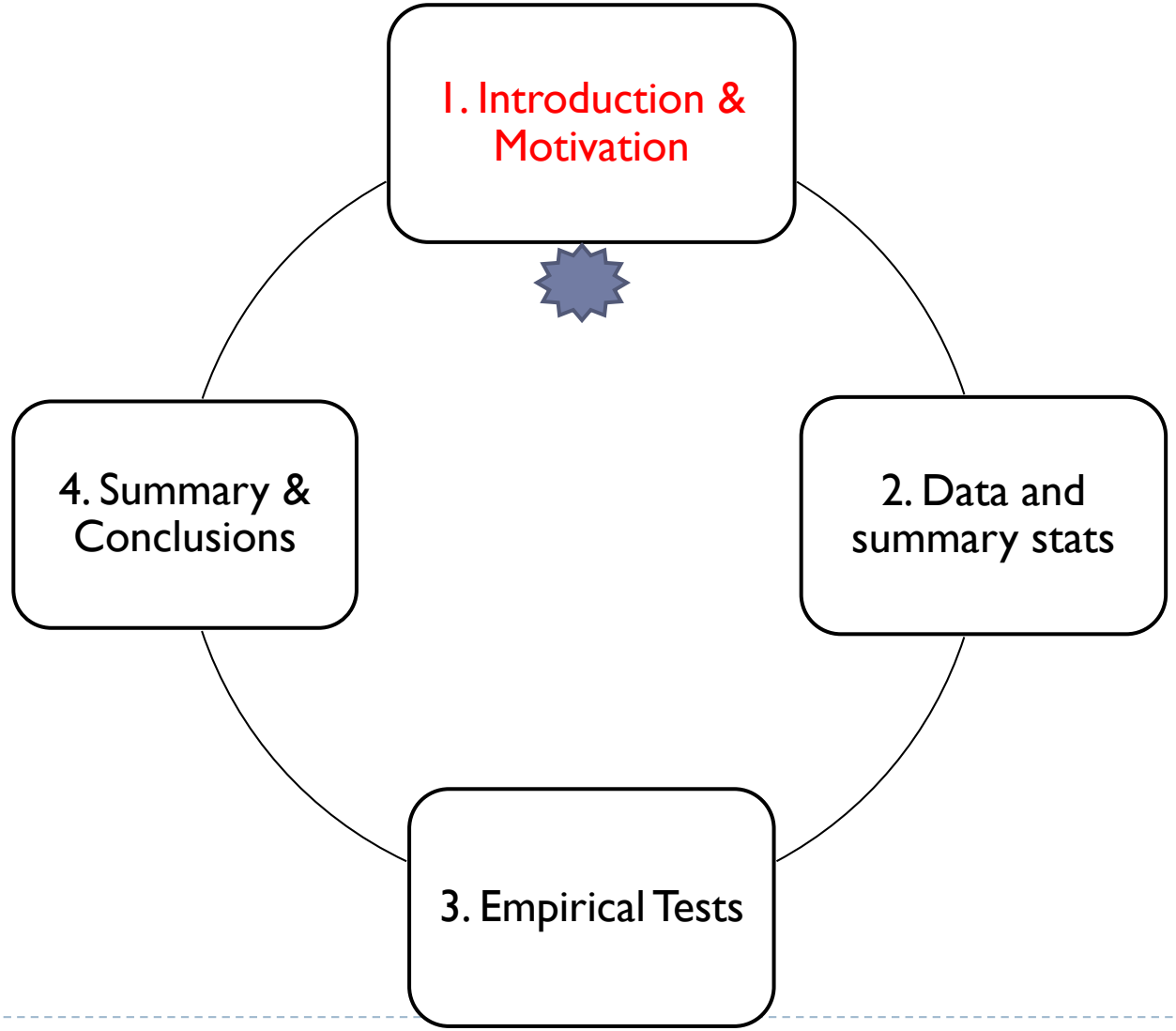
Agenda


1. Introduction & Motivation
2. Data and summary stats
3. Empirical Tests
4. Summary & Conclusions

Motivation

- The relationship between government guarantees and financial stability has been the subject of intense debate since the global financial crisis (GFC).

- The post- GFC period (i.e. 2010-2018) witnessed government interventions in the form of
  - explicit or implicit guarantees,
  - recapitalizations, and
  - loans
    - in countries around the world.

Conflicting evidence

- Extant literature finds *conflicting evidence* on the relationship between government guarantees and subsequent bank risk taking & performance.
  - (Allen et al., 2015, Kelley et al., 2016; Acharya et al., 2018; Wilcox and Yasuda, 2019; Iyer et al., 2019; Allen and Gu, 2018; Berger et al., 2020)

Government guarantees: Can increase firm value

(1) Reducing asymmetric information

improves financing for corporates

(2) Improving credit ratings, lowering funding costs, and increasing franchise value;

(3) Lowering potential systemic risks if the underlying firm falls into TBTF category

(4) Providing a downside insurance (or put option) value to banks especially during crises periods

(5) Improves liquidity provision

… but can have adverse sequences too

(1) Increased tendency to take on *excessive leverage*

(2) moral hazard problems arising from increased risk taking by the borrower

increases the likelihood of runs or distortions in banks' behavior

(3) unproductive use of capital by the borrowers affecting the industry wide productivity;

(4) counterparty risk to the guarantor arising from system wide shocks (or systemic risks) and potential bail-out costs for the tax payer.

- The ultimate effect of government guarantees is therefore an open empirical question.

Extant work-1

- Norden et al. (JFQA 2013)
- Who benefits from capital infusions?
  - Firms that are smaller, more financially distressed, and more dependent on banks for financing are likely to benefit more from capital infusion in their banks

- Correa et al (JMCB, 2014)
- Sovereign risk Impact on supported banks?
  - Sovereign credit rating downgrades have a large negative effect on bank stock returns for those banks that are expected to receive stronger support from their governments.

- Mäkinen et al. (JFE, 2020)
- Sovereign risk Impact on guaranteed banks?
  - Uncover a risk premium for banks associated with implicit government guarantees that is intimately tied to sovereign risk, suggesting that guaranteed banks inherit the risk of the guarantor.

Extant work-2

- Kelly et al (AER, 2016)
- Guarantee impact on banks' put otions?
  - Government guarantee for the financial sector lowers index put prices far more than those of individual banks

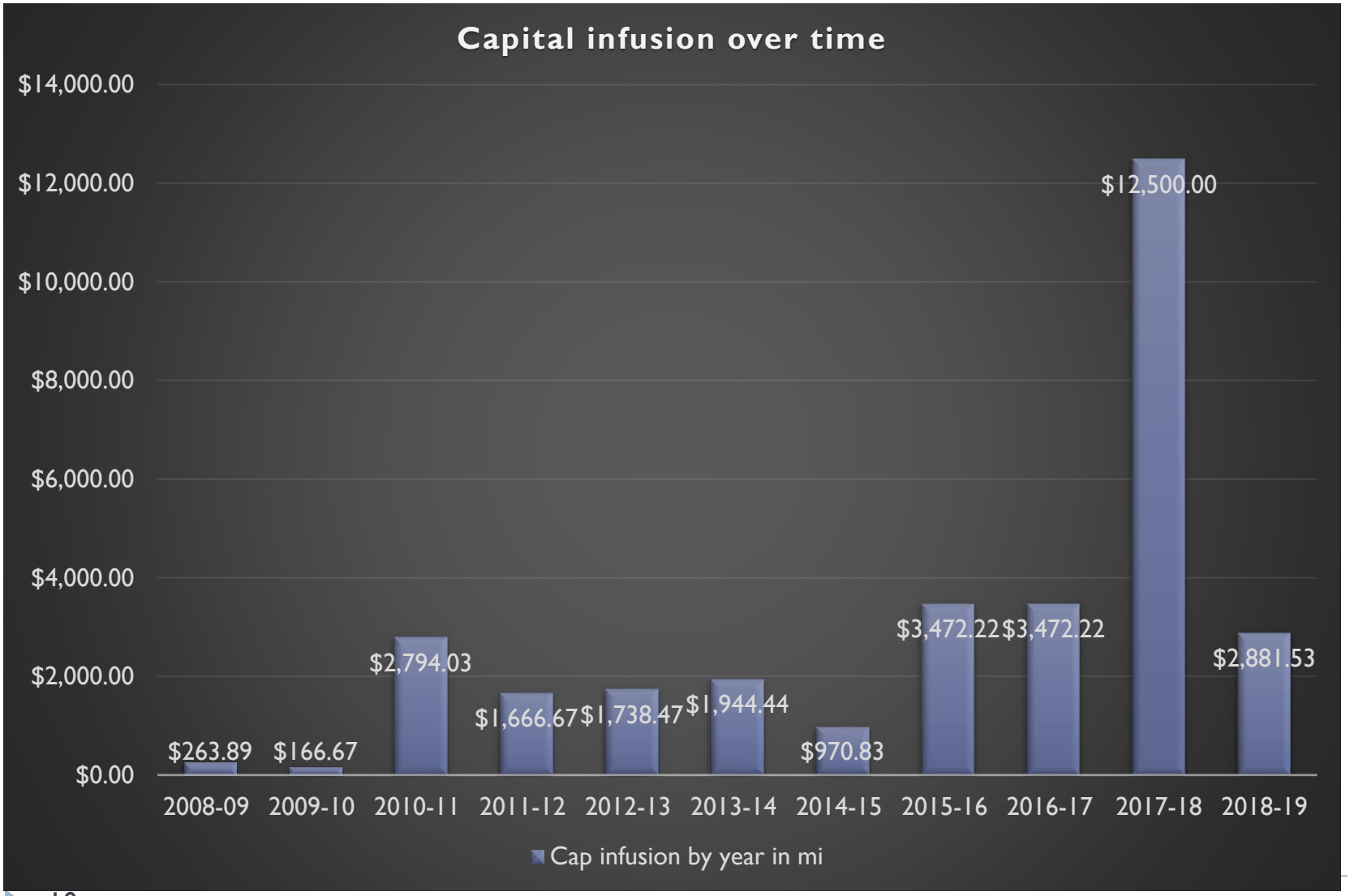
- Acharya et al (2018)
- Impact of guarantees on TBTF bank bond spreads?
  - bond credit spreads are sensitive to risk for most FIs, but not for the largest TBTF FIs in US and firms in the non-financial sectors.

In this paper

- We shed light on this debate by studying the possible effect of government guarantee on promoting financial stability.

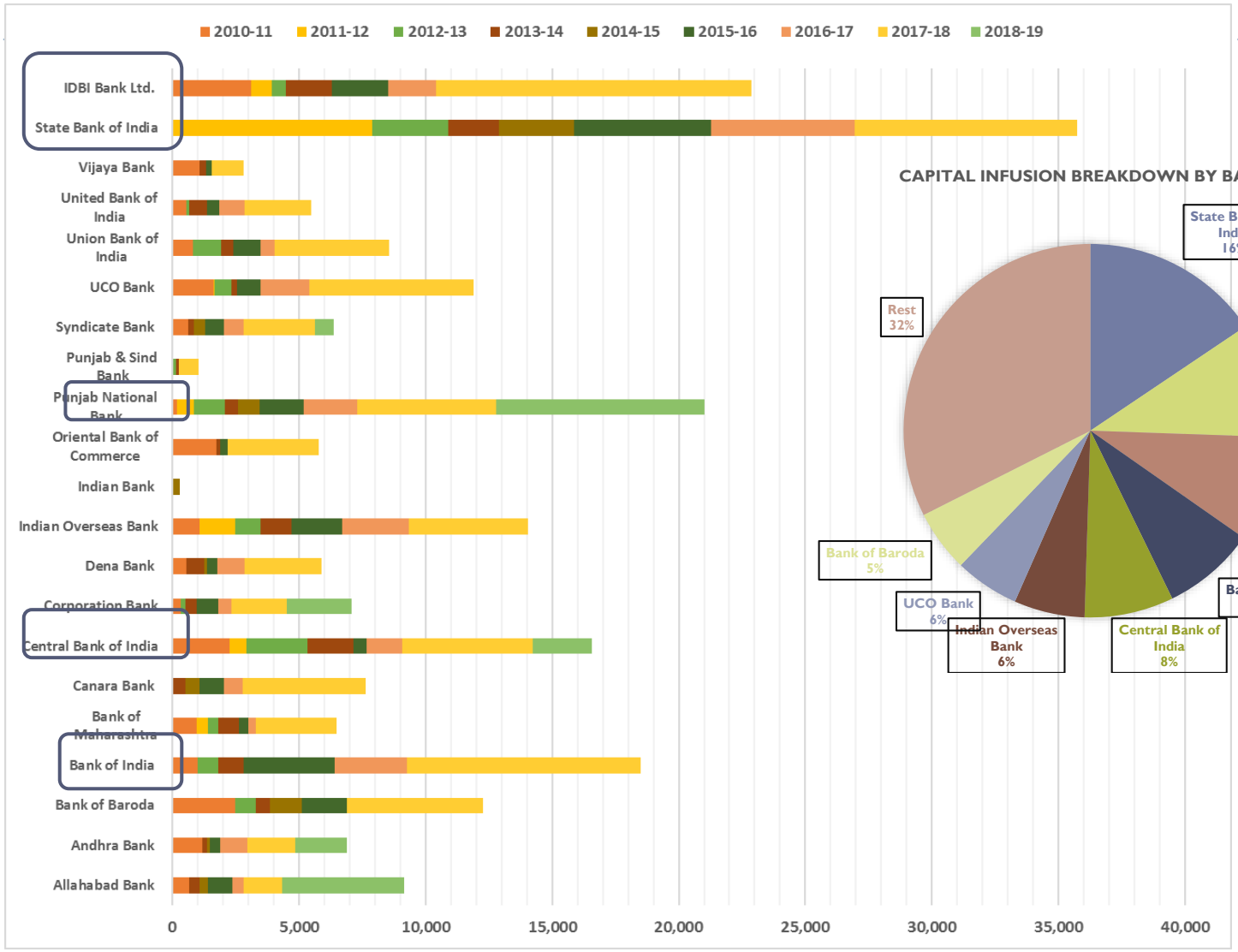
- Specifically, we ask
  - "Do government guarantees help lower the systemic risks and help financial stability?"
  - and provide comprehensive evidence through the lens of an emerging market.

Capital infusions in India 2008-2018



2019-20: $6.13 bi

Capital infusions cross sectional and time series variation 2008-2018



Relevance 1/2: Our study reframes the qsn of capital infusions & stability in the context of emerging markets

- There is limited prior literature on systemic risk and default in emerging markets.

1. Significant growth in emerging market debt

2. Higher firm level credit risks for emerging market borrowers

(esp issuing foreign debt: currency, rollover & interest risks)

3. Higher risk exposure for local banks in emerging markets

(Avdjiev, Chui and Shin, 2014,RFS)

Relevance 2/2:.. & wrt India which underwent significant policy and regulatory changes

High NPAs

- have grown significantly, Adversely affected the solvency of banks, and
- jeopardizing the onerous bank recapitalization effort by the Indian government
- (Rajan, 2018; Acharya 2020; Patel, 2020)

Increased Leverage

- The post-crisis period was also marked by mounting corporate debt
- giving rise to financial stability concerns (Acharya et al., 2015; Olga et al., 2020).

Significant policy changes

- Policy shocks: domestic (Demonetization, 2016), and foreign (Taper tantrum, 2013-14)
- Regulatory shocks (Basel III capital requirements, 2010; Asset Quality Review, 2015-16; and Insolvency and Bankruptcy Code Implementation, 2016)
- Domestic banking frauds, (2017-18); NBFC crisis, (2018-19).

Related papers

- Acharya and Kulkarni (NBER, 2019)
  - Flight of deposits to public banks ?
    - Access to stronger government guarantees during aggregate crises allows even vulnerable state-owned banks to access and extend credit cheaply despite their under-performance, and this renders private sector banks especially vulnerable to crises
    - (infusions during GFC)

- Berger, Roman & Sedunov (JFI, 2020)
  - TARP impact on stability?
    - TARP significantly reduced contributions to systemic risk, particularly for larger and safer banks, and those in better local economies.
    - This occurred primarily through a capital cushion channel that reduced market leverage by increasing the value of common equity
    - ($220 bi injection during the GFC)

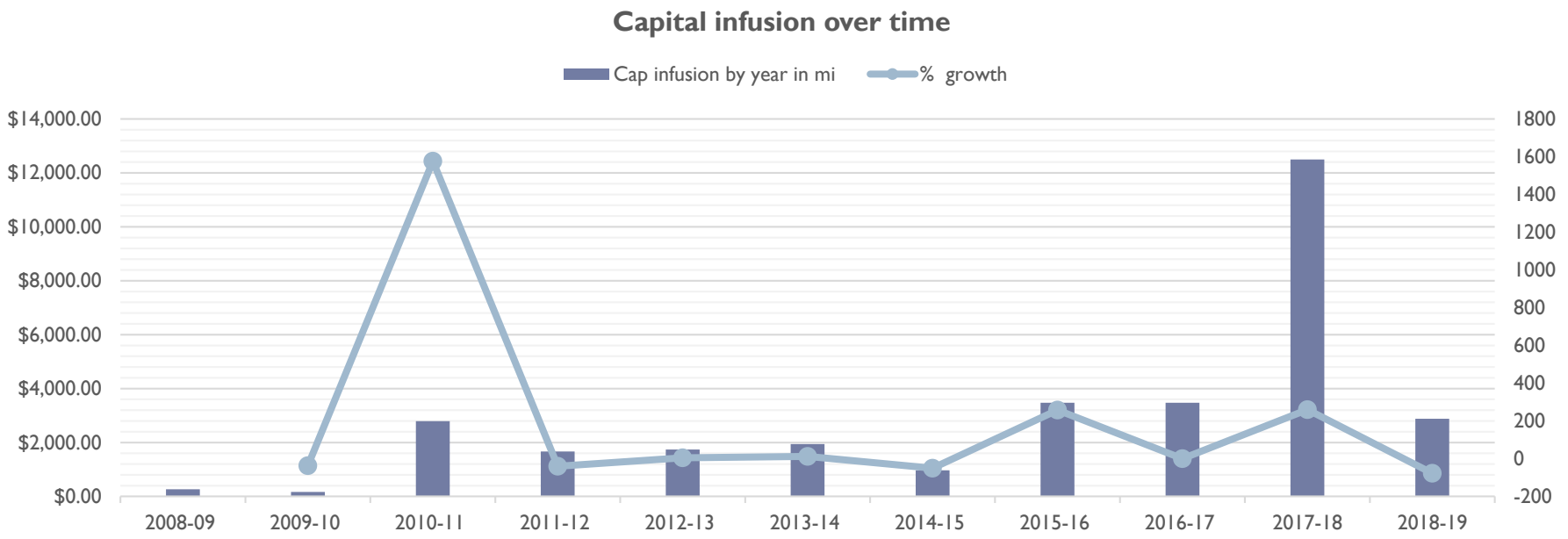
Three key results in the paper: Key result 1/3

- Capital infusions in general are associated with improvement in default & systemic risks in treated banks vs other control banks and FIs.

- However "large capital infusions" can exacerbate the default and systemic risks of the treated banks.
  - Systemic risk: MES (distress beta) and NSRISK (capital shortfall)
  - Indicates moral harzard and risk taking behavior for large capital infusions

- DID regressions using capital infusion as a pseudo exogenous event; robust to endogeneity (2 SLS-IV, Heckman)

Key result 2/3:Capital infusion during Macro stress periods



2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
	-36.84%	1576.42%	-40.35%	4.31%	11.85%	-50.07%	257.65%	0.00%	260.00%	-76.95%

No external Audit

: policy shock: domestic (Demonetization, 2016), and regulatory shocks (Asset Quality Review, 2015-16; and Insolvency and Bankruptcy Code Implementation, 2016).

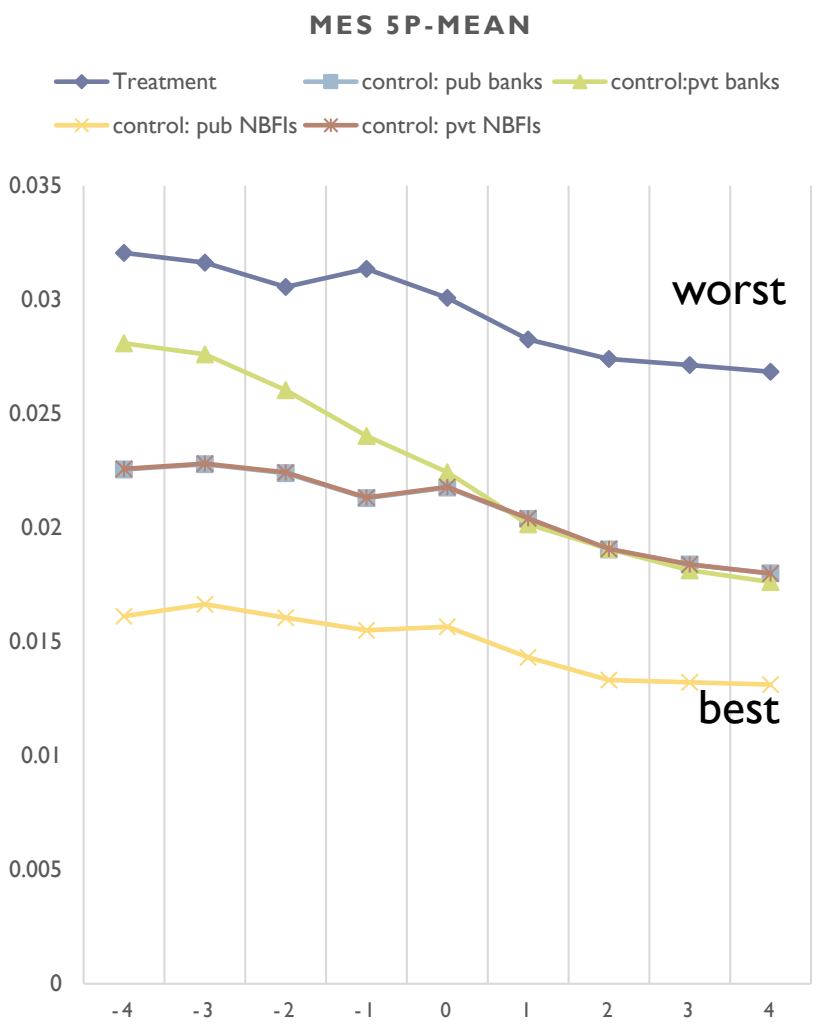
domestic banking frauds, (2017-18); and developing Non-Banking Financial company (NBFC) crisis, (2018-19))

Key result 2/3: Macro stress periods

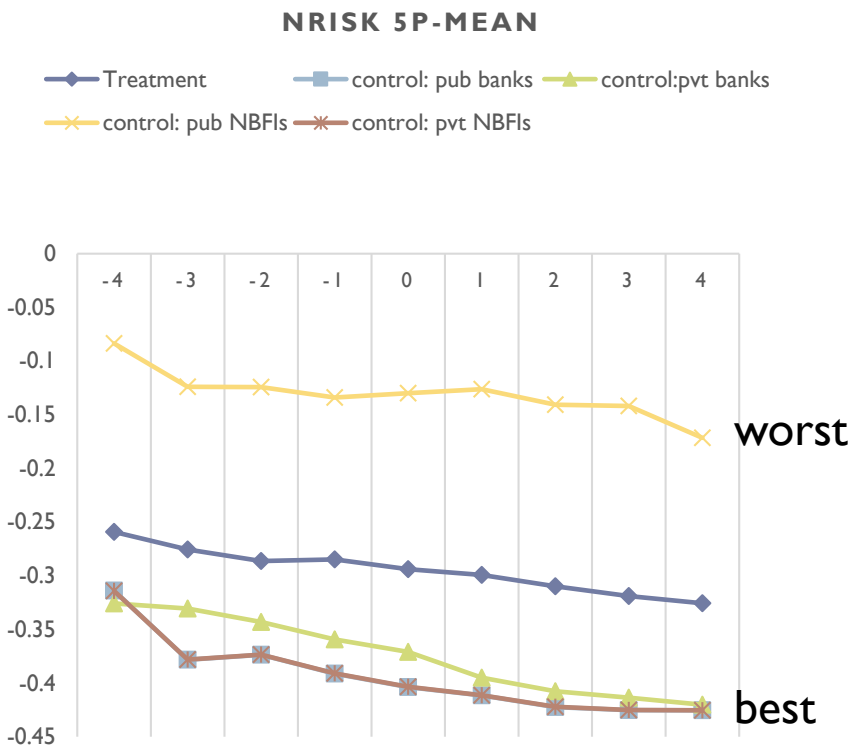
- The three periods saw a massive surge in capital infusion
- For two macro-stress periods (2015-17 & 2017-18), large capital infusion helps lower sys risk for treated firms vs controls
  - In line with US TARP results
- We do not see any such effects for year 2010-11 (where surge in capital infusion was Accounting related)
- While "large capital infusions"
  - can exacerbate the default and systemic risks of the treated banks. in normal years,
  - they are associated with improvement in default & systemic risks for treated banks vs other control banks and FIs during macro-tress periods.

Key result 3/3: Strong evidence of "short-term" network effects

Distress beta



Capital shortfall



DID regressions show this effect holds for large infusions

Key result 3/3: This implies..

- Large infusions have "short-term" positive externalities in terms of network effects
- Buy yet could induce "moral hazard" related excessive risk taking by banks esp. during "non-stress periods".

Contribution: This study examines the effect of capital infusion on financial stability using the unique setting of non-crisis vs. crisis driven infusions.

Indian data

- Capital infusions are yearly and lot more prevalent
- $38 bi over 141 infusions during 2008-19
- Infusions happen even during Calm or non-stress periods

US Data

- Capital infusions are more tied to the crisis
- TARP (Capital Purchase Program or CPP)
- Infused capital of $204.9 billion into 709 banking organization during GFC (2008-11)
  - (BHCs (572), commercial banks (87) & thrifts or S&Ls (50))

Policy Implications 1/2

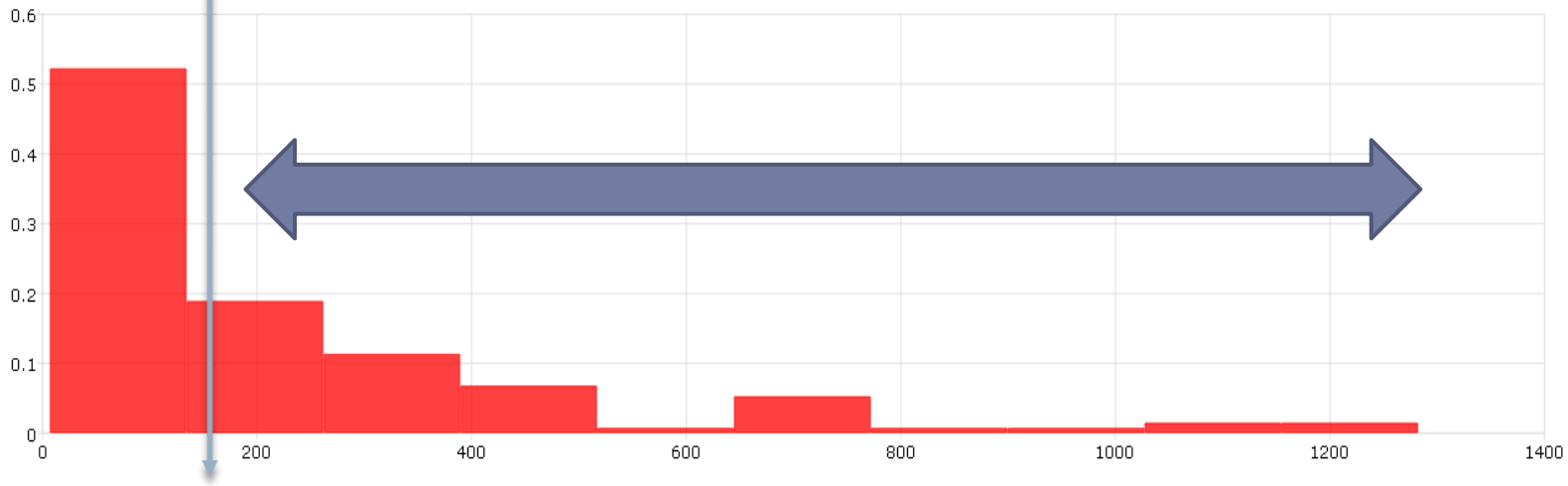
- The government guarantees imply trade-offs for the policy makers as,
  - one hand, they reduce the probability of a bank run, while,
  - on the other, they increase the probability of a sovereign default that erodes the guarantee's credibility.
  - By setting the guarantee optimally, the government balances these two effects in order to minimize expected costs of crises (König et al., 2014, JBF).
  - Our study provides a lens to understand this optimality question in crisis vs. non-crisis setting

Policy Implications 2/2

Our study provides a lens to understand this optimality question wrt +ve network effects and moral hazard calculus

- Large infusions have "short-term" positive externalities in terms of network effects
  - versus
- Yet could induce "moral hazard" excessive risk taking by banks esp. during "non-stress periods".

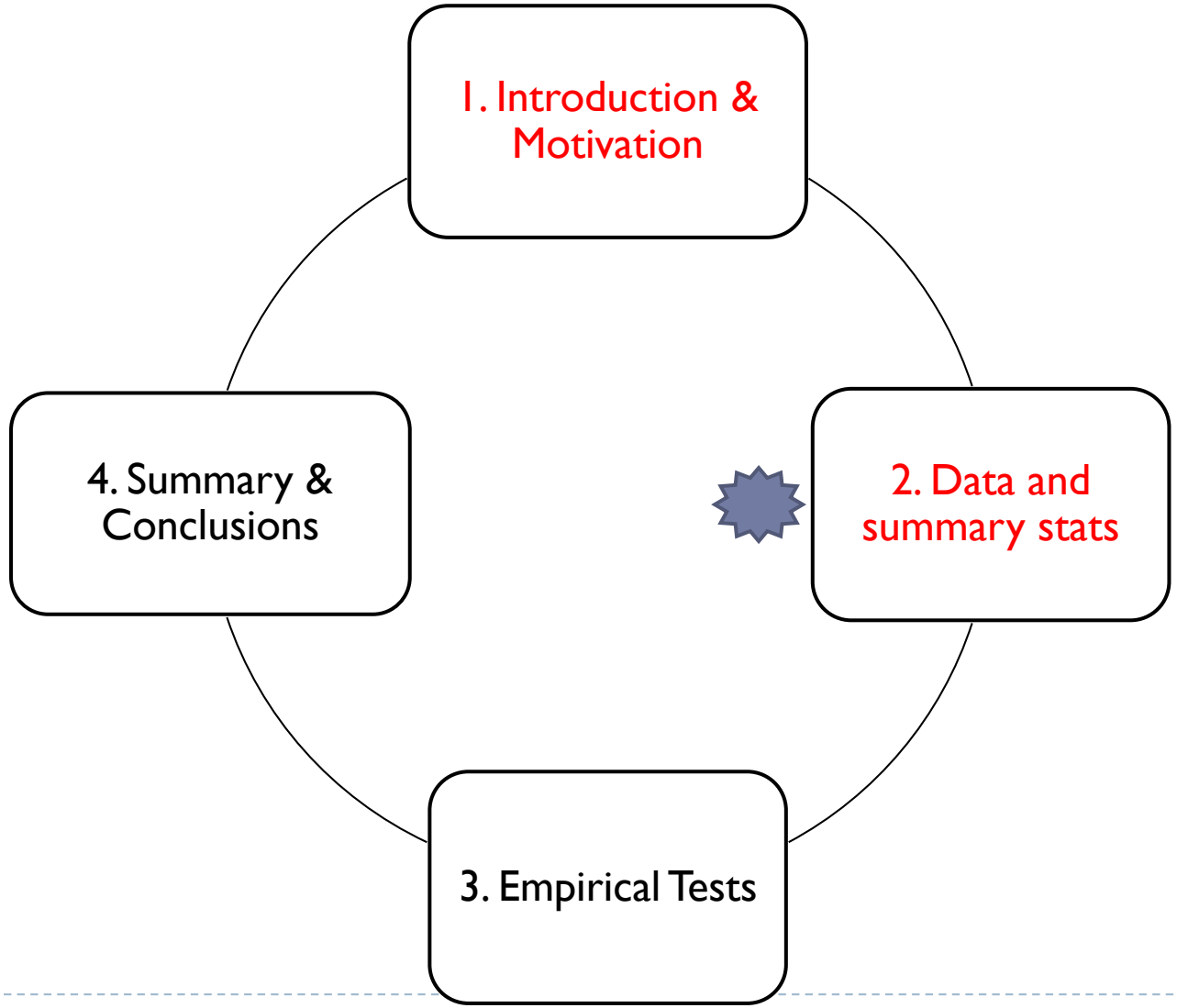
Top 5 Indian banks account for about 1/2 of capital infusion and 3/4 of their cap infusions were "large size"



median $125,35 mi
mean $226.32 mi

Histogram of capital infusions 2008-2018

Agenda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Data

- Government capital infusions into public sector banks for the period 2008-2019 from the Controller & Auditor General of India (Report No. 28, 2017) .
- CMIE Prowess and Worldscope (Datstream) database for data on firm-level financial variables and stock, both firm and index, returns
- RMI PD and DTD database
- Markit CDS data
- SDC/Capital IQ

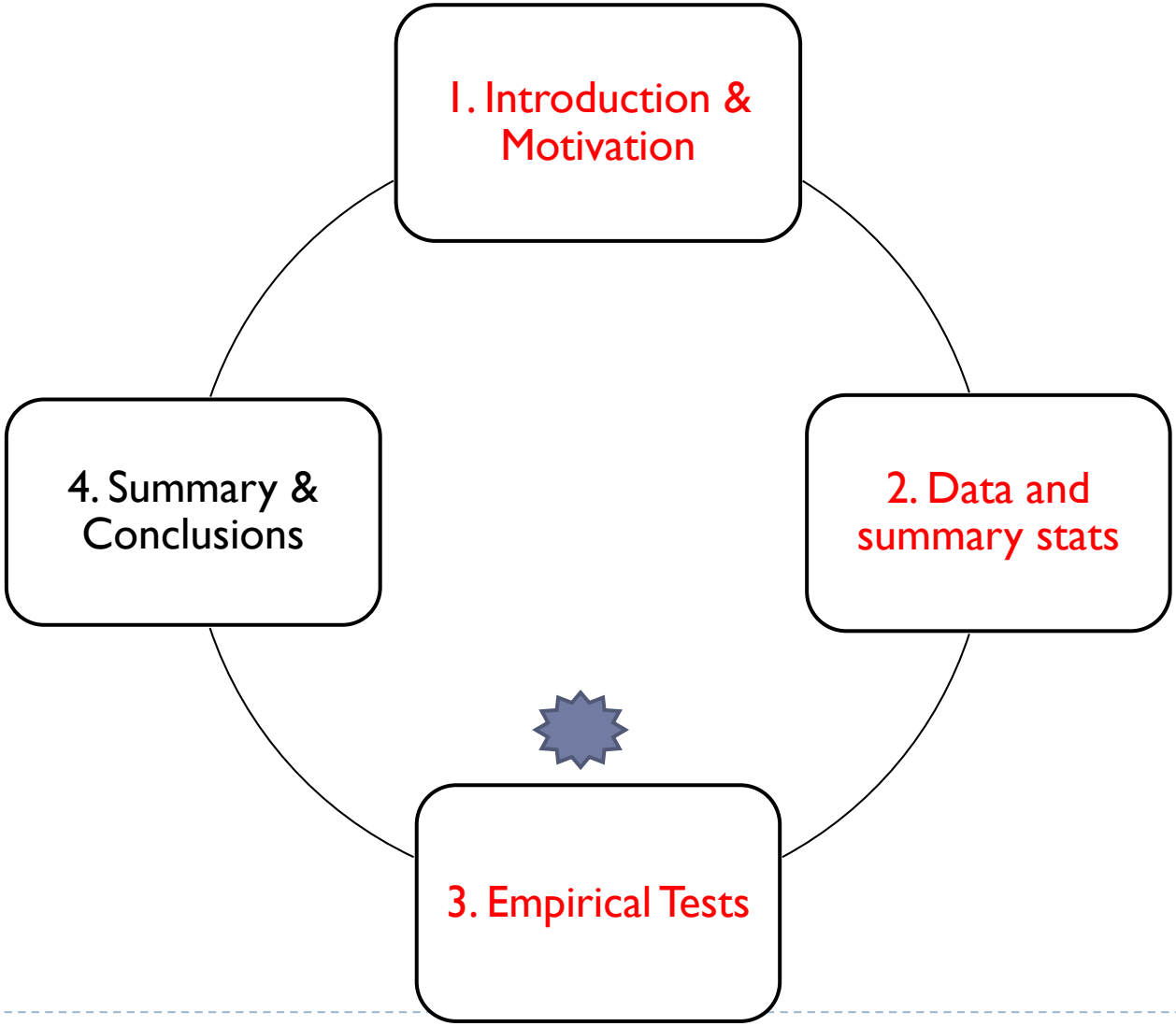
Treatment and 4 control samples

- A. Government public sector banks that receive capital infusions are denoted as Treatment firms. These are Publicly traded government owned FIs receiving capital infusions.
- B. Government public sector banks not receiving infusions are treated as the first control sample.
- C. Private banks constitute the second control sample
- D. Public NBFIs are treated as the third control sample.
- E. Private NBFIs are treated as the third control sample.

Bank and FI sample

2000-2018			
Banks			sample
Public banks	25		
dropped due to M & As	minus 2		
net public banks			23
Private banks	20		
dropped due to M & As	minus 4		
net private banks			17
NBFIs			
Public	18		
dropped	minus 3		
net public NBFIs	15		15
Private	505		
dropped	minus 479		
net private NBFIs (consider only top 25 firms by asset size)			26
Exclude non-Fis	105		
Final sample			81

Agenda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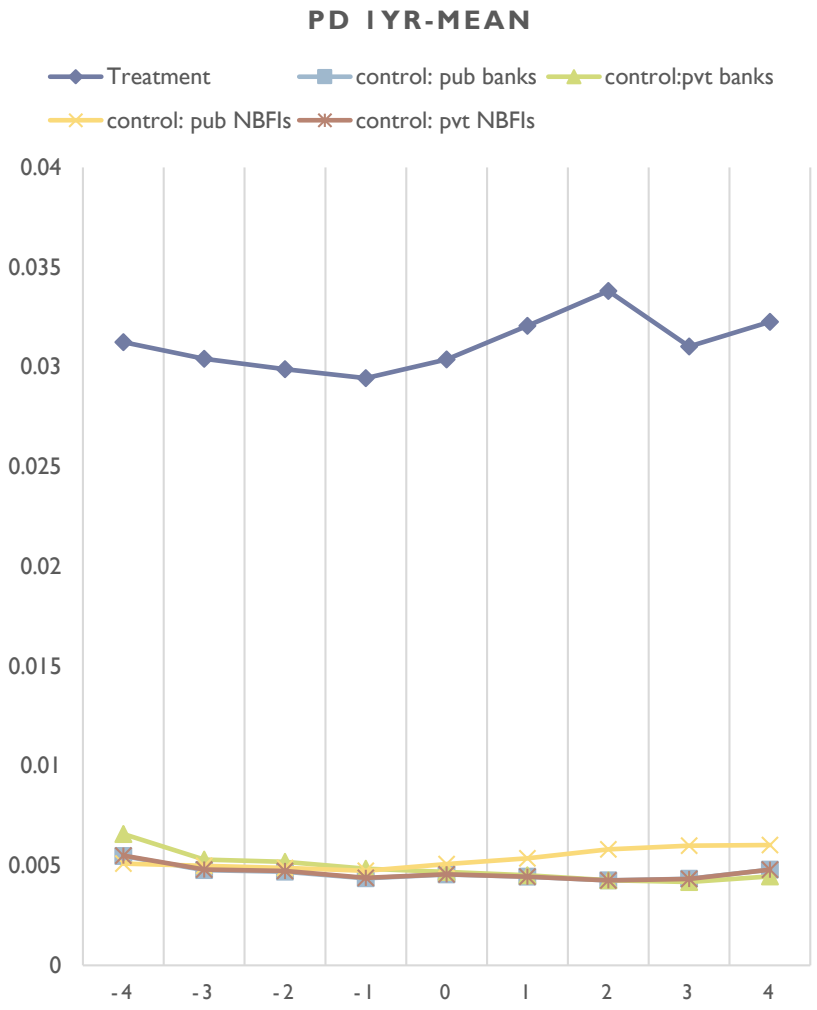
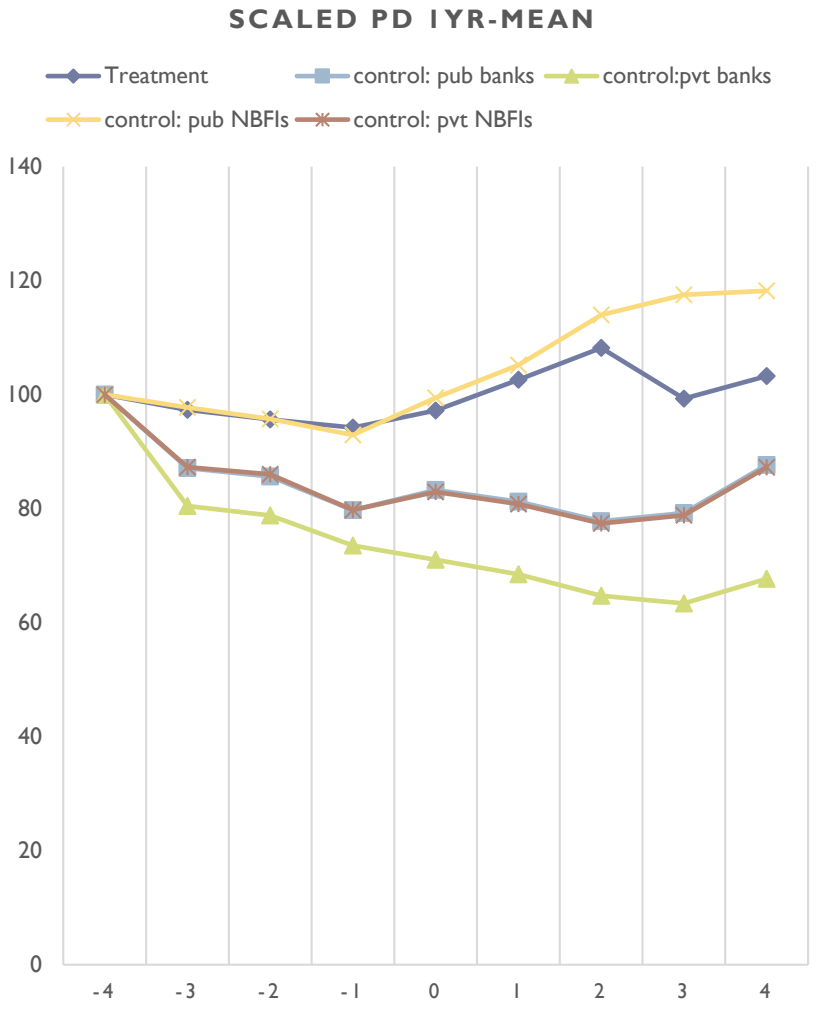
We execute this paper through tests of "six" hypotheses

- H1: Effect on default risk: Given that capital infusions help treated banks receive capital injections, they can increase the tier 1 capital, and hence lower the ex ante default risk of the underlying firm.

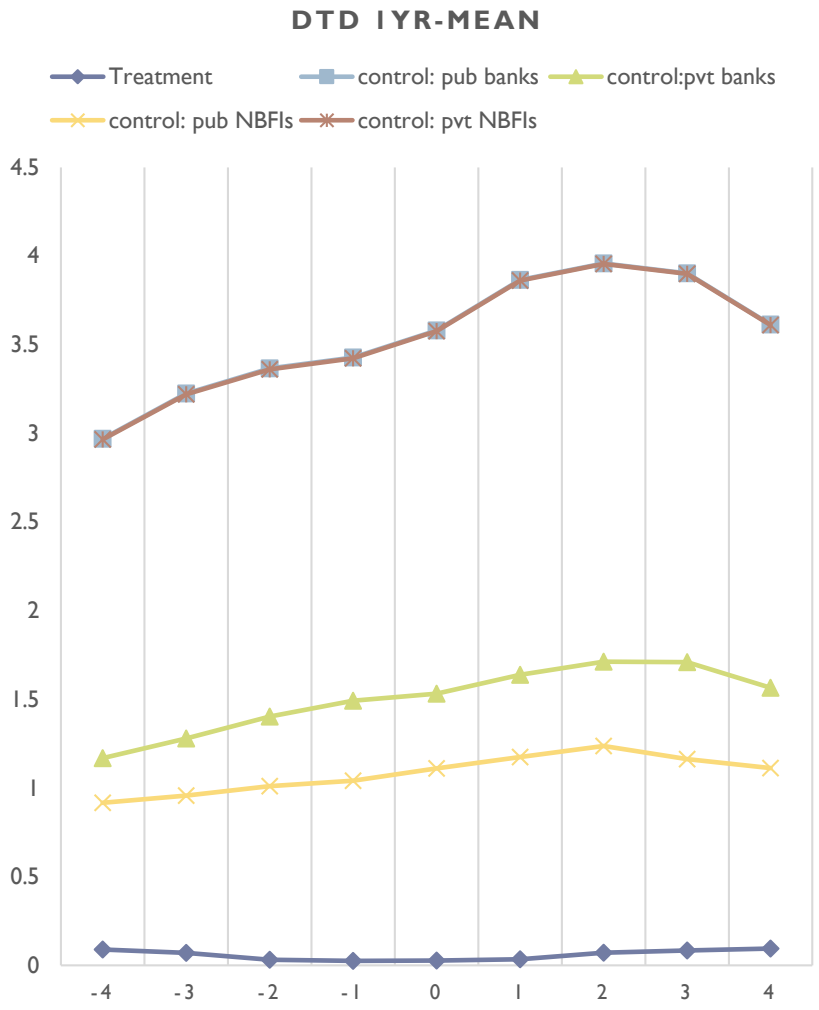
- H2: Effect on systemic risk: Government capital infusions help lower systemic risks of the government guaranteed banks and Financial Institutions (FIs) especially those for large firms.

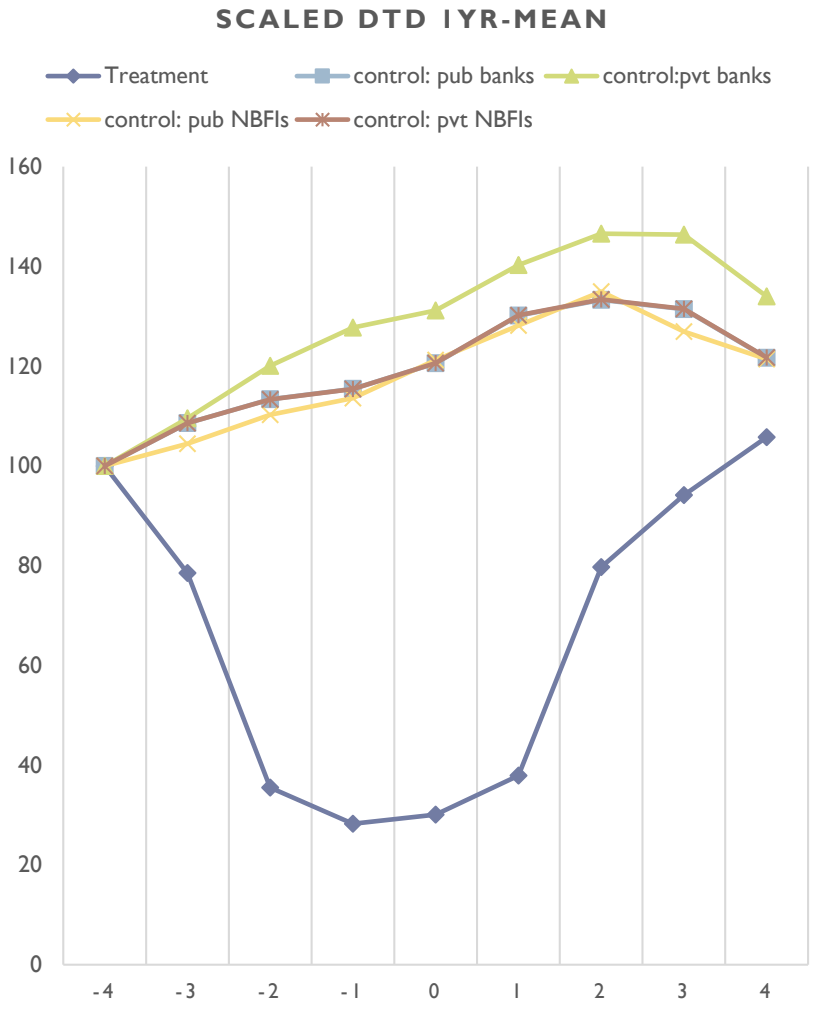
PD evolution event window (event & spillover effects)





DTD evolution event window (event & spillover effects)





Univariate DID

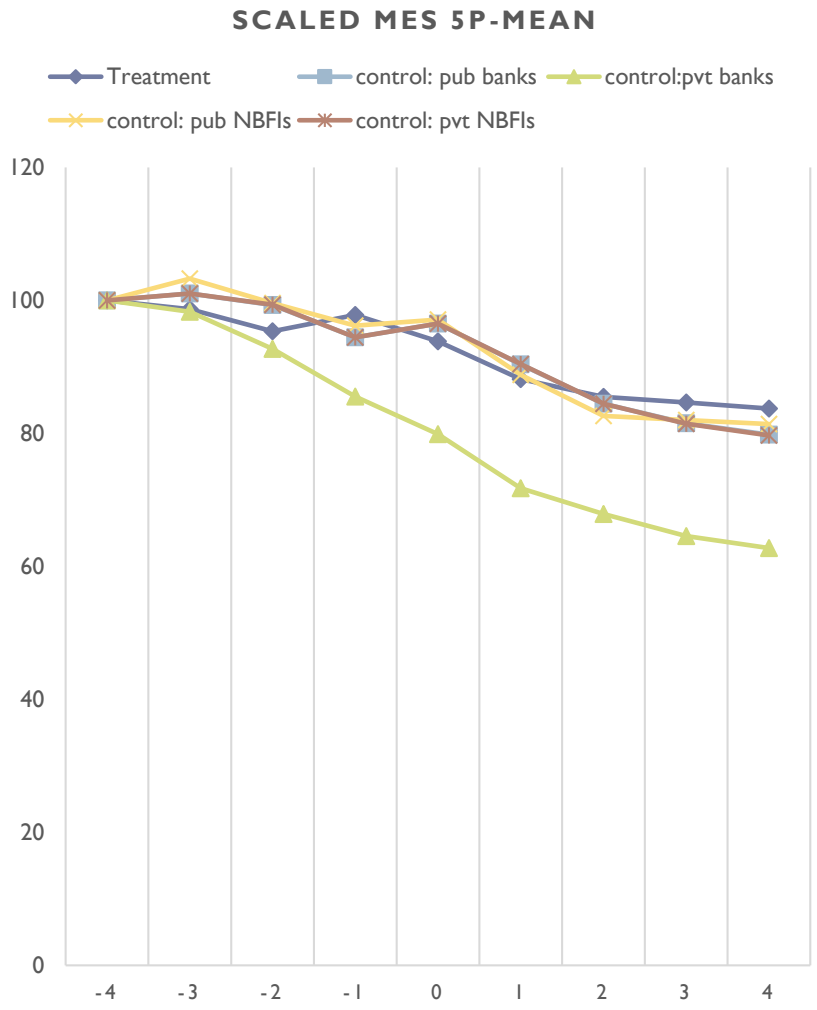
	±2Q					±3Q				
PD 1 year										
Post-pre performance										
	A.Treat.	B. Control: pub banks	C. Control: pvt banks	D. Control: pub NBFIs	E. Control: pvt NBFIs	A.Treat.	B. Control: pub banks	C. Control: pvt banks	D. Control: pub NBFIs	E. Control: pvt NBFIs
pre	0.030	0.005	0.005	0.005	0.005	0.030	0.005	0.005	0.005	0.005
post	0.033	0.004	0.004	0.006	0.004	0.032	0.004	0.004	0.006	0.004
post-pre	0.003	0.000	-0.001	0.001	0.000	0.002	0.000	-0.001	0.001	0.000
t-stat	2.015	-0.509	-1.717	1.165	-0.607	1.547	-0.783	-2.286	1.400	-0.883
P-value	0.044	0.611	0.086	0.244	0.544	0.122	0.434	0.022	0.162	0.377
Treatment vs Control differences										
	A Vs B	A Vs C	A Vs D	A Vs E		A Vs B	A Vs C	A Vs D	A Vs E	
treat.	0.003	0.003	0.003	0.003		0.002	0.002	0.002	0.002	
control	0.000	-0.001	0.001	0.000		0.000	-0.001	0.001	0.000	
treat-control	0.003	0.004	0.002	0.003		0.003	0.003	0.002	0.003	
t-stat	3.933	4.416	2.513	3.970		3.214	3.843	1.685	3.252	
P-value	0.000	0.000	0.012	0.000		0.001	0.000	0.093	0.001	

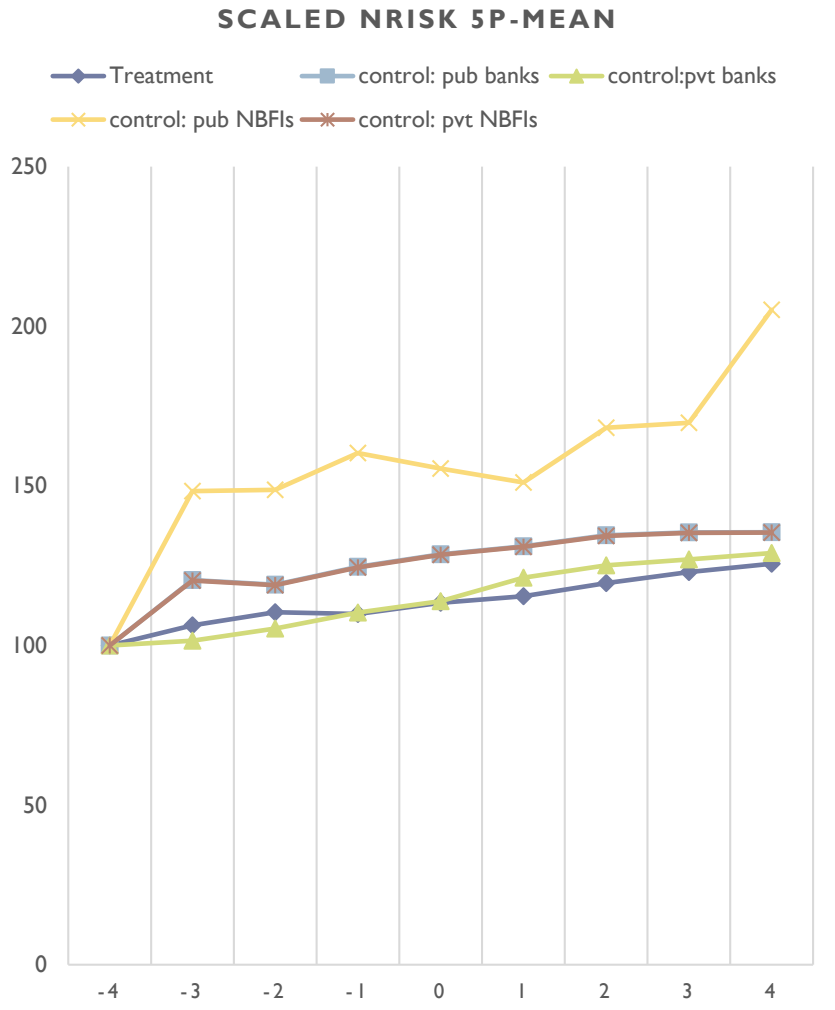
Measuring Systemic risk

- *Cross-sectional Correlation Measures*
  - Distressed insurance premium (DIP) measure:
    - Huang, Zhou, and Zhu (2012)
  - **Marginal expected shortfall (MES):**
    - Acharya et al., (2012)
  - ***Systemic expected shortfall (SES):***
    - Acharya, Pedersen, Philippon and Richardson (2010)
  - **Systemic Risk Measurement (or NSRISK):**
    - Brownlees and Engle (2015)
  - **Conditional value at risk (CoVaR) model**:
    - Adrian and Brunnermeier (2011)

- *Network-Based Measures*
  - Billio, et al., (2012, 2013), Diebold and Yimaz (2014)-LASSO,
  - ***Das et al (2020) : adjacency matrix + PDs and firm size***

MES and NSRIK (event & spillover effects)





DID panel regression

$$(\text{Default or systematic risk measure})_{i,,t} = \alpha_0 + \alpha_1 \text{ treated firm} + \alpha_2 \text{ post-infusion} + \alpha_3 \text{ infusion size dummy} + \beta_0 (\text{treated firm X post-infusion})_{i,,t} + \beta_1 (\text{treated firm X post-infusion X infusion sized dummy})_{i,,t} + \beta_2 X_i + \beta_3 \text{ firm fixed effects}_i + \beta_4 \text{ time fixed effects}_t + \text{error}_{i,j,t} \quad (2)$$

Table 7. DID panel regressions of default risk (Hypothesis 1)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	PD_12	PD_12	PD_12	PD_slope	PD_slope	PD_slope	DTD	DTD	DTD
treat x post	-1.28***	-1.31***	-1.33***	-3.67***	-3.77***	-3.85***	0.56**	0.58***	0.60***
	{-4.83}	{-5.04}	{-5.18}	{-4.59}	{-4.88}	{-5.05}	{3.26}	{3.46}	{3.60}
treat x post x capinfmedian	1.13***	1.18***	1.26***	3.59***	3.79***	4.05***	-0.59***	-0.62***	-0.69***
	{4.42}	{4.71}	{5.04}	{4.64}	{5.06}	{5.46}	{-3.51}	{-3.82}	{-4.24}
capinfmedian	-0.53***	-0.38**	-0.50***	-1.60***	-1.02**	-1.36***	0.39***	0.28***	0.34***
	{-4.38}	{-3.15}	{-4.07}	{-4.52}	{-2.93}	{-3.82}	{4.96}	{3.65}	{4.15}
treatdummy	3.82***	3.83***	3.70***	11.73***	11.74***	11.37***	-2.74***	-2.75***	-2.69***
	{9.32}	{9.52}	{9.29}	{9.45}	{9.77}	{9.57}	{-9.86}	{-10.13}	{-9.93}
post	-0.11	-0.14	-0.21*	-0.29	-0.41	-0.65**	0.03	0.05	0.11
Local factor	N	Y	Y	N	Y	Y	N	Y	Y
US factors	N	N	Y	N	N	Y	N	N	Y
Firm fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y
_cons	2.28***	4.24***	1.11	8.99***	16.56***	6.30*	0.64*	-0.74*	0.04
	{5.83}	{9.19}	{1.19}	{7.64}	{12.13}	{2.30}	{2.42}	{-2.39}	{0.06}
N	1441	1441	1441	1508	1508	1508	1387	1387	1387
R^2	0.72	0.73	0.74	0.77	0.79	0.79	0.78	0.79	0.8

Table 8. DID panel regressions of systemic risk (Hypothesis 2)

	(1) MES_5P	(2) MES_5P	(3) MES_5P	(4) MES_1P	(5) MES_1P	(6) MES_1P	(1) NSRISK-5p	(2) NSRISK-5p	(3) NSRISK-5p	(4) NSRISK-1p	(5) NSRISK-1p	(6) NSRISK-1p	(1) COVAR_5P	(2) COVAR_5P	(3) COVAR_5P	(4) COVAR_1P	(5) COVAR_1P	(6) COVAR_1P
treat x post	-0.99***	-1.02***	-1.03***	-0.8	-0.85	-0.88	-0.07**	-0.08**	-0.08***	-0.01	-0.01	-0.01	0.43*	0.41*	0.37	0.76	0.72	0.63
	{-4.72}	{-4.92}	{-5.16}	{-1.58}	{-1.70}	{-1.82}	{-3.12}	{-3.29}	{-3.44}	{-0.18}	{-0.29}	{-0.37}	{2.09}	{2.01}	{1.87}	{1.41}	{1.34}	{1.23}
treat x post x capinfmedian	1.10***	1.13***	1.18***	1.19*	1.25*	1.34**	0.09***	0.10***	0.10***	0.07	0.07	0.08*	-0.64**	-0.62**	-0.52**	-1.28*	-1.23*	-1.06*
	{5.35}	{5.59}	{6.00}	{2.41}	{2.55}	{2.82}	{4.00}	{4.21}	{4.59}	{1.68}	{1.84}	{2.11}	{-3.17}	{-3.09}	{-2.67}	{-2.42}	{-2.35}	{-2.09}
capinfmedian	-0.33***	-0.21*	-0.23**	-0.66**	-0.42*	-0.46*	-0.03**	-0.02	-0.02*	-0.06***	-0.04*	-0.04*	0.03	0.12	0.01	0.18	0.38	0.17
	{-3.82}	{-2.44}	{-2.69}	{-3.14}	{-1.99}	{-2.20}	{-3.27}	{-1.93}	{-2.47}	{-3.37}	{-2.10}	{-2.38}	{0.30}	{1.43}	{0.01}	{0.80}	{1.67}	{0.75}
treatdummy	0.07	0.06	-0.01	-0.33	-0.36	-0.59	-0.18***	-0.18***	-0.19***	-0.28***	-0.28***	-0.30***	0.25	0.24	0.19	1.99**	1.97**	1.94**
	{0.25}	{0.20}	{-0.04}	{-0.47}	{-0.51}	{-0.87}	{-5.44}	{-5.58}	{-6.00}	{-4.91}	{-5.03}	{-5.48}	{0.88}	{0.85}	{0.69}	{2.67}	{2.65}	{2.70}
post	0.09	0.07	-0.01	-0.17	-0.2	-0.33*	0	0	-0.01	-0.03*	-0.03**	-0.04***	0.1	0.09	-0.01	0.24	0.22	0.06
	{1.54}	{1.34}	{-0.09}	{-1.28}	{-1.48}	{-2.44}	{0.47}	{0.26}	{-1.30}	{-2.37}	{-2.61}	{-3.60}	{1.80}	{1.64}	{-0.14}	{1.70}	{1.57}	{0.41}
Local factor	N	Y	Y	N	Y	Y	N	Y	Y	N	Y	Y	N	Y	Y	N	Y	Y
US factors	N	N	Y	N	N	Y	N	N	Y	N	N	Y	N	N	Y	N	N	Y
Firm fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
_cons	6.08***	7.56***	4.78***	9.37***	12.33***	3.85*	0	0.17***	-0.1	0.12*	0.38***	-0.24	3.21***	4.41***	2.68***	6.00***	8.45***	3.45*
	{24.11}	{23.75}	{7.21}	{15.42}	{15.98}	{2.39}	{0.09}	{4.54}	{-1.28}	{2.39}	{6.09}	{-1.78}	{12.93}	{13.98}	{4.04}	{9.27}	{10.22}	{2.02}
N	1530	1530	1530	1530	1530	1530	1495	1495	1495	1495	1495	1495	1530	1530	1530	1530	1530	1530
R^2	0.71	0.72	0.74	0.52	0.53	0.56	0.74	0.75	0.76	0.55	0.56	0.58	0.57	0.58	0.61	0.47	0.48	0.52

Summary of DID regressions

	Default risk	Sys risk
Treatment effect	+ve sig (strong) risk high	-ve sig (strong) risk low
Post_ infusion	-ve sig (weak)	-ve sig (weak)
large_infusion (network effect)	-ve sig (strong)	-ve sig (strong)
Treatment effect × Post_ infusion (DID effect)	-ve sig (strong)	-ve sig (strong)
Treatment effect × Post_ infusion ×large_infusion (moral hazard)	+ve sig (strong)	+ve sig (strong)

Endogeneity Tests: Table 9

- First stage: Probit model for capital infusion with the following covariates: lagged values of Tier 1, loans/total assets, ROE, deposits/total assets, Cfbeta (IV).

- Cfbeta: responsiveness of individual firms returns to net aggregate capital flows

- 2 SLS IV:
  - Results are still robust

- Heckman:
  - `Results are still robust mainly for NRSIK

Hypothesis 3-6

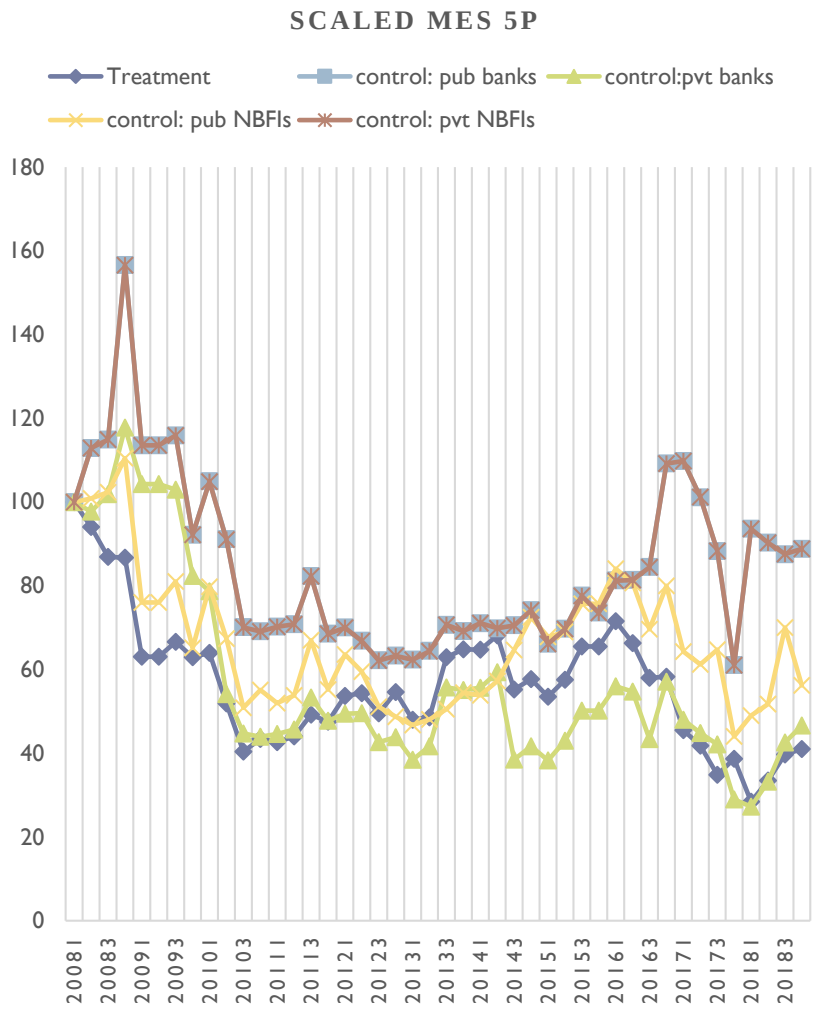
- H3: Effect on systemic risk during macro-stress periods
  - Large infusions are beneficial during macro-stress periods
- H4: Systemic Risk Channels- (preliminary)
  - Variables considered: Leverage ratio: (debt/equity; debt to capital); Loans/assets; Tier 1 ratio; Idio vol
  - We find that mainly leverage (primary) and Ivol (secondary) are the two main channels through which capital infusion may impact the systemic risks
- H5: Effect on sovereign risk-in progress--in progress
- H6: Network risks- in progress

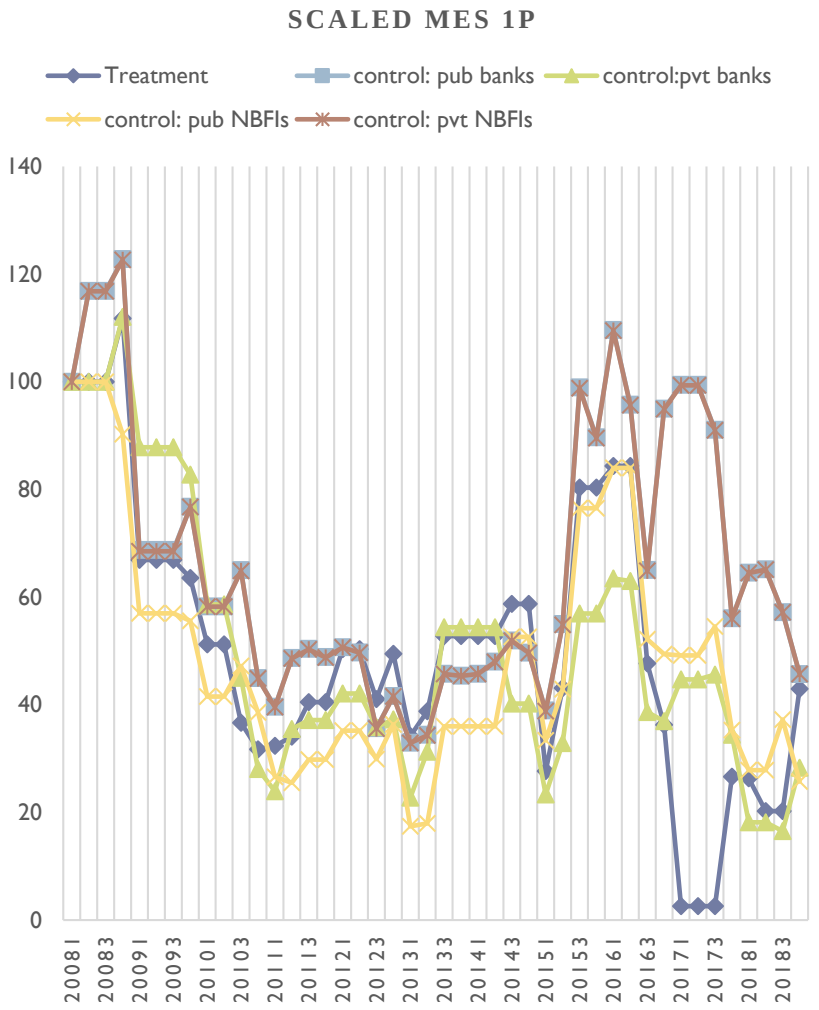
Counterfactual story

- What would have happened had banks not been bailed out?

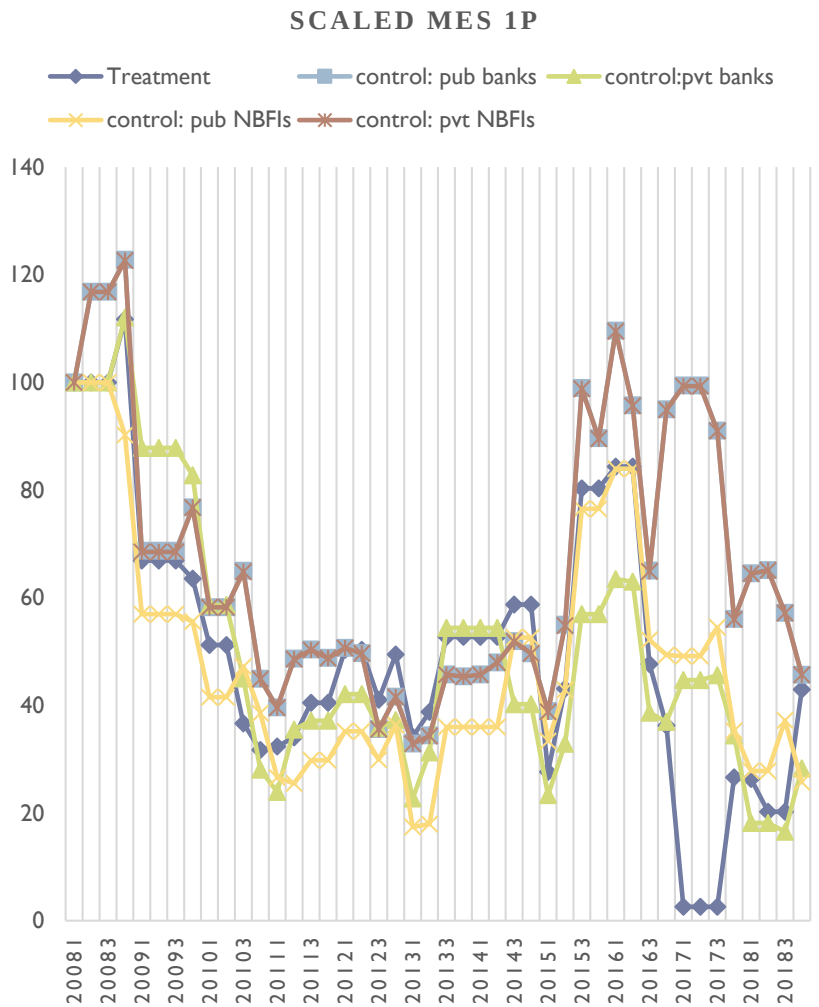
- We present the time series evidence below

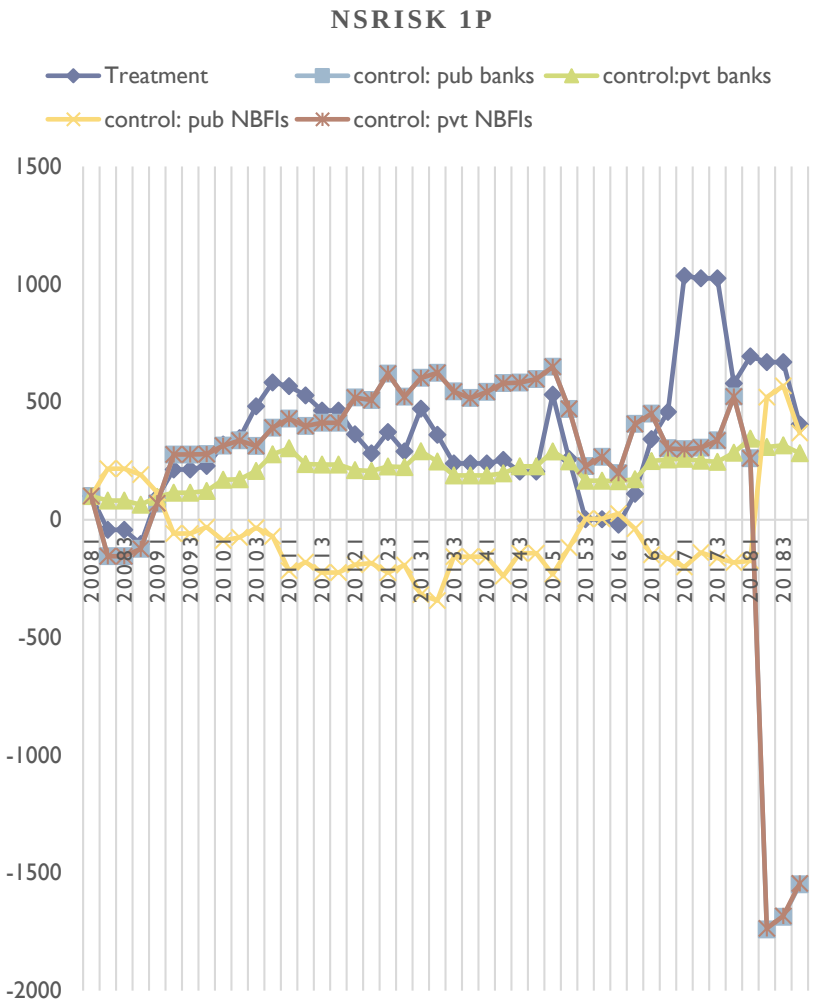
MES time-series plots





MES VS NSRISK time-series plots





Impact of capital infusions on stability (Berger et al., 2020)

Bank leverage risk

- Capital Cushion

Portfolio risk

- Moral Hazard
- Stigma and safety channel

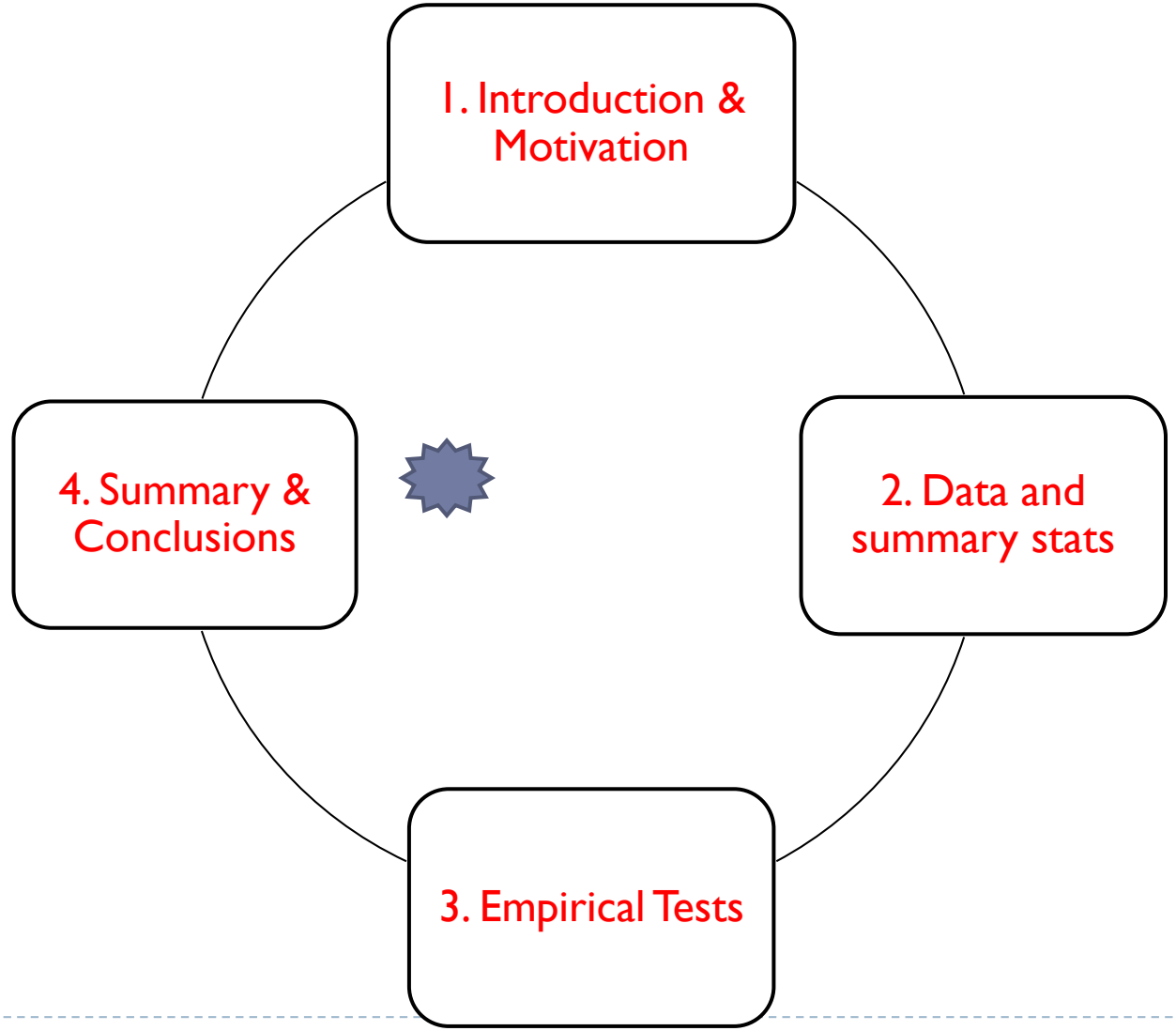
- Short-term

Systemic importance

- May increase (TBTF) protections, to become more interconnected to gain too-interconnected-to-fail (TITF) protections

- Long term

Agenda


1. Introduction & Motivation
2. Data and summary stats
3. Empirical Tests
4. Summary & Conclusions

Summary

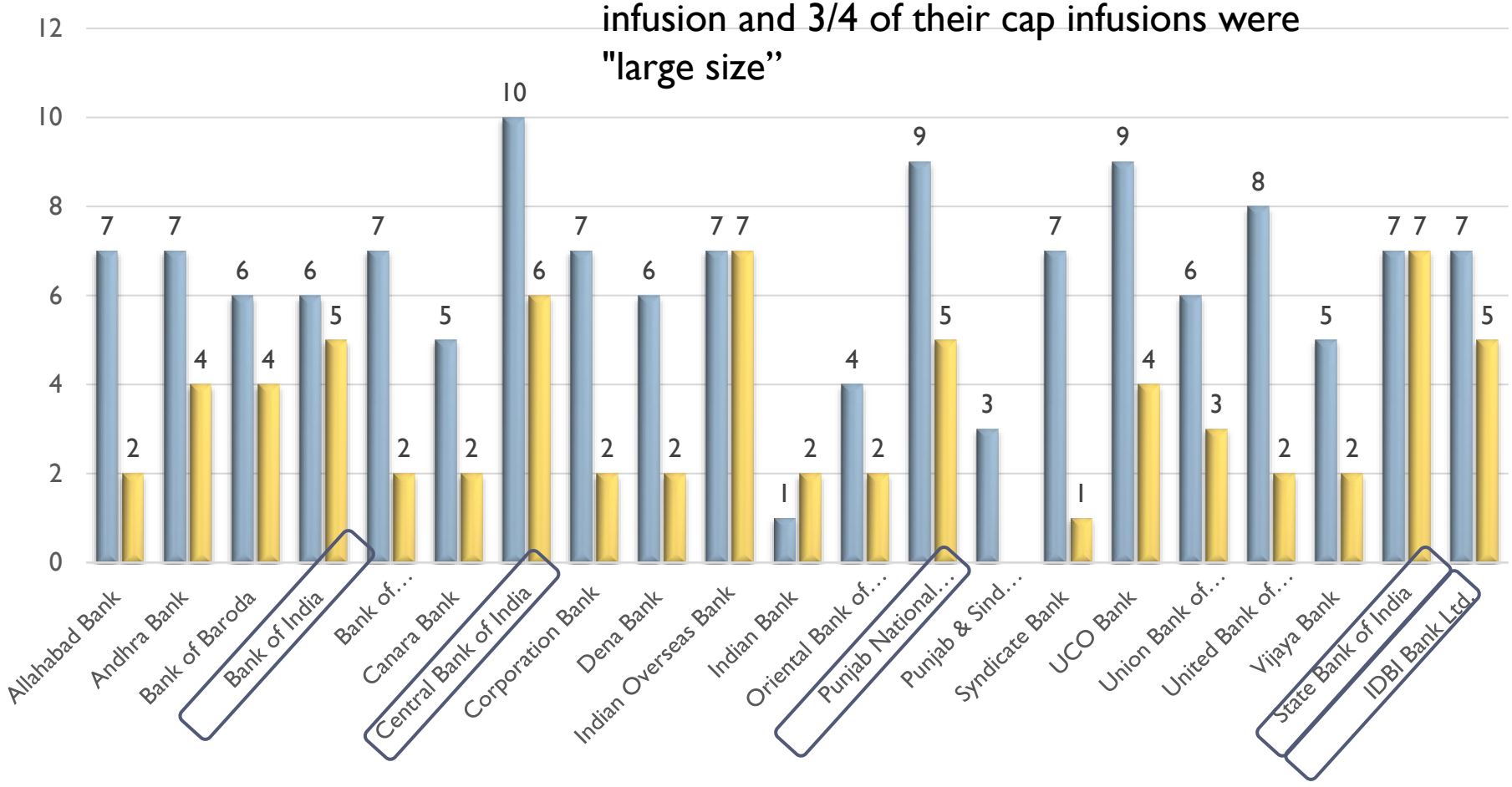
1. Capital infusions in general are associated with improvement in default & systemic risks in treated banks vs other controls.
2. However "large capital infusions" however can exacerbate the default and (distress beta and capital shortfall) systemic risks of the treated banks.
   - Supports Moral harzard argument
3. For "macro-stress periods", however capital infusion helps lower sys risk for treated firms vs controls
4. Short-term network effects associated with capital infusion

In Conclusion….

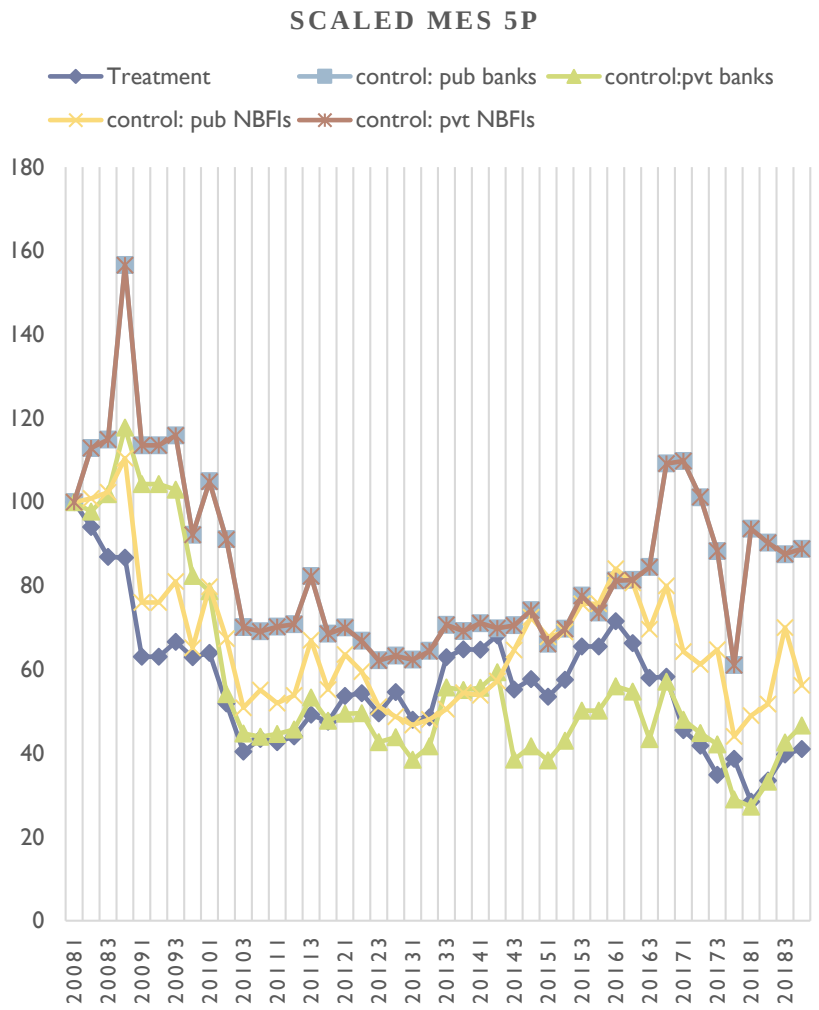
- Systemic risk therefore refers to a risk that has
  - (a) large impact, (b) is widespread, i.e., affects a large number of entities or institutions, and (c) has a ripple effect that endangers the existence of the financial system.
- Governments often employ prudential regulatory tools to ensure financial stability.
  - Governments support ailing banks in many ways including (preferred) equity capital injections, liquidity infusions, financial guarantees, and large-scale nationalization.
- The question of how governmental support to banks impacts the financial stability has a wider policy interest.
- To the best of our knowledge, this study contributes to the literature by providing the first study of how government guarantees impact financial stability in the context of emerging markets.

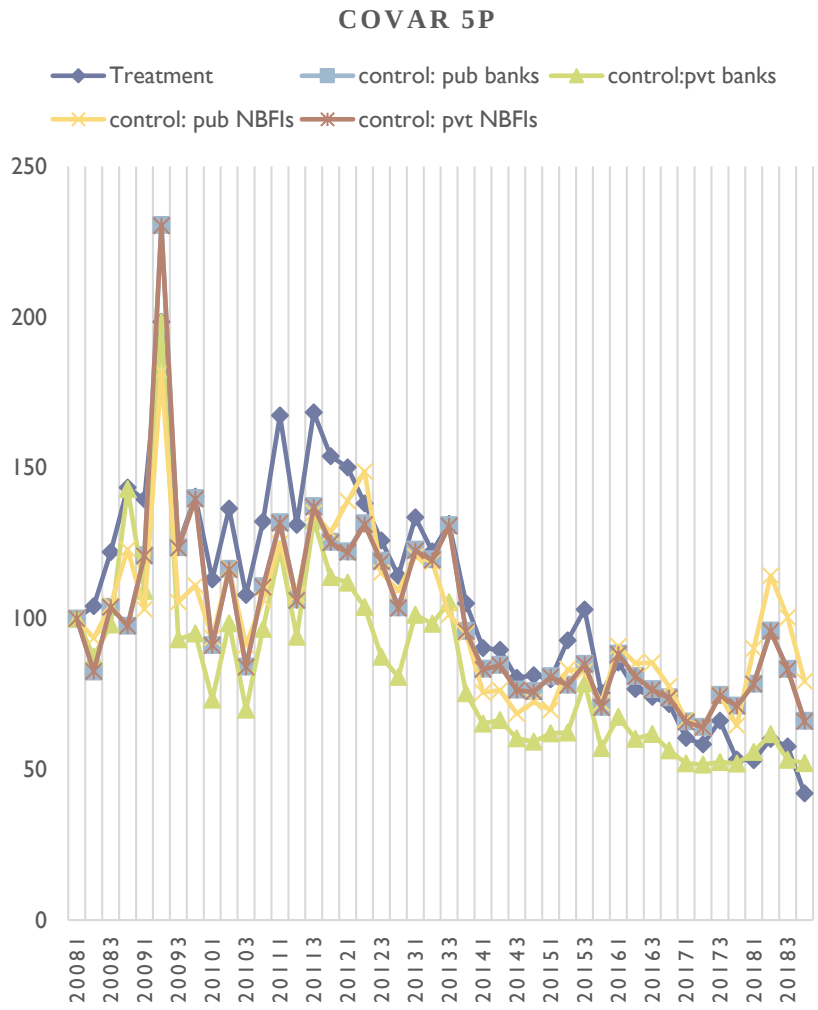
Number of Capital infusions over the sample 2008-18

top 5 banks account for about 1/2 of capital infusion and 3/4 of their cap infusions were "large size"



Why CoVar has opposite reulsts: MES VS COVAR plots over time





NSRISK VS COVAR plots over time