Capital Regulation and Shadow Finance: a Quantitative Analysis

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WE_ARE_IN Macroeconomics and Finance
September 2022

Introduction

- New capital regulation after 2007-2009 financial crisis
  - Basel III: Higher minimum capital requirements

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  - Basel III: Higher minimum capital requirements
- Recent trends in financial intermediation markets
  - Decline in share of regulated banks
  - Increase in share of non-bank ("shadow") lenders

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- New capital regulation after 2007-2009 financial crisis
  - Basel III: Higher minimum capital requirements
- Recent trends in financial intermediation markets
  - Decline in share of regulated banks
  - Increase in share of non-bank ("shadow") lenders
- Corporate credit-level data from South Korea, 2013-2019:
  - 25% decrease in lending by regulated banks
  - Increase in shadow lending by similar magnitude
  - More decline in lending by large (Systemically Important) banks
  - Coincides with the introduction of Basel III.

Research questions

What is the effect of bank capital requirements on:

1. regulated bank lending?
2. non-bank (shadow) lending?
3. large (Systemically Important) bank lending?

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Not the focus of this paper: optimal regulation

Preview of results

Basel III accounts for

- most of the observed decrease in regulated bank lending
- about three quarters of the increase in shadow lending
- about 20% lower lending by large (Systemically Important) banks compared to other banks

Background

Data

Panel of corporate credit accounts in South Korea, Q2:2013 - Q1:2019

- Observation: firm $\times$ lender $\times$ quarter ($\times$ credit types)

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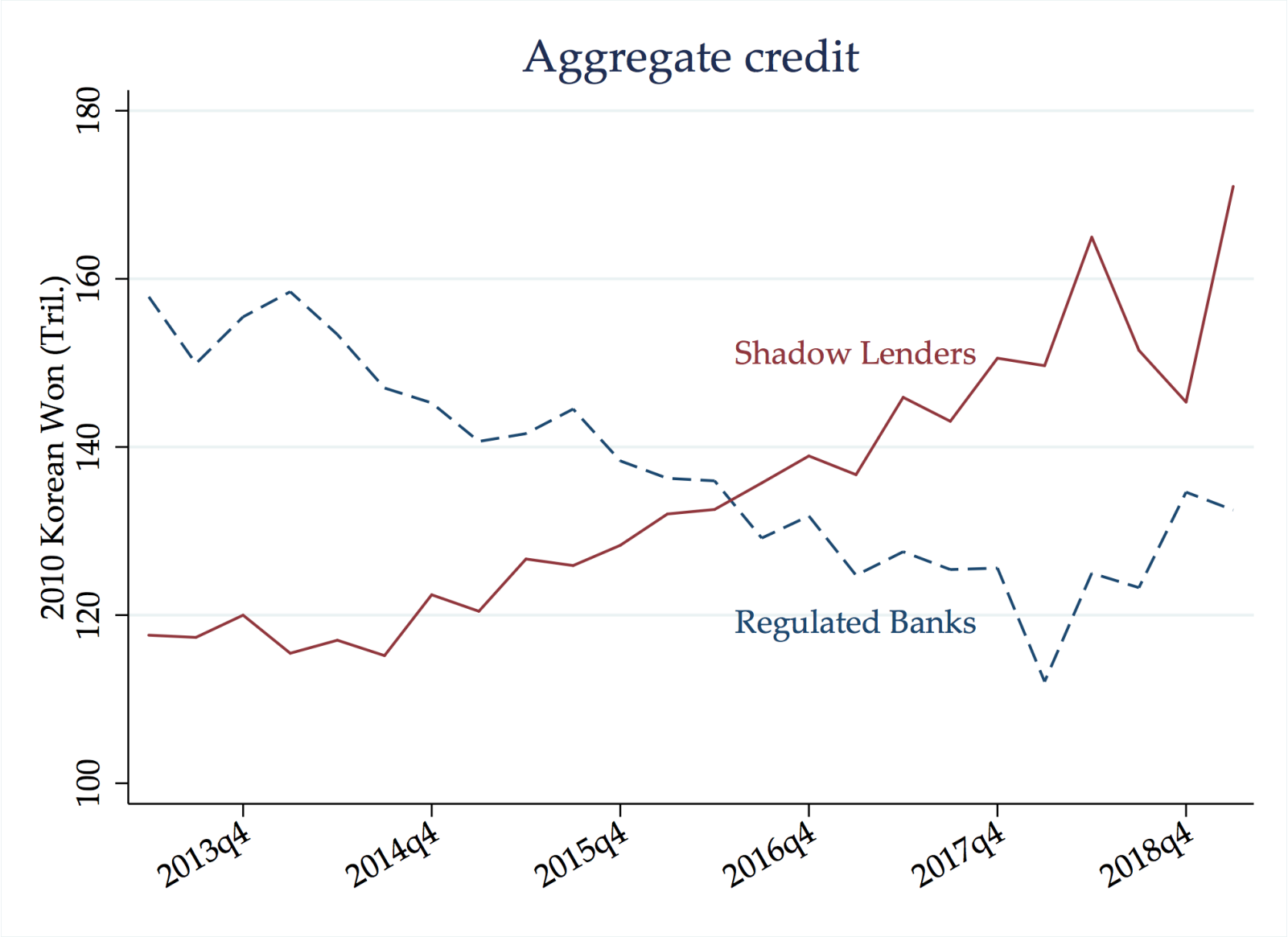
- 2204 public firms $\times$ 578 banks/non-banks $\times$ 24 quarters

Data

Panel of corporate credit accounts in South Korea, Q2:2013 - Q1:2019

- Observation: firm $\times$ lender $\times$ quarter ($\times$ credit types)
- 2204 public firms $\times$ 578 banks/non-banks $\times$ 24 quarters
- Non-banks: insurance companies, wealth management, etc.

Aggregate credit in years 2013-2019



Basel III

- Capital ratio $= \dfrac{\text{equity}}{\text{risk-weighted assets}}$
- Before Basel III (prior to 2010): $\geq 4\%$.
- Basel III (since 2010, subj. to implementation): $\geq 8.5\%$
- Additional buffer for Systemically Important Banks (SIB)

Basel III implementation in Korea

Table: Minimum capital ratio requirements

Time	Tier1 capital ratio (in %)	Note
Until 2012	4	Basel II
From 2013		
From 2014		
From 2015		
From 2016		Basel III
From 2017		
From 2018		
From 2019	8.5 $+ H_{it}$	

H_{it} variable:

- extra 1% for Domestic Systemically Important Banks (DSIB)

Basel III implementation in Korea

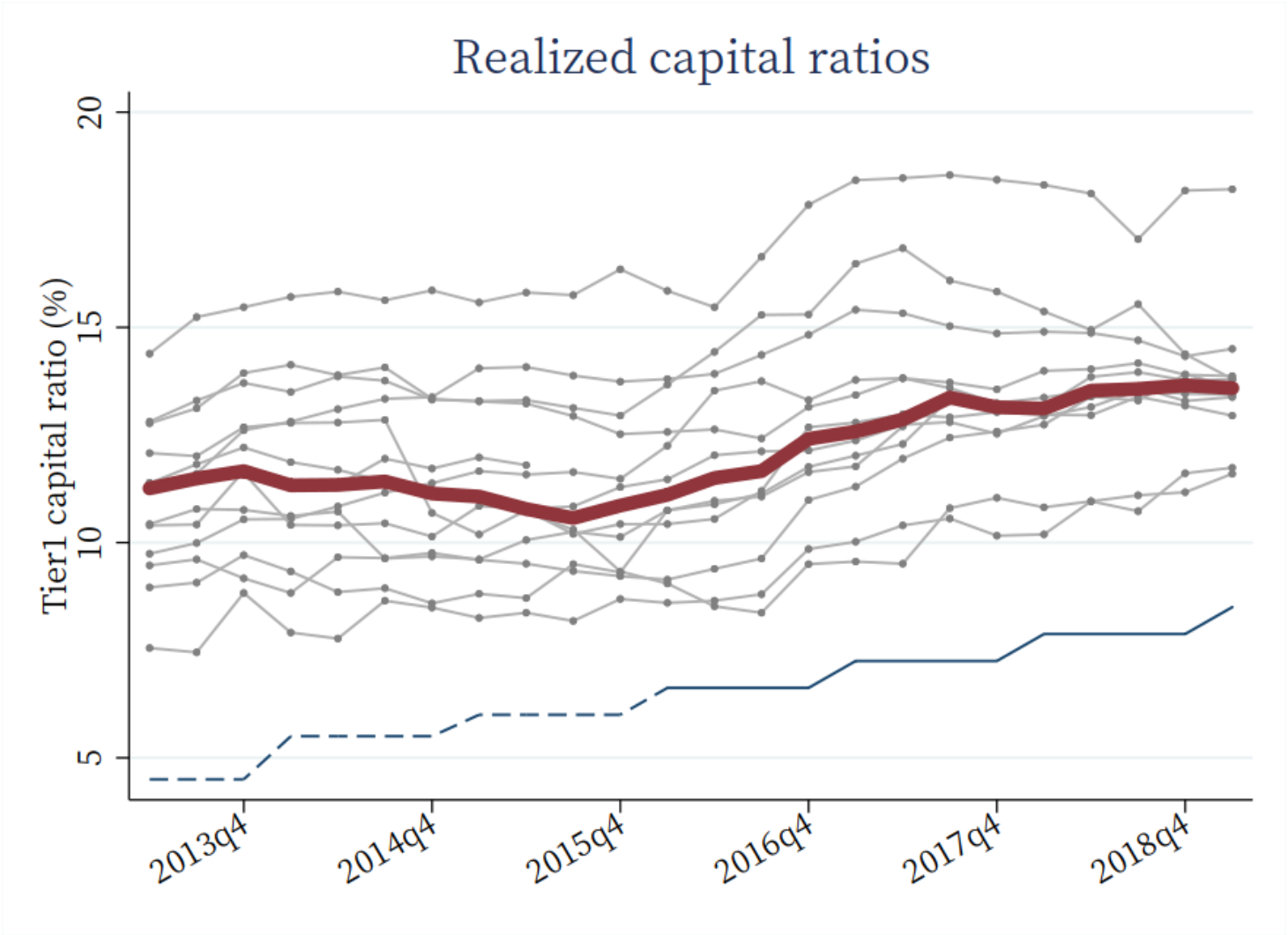
Table: Minimum capital ratio requirements

Time	Tier1 capital ratio (in %)		Note
Until 2012	4		Basel II
From 2013	4.5		Basel III guideline
From 2014	5.0		(no penalty)
From 2015	5.5		
From 2016	6.625	$+ H_{it} \times 1/4$	Basel III
From 2017	7.25	$+ H_{it} \times 1/2$	(with penalty)
From 2018	7.875	$+ H_{it} \times 3/4$	
From 2019	8.5	$+ H_{it}$	

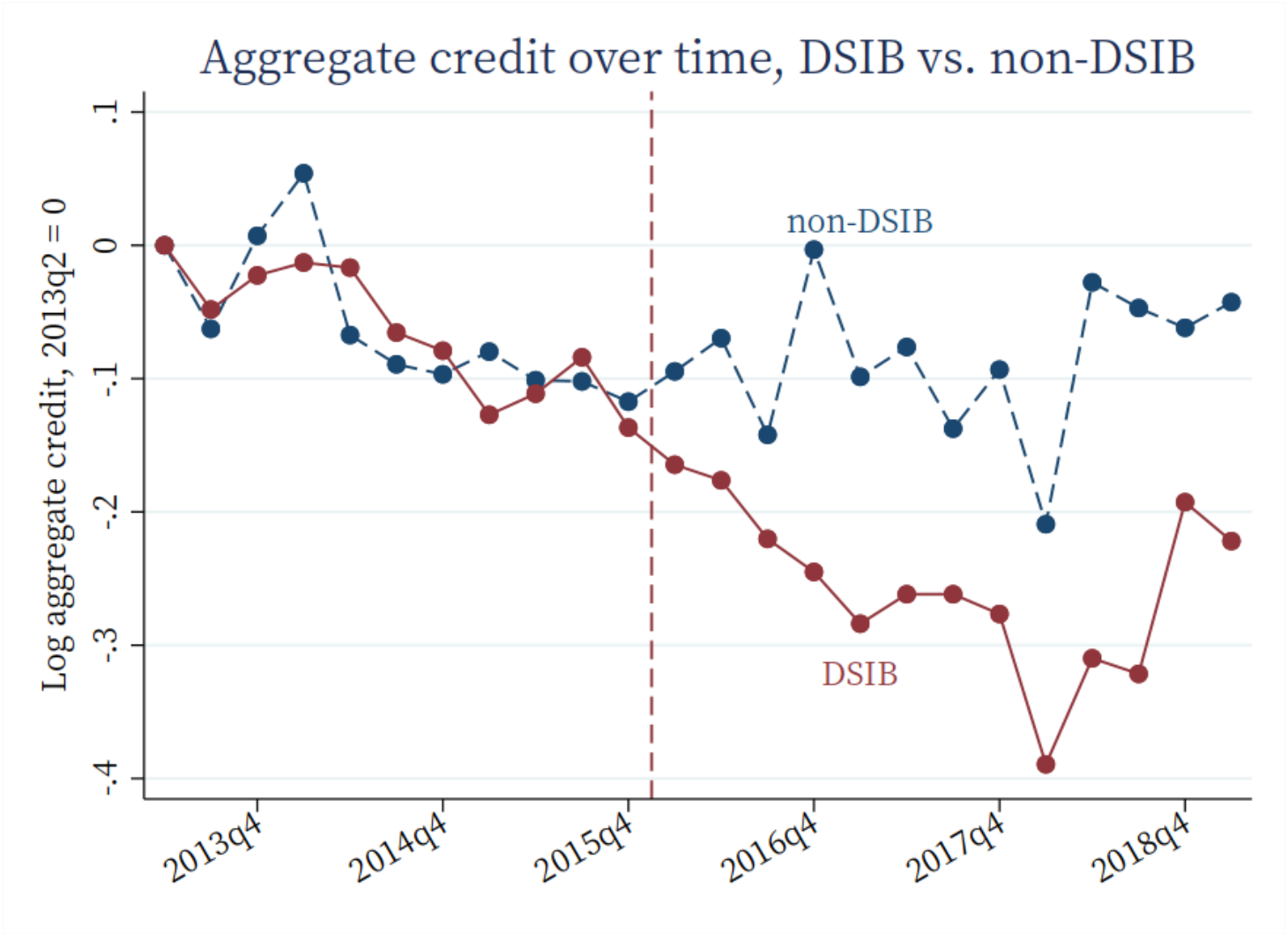
H_{it} variable:

- extra 1% for Domestic Systemically Important Banks (DSIB)

Bank capital ratios



DSIB vs. non-DSIB



Micro estimation

Bank credit elasticities

$$\Delta \ln total\_credit_{ijt} = f_i + f_j + \beta \ln min\_cap\_req_{jt} + \Psi X_{ijt} + \varepsilon_{ijt}$$

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VARIABLES	(1) Δ ln total_credit	(2) Δ ln total_credit	(3) Δ ln total_credit	(4) Δ ln total_credit
ln min_cap_req	-0.135***	-0.138**	-0.140***	-0.143***
	(0.0433)	(0.0469)	(0.0426)	(0.0461)
Constant	0.144*	0.143	0.356***	0.368***
	(0.0777)	(0.0841)	(0.0822)	(0.0891)
Observations	83,559	77,733	83,559	77,733
Fixed Effects	Firm, Bank	Firm, Bank	Firm, Bank	Firm, Bank
Relationship controls	No	No	Yes	Yes
Sample	All	Domestic	All	Domestic
R2	0.0699	0.0722	0.0919	0.0954

Spillover effect on shadow lending

$$\Delta \ln total\_credit_{ijt} = f_i + f_j + f_t + \gamma_t \cdot Shadow_j + \Psi X_{ijt} + \varepsilon_{ijt}$$

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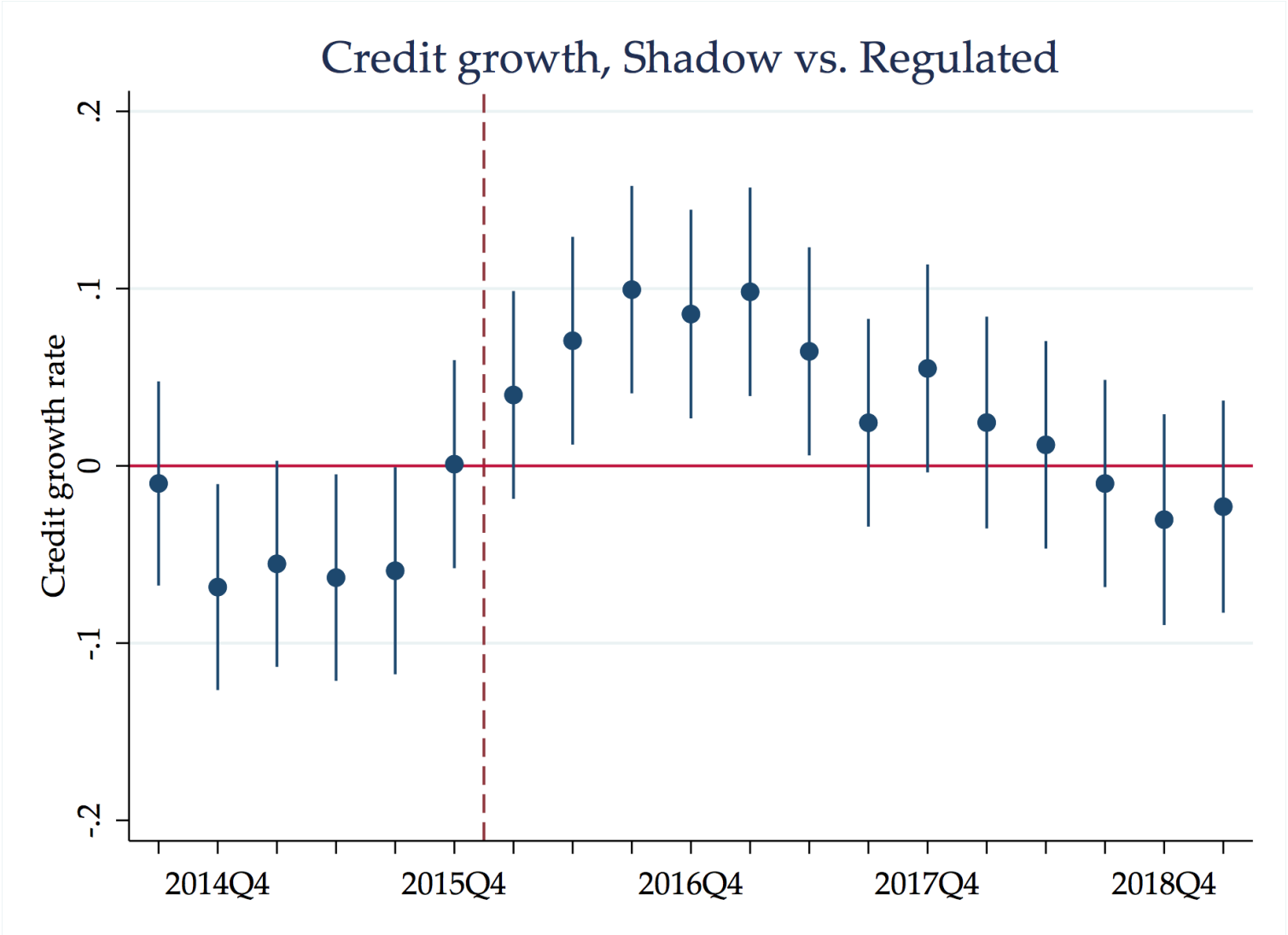

Effect of reform on large and small banks

$$\Delta \ln total\_credit_{ijt} = f_i + f_j + f_t + \gamma_t \cdot DSIB_j + \Psi X_{ijt} + \varepsilon_{ijt}$$

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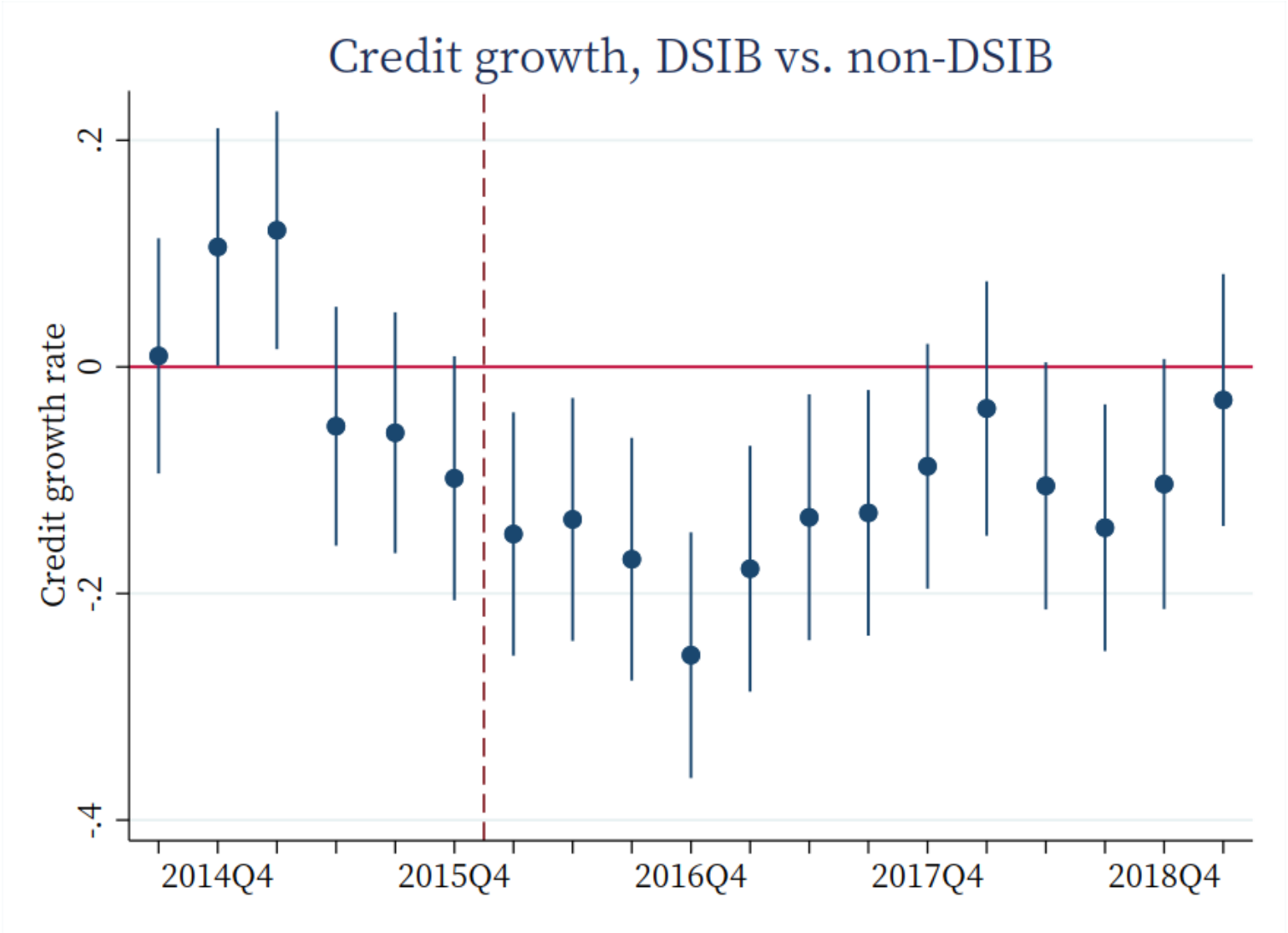
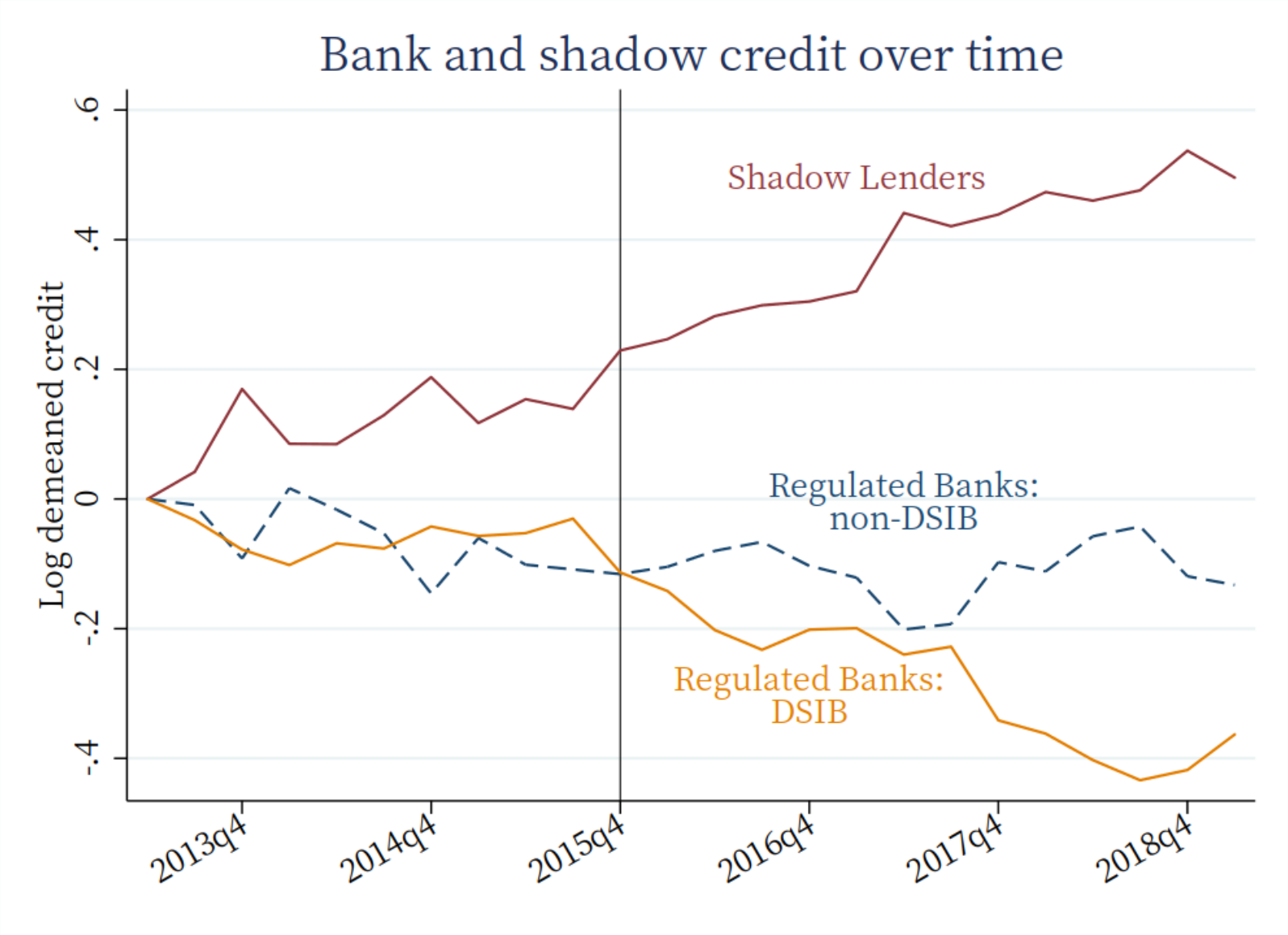


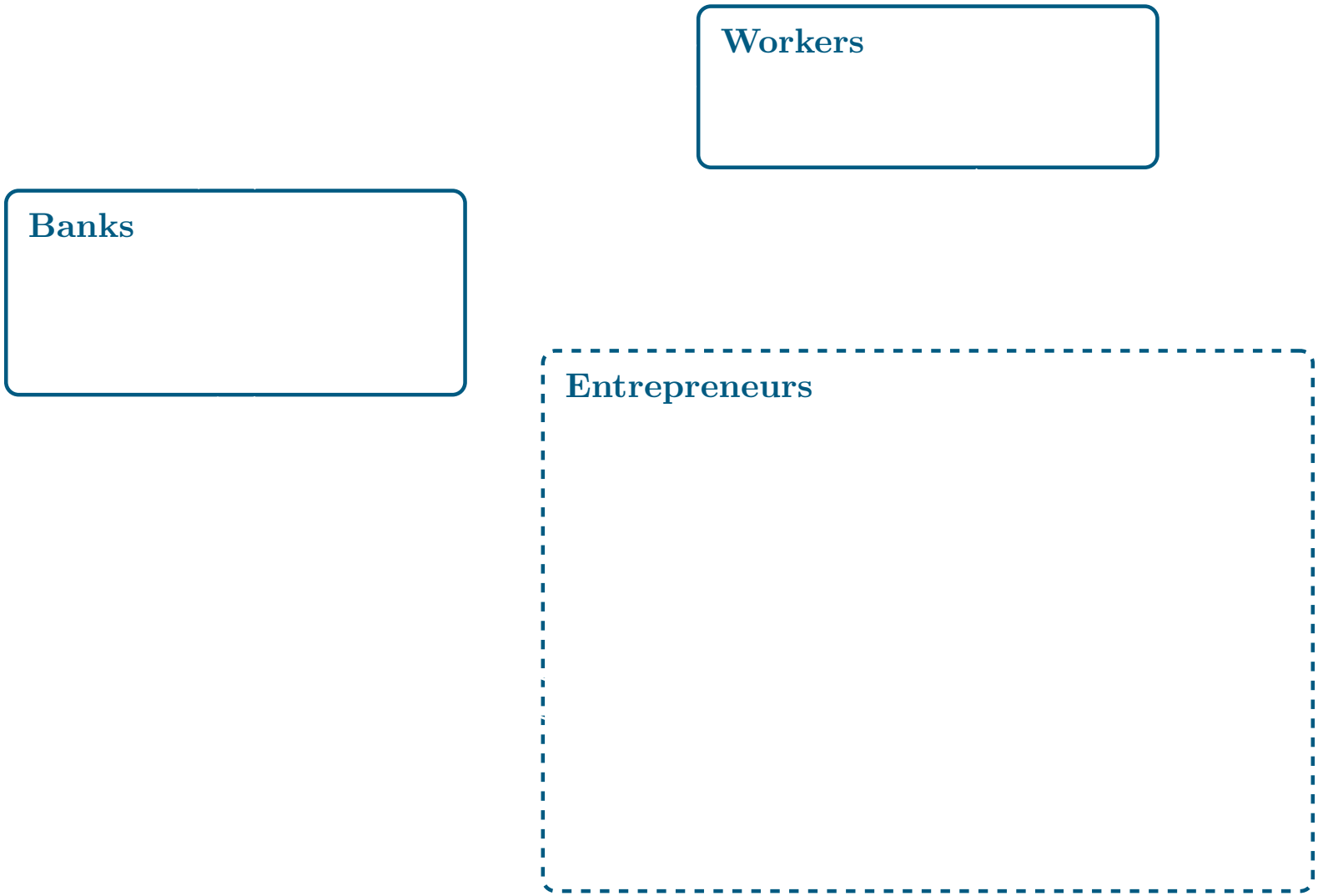
Substitution between bank and shadow credit

Within an average firm



Model

Model overview



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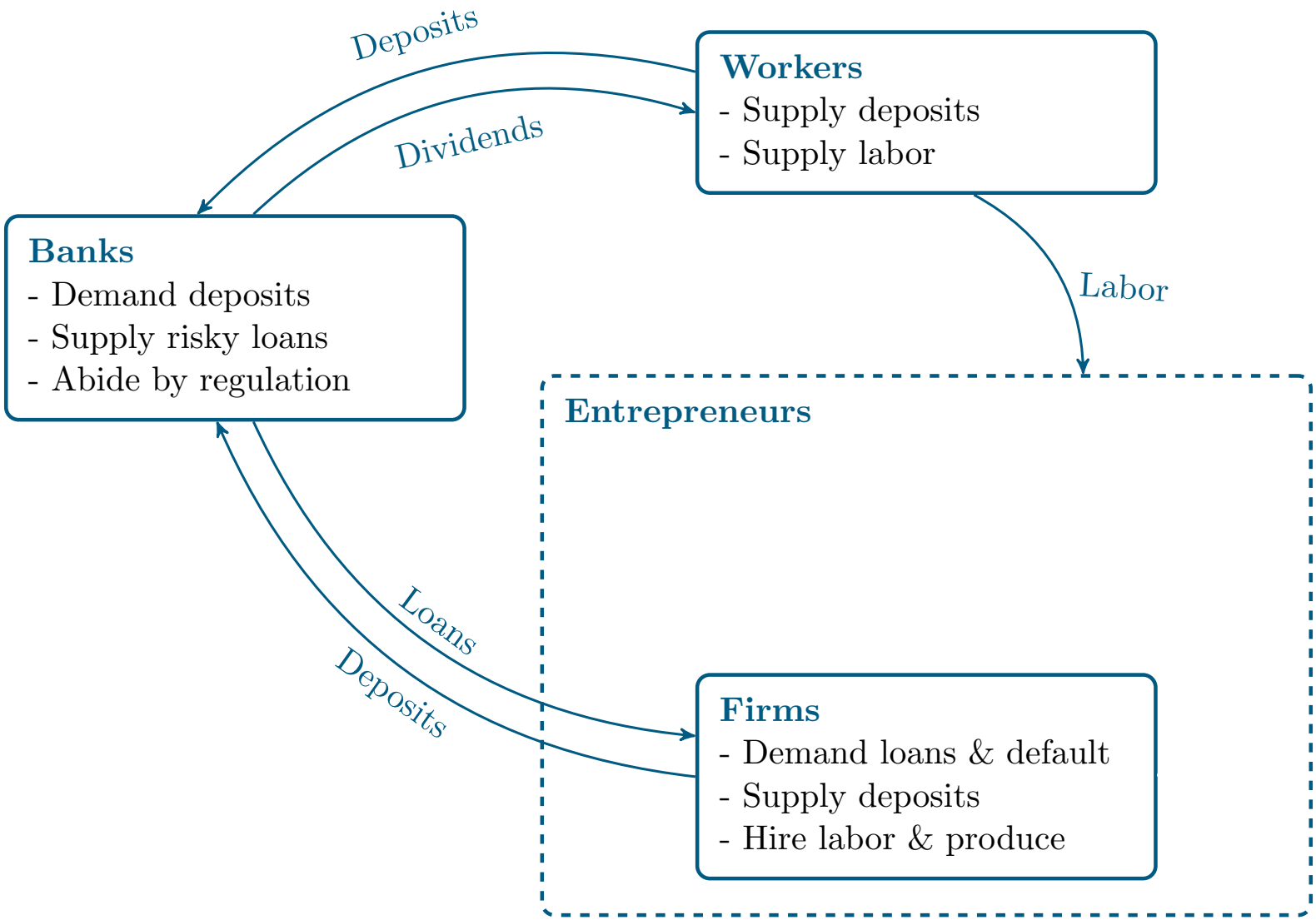
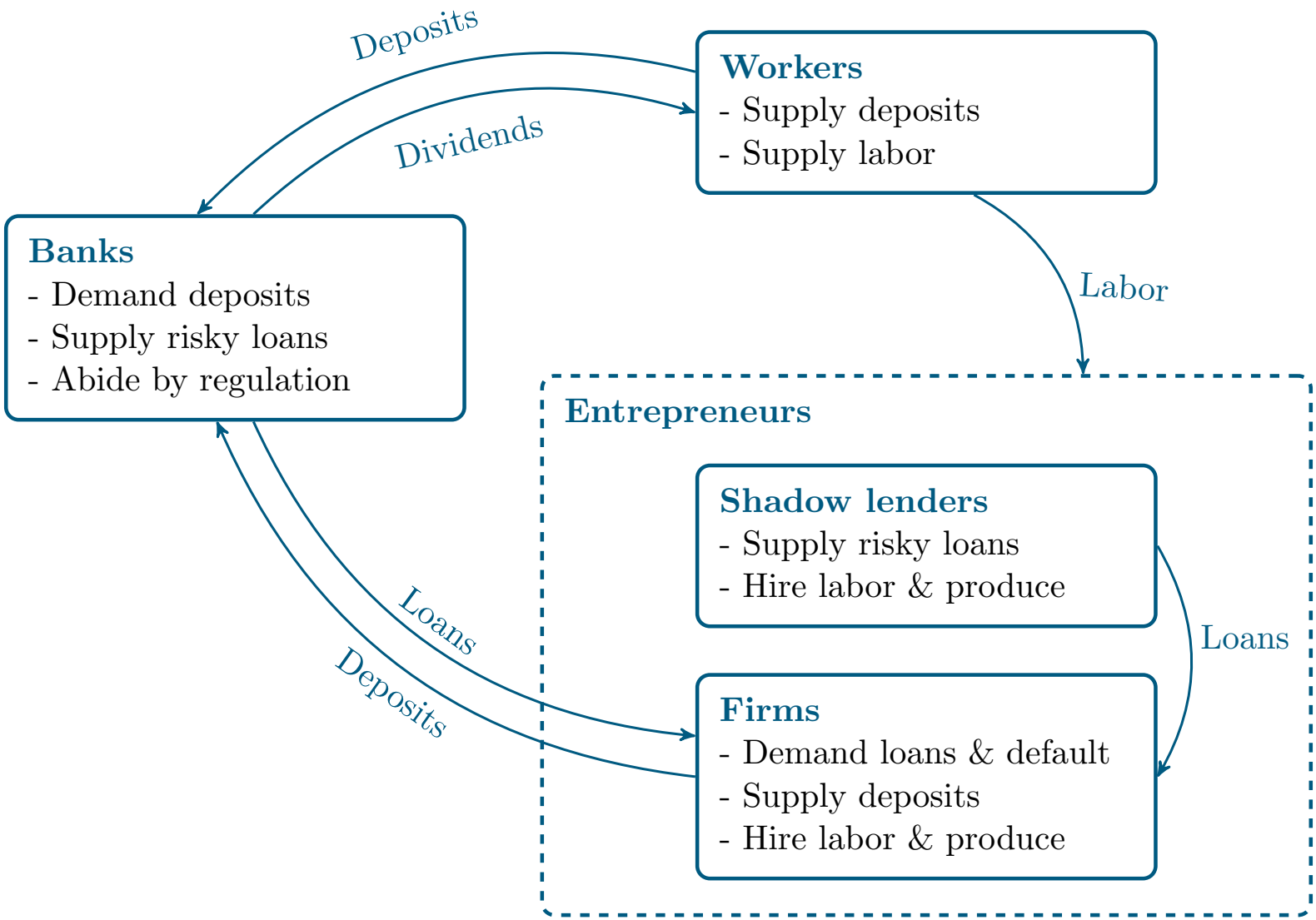


Model overview



Increase in capital requirement

	Before reform	After reform
Capital requirement	4%	
Banks		
Equity	100.00	
Loans	910.56	
Capital ratio (%)	10.97	
Shadow lenders		
Loans	678.23	
Share in all loans (%)	42.69	
Share in all firms (%)	6.23	
r_b (in %)	3.44	
r_d (in %)	1.64	

Increase in capital requirement

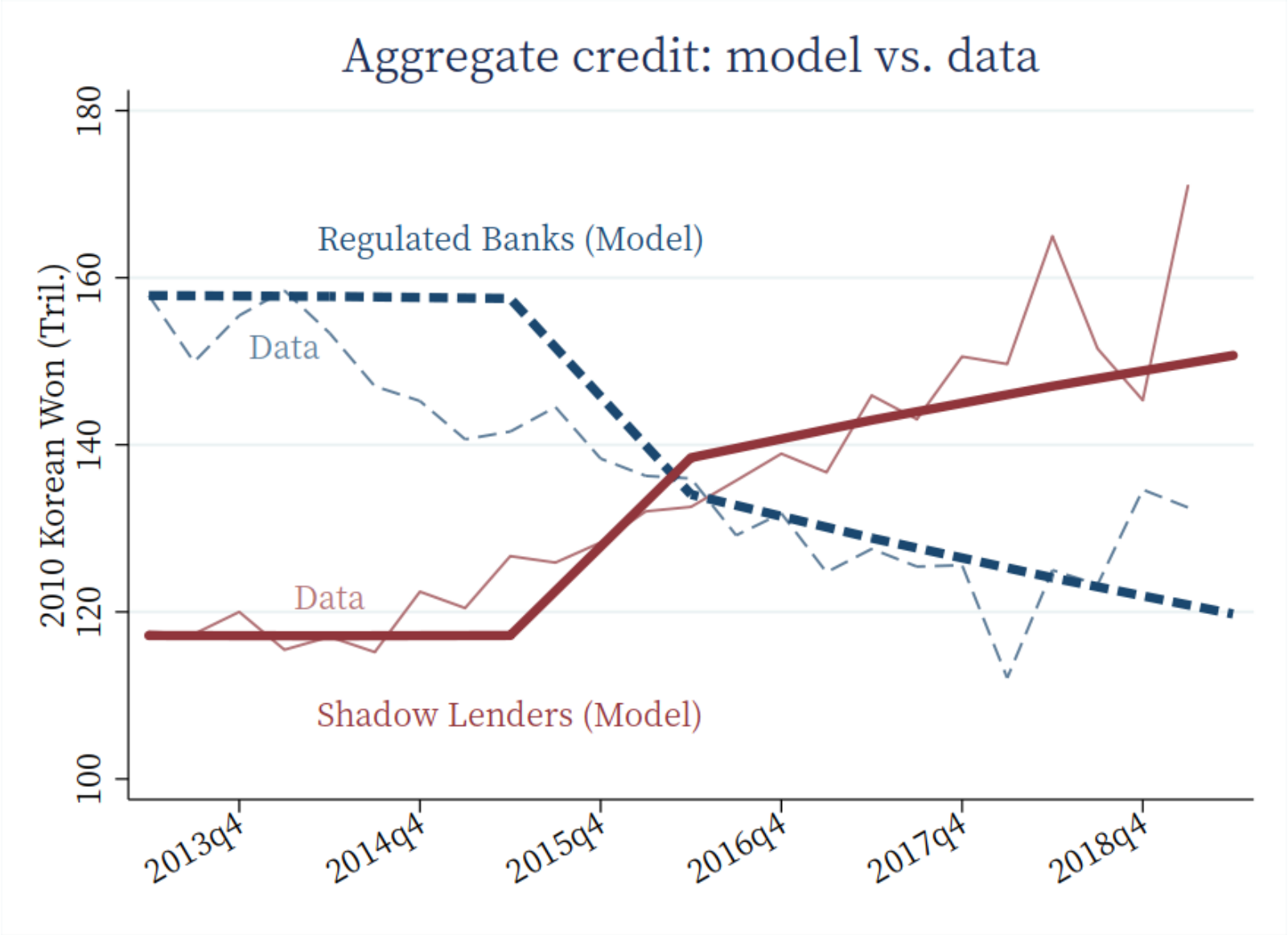
	Before reform	**After reform**
		PE
Capital requirement	4%	8.5%
Banks		
Equity	100.00	9.52
Loans	910.56	64.64
Capital ratio (%)	10.97	20.42
Shadow lenders		
Loans	678.23	678.23
Share in all loans (%)	42.69	91.30
Share in all firms (%)	6.23	6.23
r_b (in %)	3.44	3.44
r_d (in %)	1.64	1.64

Increase in capital requirement

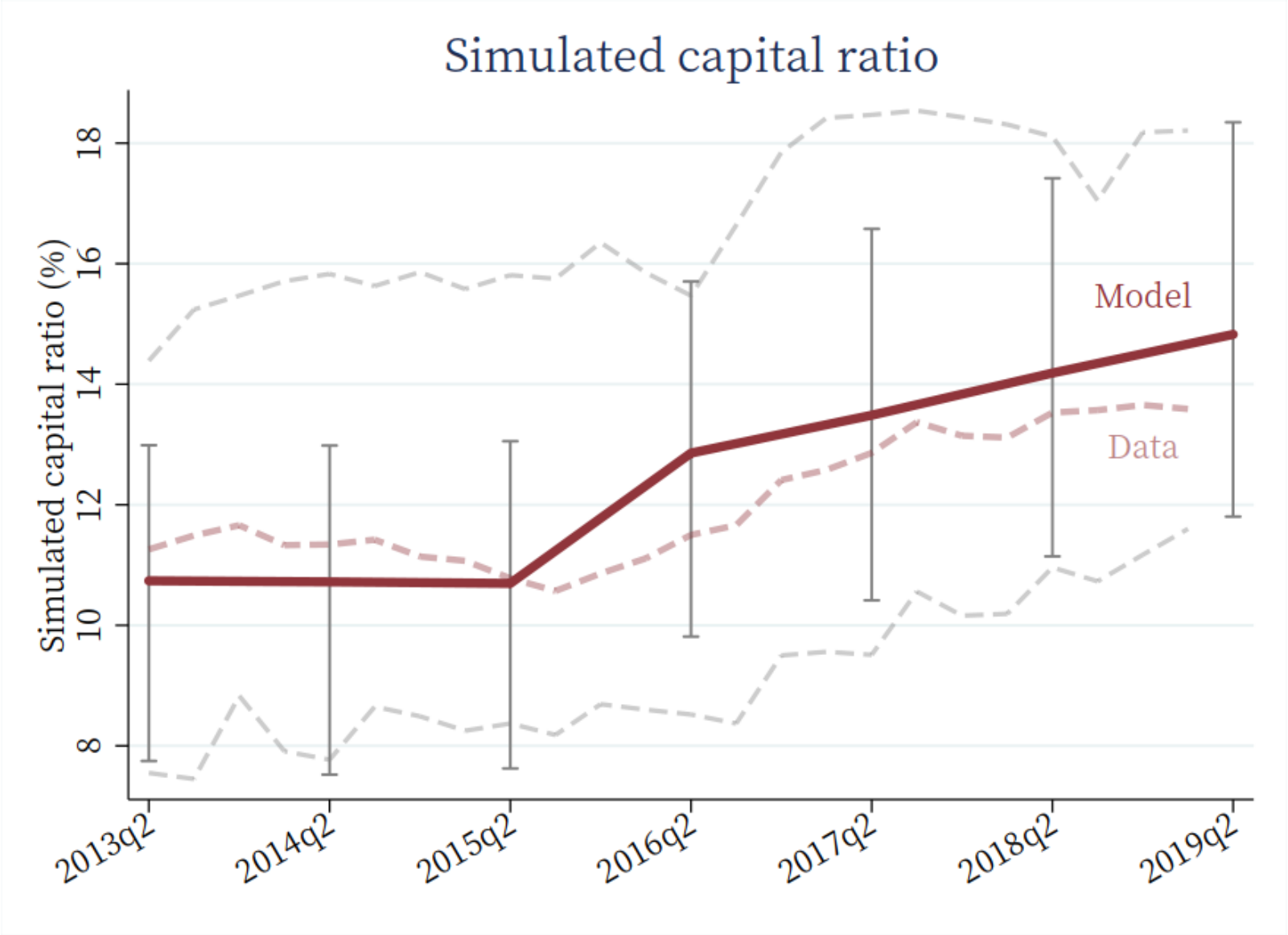
	Before reform	After reform	
		PE	GE
Capital requirement	4%	8.5%	8.5%
Banks			
Equity	100.00	9.52	104.76
Loans	910.56	64.64	722.45
Capital ratio (%)	10.97	20.42	15.15
Shadow lenders			
Loans	678.23	678.23	848.68
Share in all loans (%)	42.69	91.30	54.02
Share in all firms (%)	6.23	6.23	8.74
r_b (in %)	3.44	3.44	3.48
r_d (in %)	1.64	1.64	1.44

Model meets data

Aggregate credit: Model vs. Data

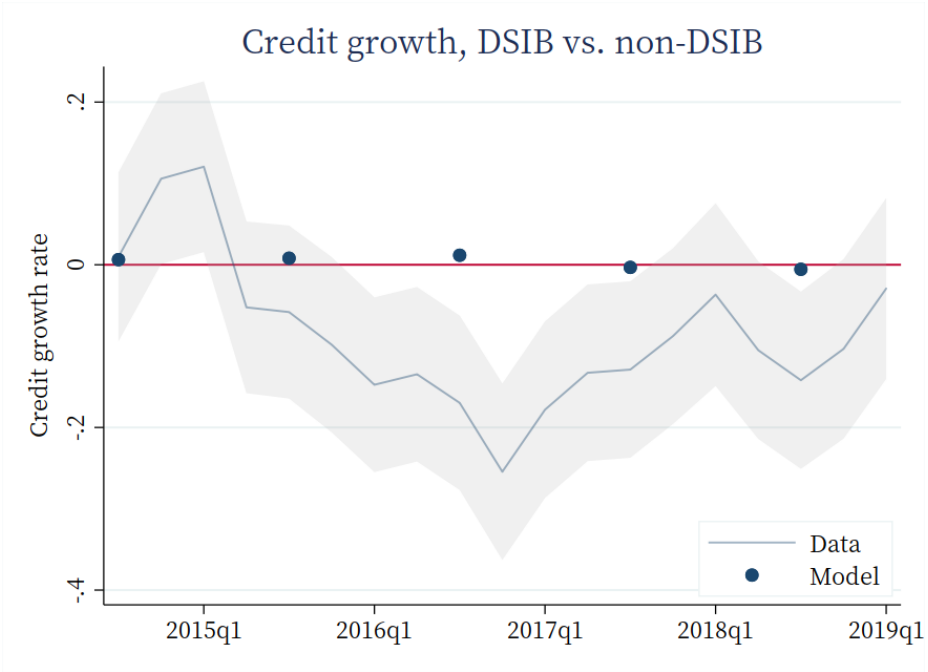


Bank capital ratios: Model vs. Data

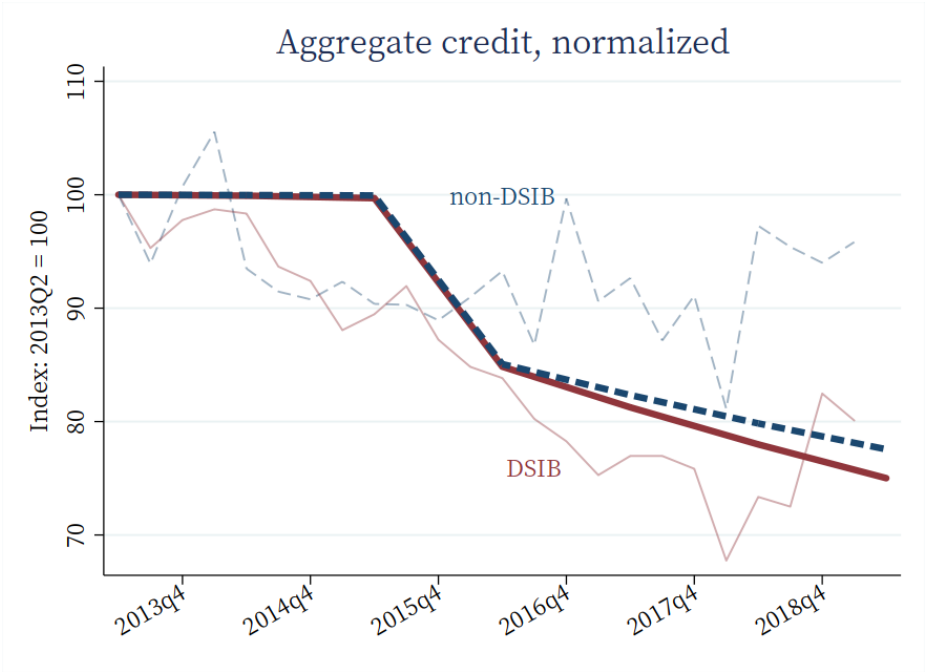


DSIB vs. non-DSIB: baseline model

Baseline scenario: extra 1% capital requirements on DSIBs



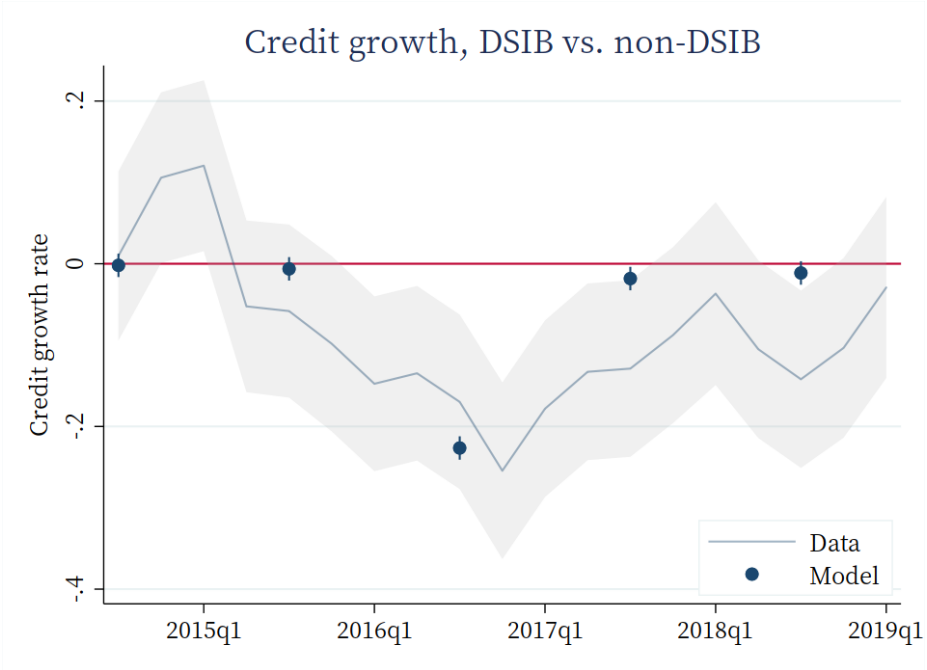
(a) Estimated marginal effects



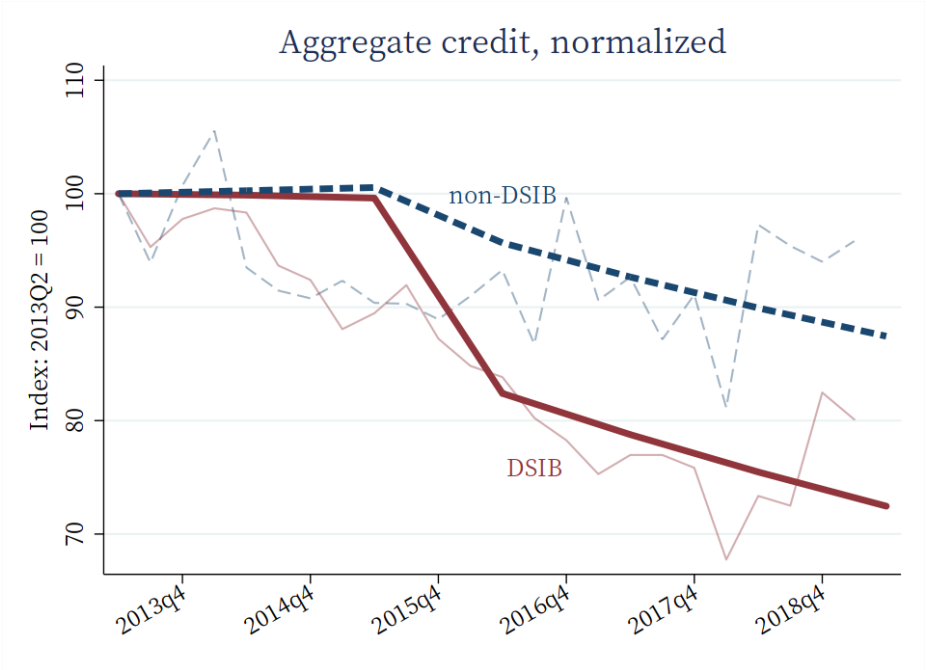
(b) Aggregate lending (normalized)

DSIB vs. non-DSIB: differential penalties

"More intensive supervision" of DSIBs (differential tax function τ)



(c) Estimated marginal effects



(d) Aggregate lending (normalized)

Conclusion

- Main takeaway - in Korea, Basel III lead to:
  - sharp decline in corporate credit from regulated banks
  - similar increase in shadow lending
- GE model of regulated banks and *endogenous* shadow lenders
- Macro results consistent with micro estimates
- Beyond capital requirements:
  - Systemically Important Banks under extra regulations
  - "More intense supervision" accounts for most of the divergence between DSIB and non-DSIB in the short run