Forbearance lending as a crisis management tool: Evidence from Japan

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Research question

- Evaluate the aggregate effects of **Japan's SME Financing Facilitation Act**
- Credit market intervention enacted in 2009: all banks required to offer **loan forbearance** to qualifying SMEs that asked for it
  - Payment deferrals and debt forgiveness
- Banks were allowed to exclude the restructured loans from their reported NPLs if they came up with **business turnaround plans** that were expected to make the loans perform again within five years
- The policy expired in 2013 but the practice has endured

Forbearance statistics

Why it matters/Policy relevance

- Credit market interventions have become a **widespread policy tool** in response to shocks like the GFC and the Covid-19 pandemic
- There is increasing interest in their costs and benefits
- **Challenge the view** that loan forbearance necessarily contributes to **zombification** of the corporate sector
- When coupled with **business restructuring plans**, forbearance can provide temporary relief for viable firms without contributing to zombification

Japan as a case study for policy evaluation

- SME Financing Facilitation Act is a **quasi-experiment**
  - Plausibly exogenous shock from the point of view of the lenders
  - Forbearance not motivated by unobserved bank-specific motives
- Although there was no penalty imposed on banks, almost all requests for loan restructurings were accepted Forbearance statistics

"As long as I'm financial services minister, I'm not going to leave small companies in the lurch, unable to get loans. If a bank takes that approach, I'll hit them with a business improvement order." (Financial Services Minister Shizuka Kamei, The Japan Times, 7 October 2009)

Methodological approach

(1) Develop a **simple search and matching model** of the credit market where banks have incentives to forbear, in order to:

- Motivate a DiD estimation of the effect of the policy on loan interest rates
- Guide back-of-the-envelope counterfactual exercises

(2) **DiD estimation of the impact of the policy on the average interest rates** paid by firms

Methodological approach

(3) Use the DiD estimates to conduct **counterfactual exercises guided by the model**

- Remove the annual treatment effects on interest rates
- Compare the counterfactual population of firms to the observed population in terms of the capital stock, capital productivity, and output

(4) **DiD estimation of policy impact on zombification and firm performance**

Roadmap

- **Theoretical model**
- Data set
- DiD estimation of treatment effects on interest rates
- Counterfactual exercises
- Zombification

Theoretical model

- **Search-and-matching model of credit markets with incentives to forbear**
- Economy is populated by entrepreneurs and banks
  - Entrepreneurs have capital funded by equity or non-bank debt
  - They search for bank credit to expand their capital stock to produce at their optimal scale
  - Banks search for entrepreneurs to whom they can lend profitably
- Once a vacant credit line is matched, the lender and the borrower bargain over interest rates
- New loan interest rate and loan amount are determined every period
- Benefit of a credit line subject to idiosyncratic shocks to firm-level productivity
- Contract is renewed if the surplus of the match is positive

Theoretical model

- If not, both parties end the relationship and the bank incurs a separation cost

- **Exogenous separation cost captures forbearance incentives**
  - Any kind of monetary or reputational cost that the bank incurs when exiting a credit relationship

- Termination cost **lowers the productivity threshold for separation** and can generate an **interest rate subsidy** for the firm
  - Termination costs in the current period push interest rate down
  - Discounted future termination costs on existing relationships increase interest rates because banks price in future termination costs

Predictions on interest rates

Roadmap

- Theoretical model
- **Data set**
- DiD estimation of treatment effects on interest rates
- Counterfactual exercises
- Zombification

Data set

- Firm-level annual panel for 2007-2018 from Tokyo Shoko Research
- Measure **firm-level exposure to policy** using 2009 data
- Product of a dummy variable for eligibility and the probability of firm receiving forbearance, conditional on eligibility
- Estimated using a Probit on a sample of 3,298 eligible firms surveyed by RIETI (Ono and Yasuda, 2017)
- Only need to control for demand-side determinants because almost all requests were accepted
  - Industry, leverage, credit score, ROA, sales, employees, and age

TSR Probit Credit market tightness

Roadmap

- Theoretical model
- Data set
- **DiD estimation of treatment effects on interest rates**
- Counterfactual exercises
- Zombification

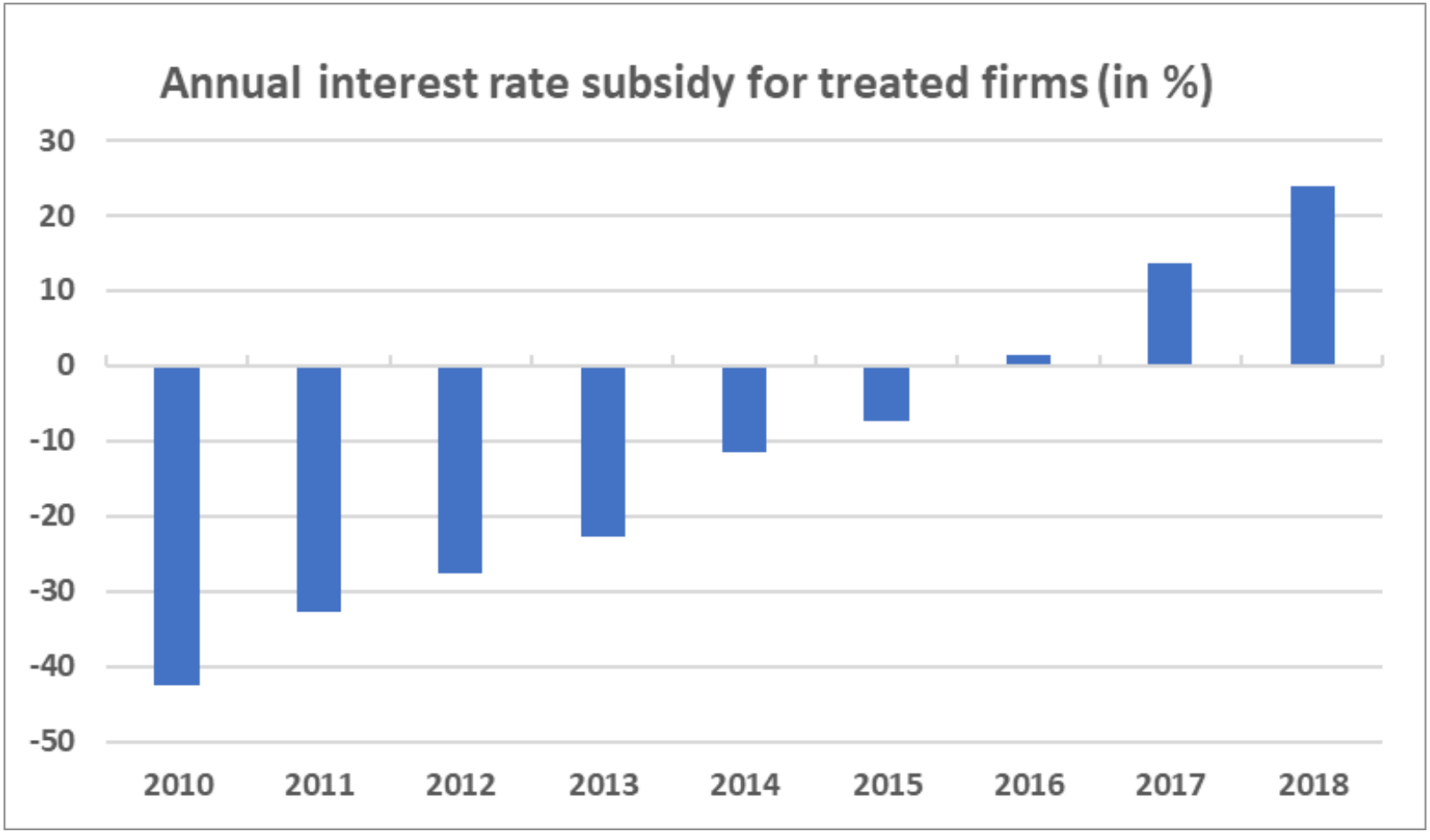
DiD estimation: Model

$$ln(r_{it}) = \alpha + \sum_{t=T_0}^{T} \beta_t \cdot D_t \cdot TreatmentIntensity_i + \Gamma X_{it} + f_i + f_t + ...$$

$$... \sum_{c} \gamma_c \cdot Post_t \cdot X_{it}^c + \epsilon_{it}$$

- $ln(r)_{it}$: log of interest rate on debt obligations
- D_t: year dummies
- $TreatmentIntensity_i$: treatment exposure
- β_t: annual treatment effects
- X_{it}: covariates dictated by model + share of bonds and trade credit
- $Post_t$: dummy for the post-treatment period (2010-2018)
- X_{it}^c: confounding covariates that are correlated with $TreatmentIntensity_i$
- f_i and f_t: firm and year fixed effects

DiD estimation: Results



Parallel trends: Placebo test
Parallel trends: Visual

DiD estimation: Results

- **Average interest rate subsidy** of 18.5% for treated firms over 2010-2018
- Treatment effects fade away over time and turn positive in 2017
- **Weakening of forbearance incentives over time**
- Most forbearance was granted in the form of **temporary payment deferrals**
- Firms that received payment deferrals experienced a period of subsidized credit before returning to higher interest rates around 2016

DiD by type of forbearance

Roadmap

- Theoretical model
- Data set
- DiD estimation of treatment effects on interest rates
- **Counterfactual exercises**
- Zombification

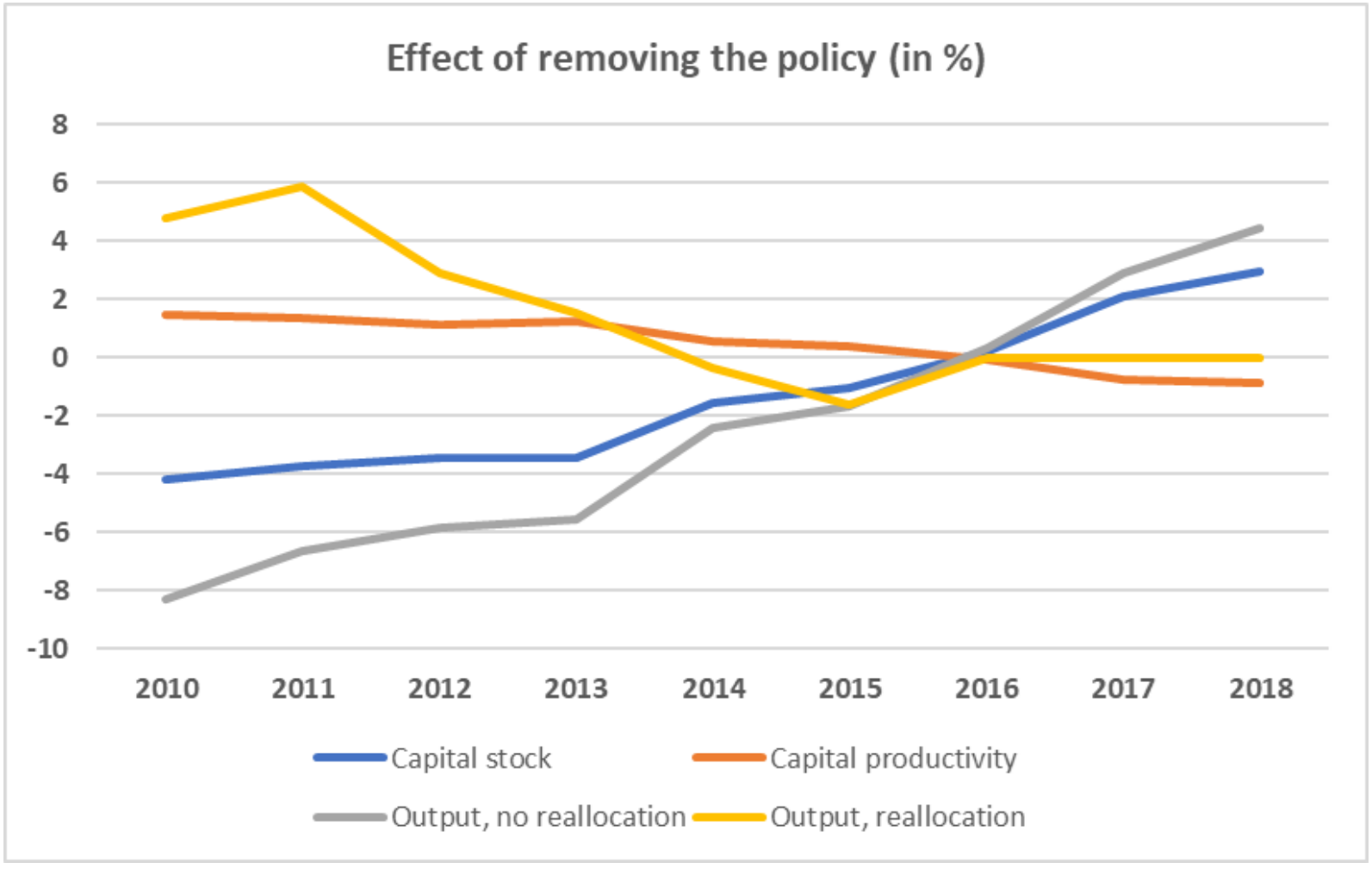
Counterfactual exercises: Methodology

- Model tells us how a firm's capital stock changes in response to changes in interest rates on bank credit Capital stock adjustment
- Remove annual treatment effects on interest rates and calculate each firm's counterfactual capital stock
- Calculate counterfactual aggregate capital stock, output, and capital productivity (aggregate output net of labour costs per capital unit)
- Output counterfactual with reallocation:
  - Assume that freed-up capital is seamlessly reallocated to firms that produce at CF capital productivity
  - Extra output is added to CF aggregate output

Counterfactual exercises: Results

- **Cheap credit boosted capital stock at the expense of productivity**
  - The Act boosted the capital stock by 1.4% and depressed capital productivity by 0.5% on average over 2010-2018
  - Effects are initially large but fade away over time
- **The extent of credit reallocation determines whether the policy leads to output gains or losses**
  - Impaired reallocation (plausible): Act is estimated to have boosted output by 2.5% on average
  - Seamless reallocation: Act is estimated to have depressed output by 1.5% on average

Counterfactual exercises: Results



Counterfactuals: Table

Roadmap

- Theoretical model
- Data set
- DiD estimation of treatment effects on interest rates
- Counterfactual exercises
- **Zombification**

Zombification

- Explore whether the policy contributed to zombification in a DiD set-up
- Our main definition of zombie firm is based on Fukuda and Nakamura (2013)
- We classify a firm as a zombie if:
  - (i) It receives subsidized credit and it is unprofitable; or
  - (ii) It does not receive subsidized credit, but it is unprofitable, has elevated leverage, and has increased its bank loans
- Also explore policy impact on exit, TFP, and interest coverage ratios

Zombie definition Lower bound interest rate

Zombification: Results

- The Act **did not contribute to the creation of zombie firms**
- Policy reduced the probability that a firm is classified as a zombie (despite zombies being more likely to be treated)
- Policy improved firm-level TFP
- Policy reduced debt-servicing pressures (increased ICRs)
- Policy reduced the probability of bankruptcy
- Business restructuring plans allowed treated firms to resurrect

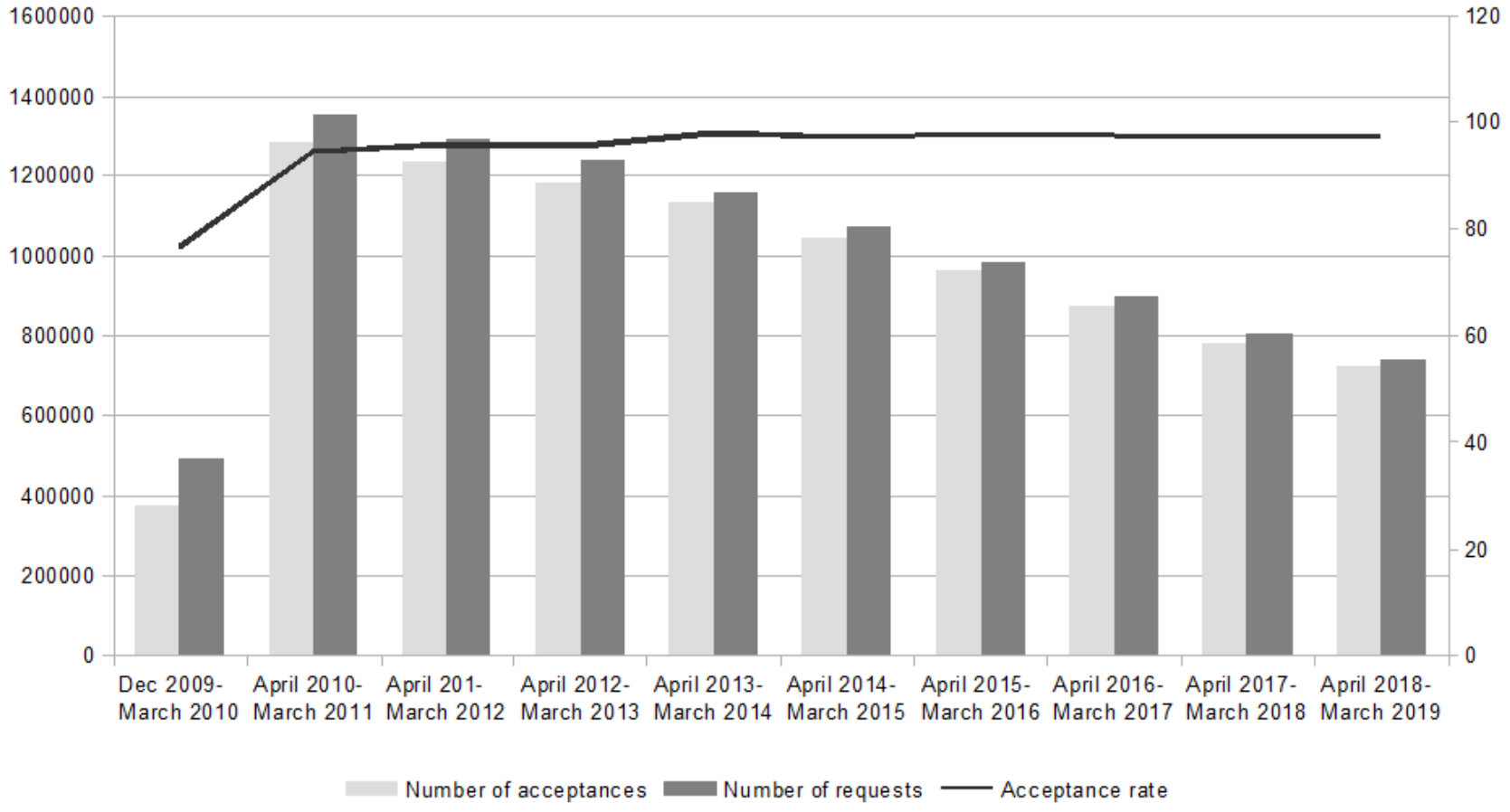
Zombification: Table

This time is different

- Forbearance was mandated by law and disclosed by financial institutions, i.e. **not a hidden phenomenon practised by weakly capitalized banks**
  - No correlation between average treatment intensity of a bank's borrowers and capital ratio, but positive correlation with NPL ratio
- **Business restructuring plans** required to exclude the restructured loans from NPLs
  - Yamori (2019) finds that about 60% of companies whose loan conditions were amended ultimately recovered
- **Eligibility criteria** exclude financial institutions, as well as subsidiaries or parent companies of financial institutions
  - Help address distortions created by business affiliations during the Lost Decade

Thank you!

Statistics on applications and acceptance rate



Research question | Quasi-experiment

Theoretical model: Predictions on interest rates

- Interest rates increase in the bank's funding cost
- Interest rates increase in the average product of borrowed capital, i.e., the average EBITDA generated by an extra unit of borrowed capital
- Higher credit market tightness (i.e. vacant credit lines over unmatched borrowers) pushes interest rates downward
- Forbearance incentives have a theoretically ambiguous effect:
  - A higher per-capital-unit termination cost in the current period drives interest rates down
  - The discounted per-capital-unit termination cost on existing relationships in the next period increases interest rates because banks price in future termination costs
- In practice, expect first effect to dominate (subsidy)

Model DiD results

Data: Tokyo Shoko Research (TSR) data set

- Firm-level annual panel for listed and unlisted Japanese firms for 2007-2018
- Source of most data items, incl. firms' stocks of debt and interest payments
- Number of observations with required data items is about 439K for 2007-2018 in main sample (on average 36K annually)
- 96% of observations are for firms with fewer than 250 employees
- Use sampling weights to make the counterfactual exercises representative of the population in terms of size, sectoral, and geographical distribution

Data set

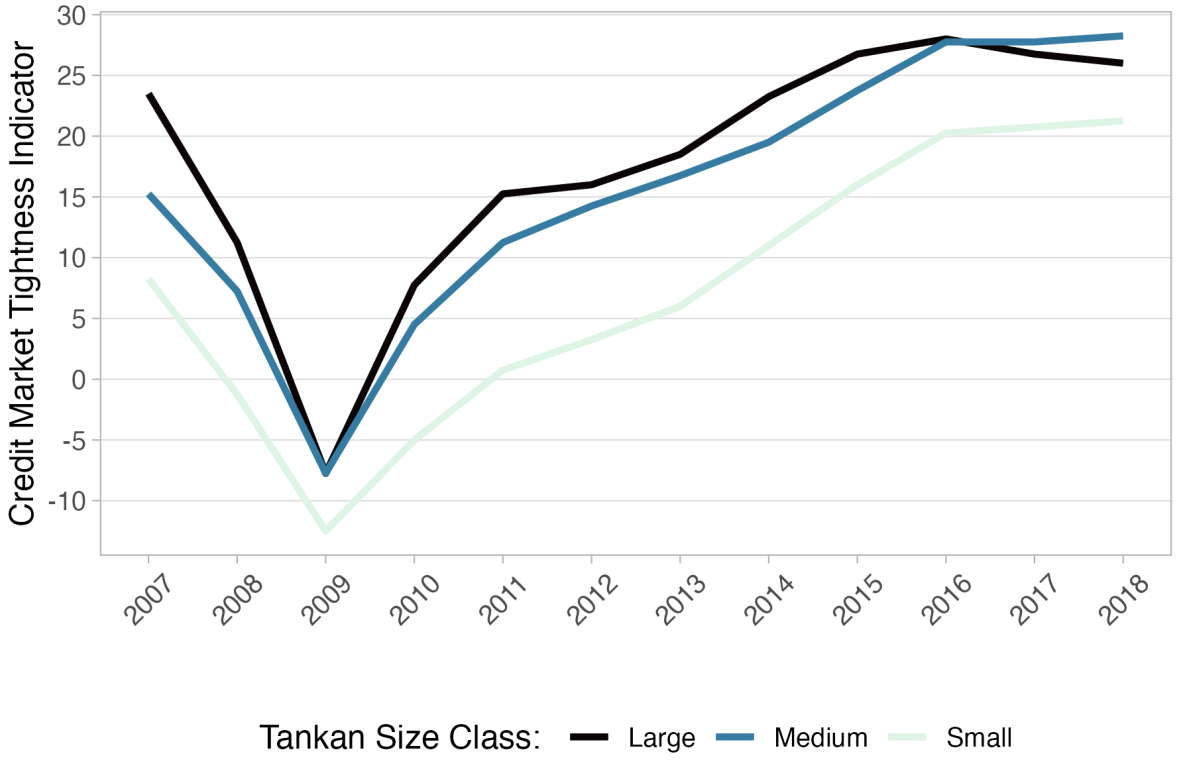
Data: Credit market tightness

- Use Tankan survey of the BoJ to capture time-varying credit market tightness by size class (large, medium, small)
- We use the indices measuring the lending attitude of banks as reported by private enterprises in the survey
- A more positive index means that credit is being offered more easily to firms, which we interpret as higher credit market tightness, namely more credit lines on offer compared to the number of firms searching

Data set

Data: Credit market tightness

- Sharp deterioration in lending conditions for all firms between 2007 and 2009, then sharp recovery to pre-crisis levels
- Small firms face systematically tighter conditions.
- Clear relaxation in lending attitudes following the Act



Data: Treatment intensity

	Any type of forbearance
Leverage	0.926***
	(0.0828)
Credit score	-0.076***
	(0.0059)
ROA	0.531**
	(0.2285)
ln(Sales)	0.043*
	(0.0255)
Employment	-0.0004
	(0.0003)
Firm age	-0.004**
	(0.0017)
Constant	2.275***
	(0.4043)
Observations	3,298
Industry FE	Yes

Data set

Diff-in-diff: Parallel trends assumption - Placebo test

- If no treatment had occurred, the difference between the treated and untreated groups would have stayed the same in the post-treatment period as it was in the pre-treatment period
- Placebo test using a specification that interacts treatment exposure with a full set of time dummies

$$ln(r_{it}) = \alpha + \sum_{t=T_0^*}^{T} \beta_t \cdot D_t \cdot TreatmentIntensity_i + \Gamma X_{it} + f_i + f_t + ...$$

$$... \sum_{c} \gamma_c \cdot Post_t \cdot X_{it}^c + \epsilon_{it}$$

- T_0^* denotes the first sample year prior to the intervention (2007) and T denotes the last sample year (2018).
- Last pre-treatment year (2009) is the benchmark

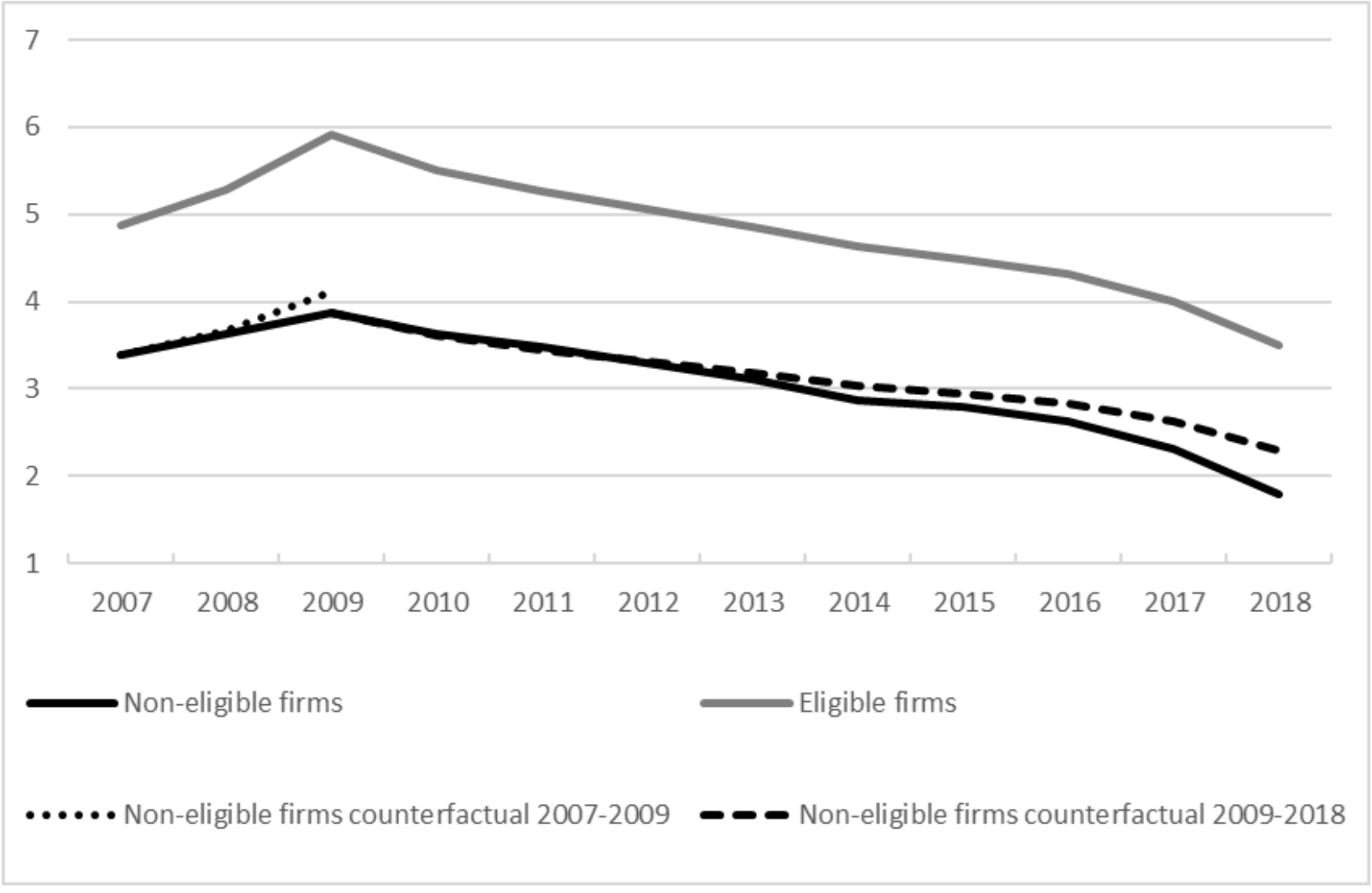
DiD results

Diff-in-diff: Parallel trends assumption - Placebo test

- If the parallel trends assumption is not true, the β_t estimated in periods before the introduction of the Act (the placebo years) would be statistically different from zero as well
- While there is no significant "treatment effect" in 2008, there is a small significantly negative effect in 2007
- However:
  - The effect is very small in magnitude in comparison to the negative treatment effects in 2010-2015
  - Wald test for the joint significance of the "treatment effects" in 2007 and 2008 indicates that the null hypothesis that the latter are jointly equal to zero cannot be rejected

Diff-in-diff: Parallel trends assumption - Visual

- Average interest rate for eligible and non-eligible firms over time

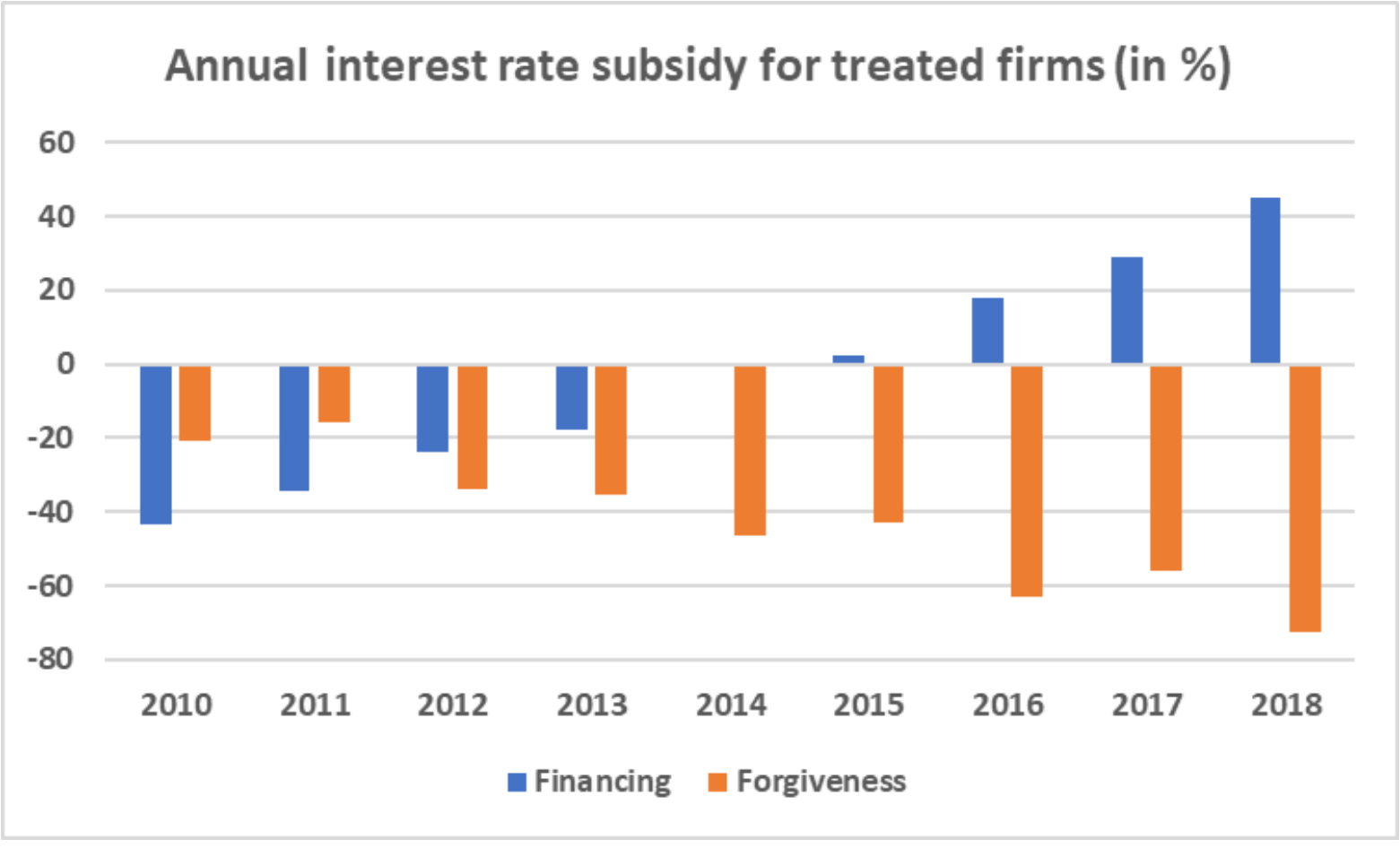


DiD results

Diff-in-diff: Parallel trends assumption - Visual

- The interest rates paid by eligible and non-eligible firms display very similar dynamics
- Closer inspection points to a small trend differential which might bias our results *against* finding significant treatment effects
  - Eligible firms experienced a sharper increase in interest rates on average in the pre-treatment period
  - Eligible firms experienced a smaller decrease in interest rates on average in the post-treatment period
- Eligible firms might have a positive trend differential relative to non-eligible firms, which predates treatment and continues thereafter
- Larger treatment effects when DiD allows for differential trend (robustness tests)

DiD estimation: Results by type of forbearance



DiD results

Counterfactual exercises: Methodology

- Use the structure of the model to conduct counterfactual exercises
- The profit maximizing capital stock is

$$k^*_{ijt} = \left(\frac{\alpha\gamma z_{it} l_{ijt}^{(1-\alpha)\gamma}}{r_{i,j,t}} \right)^{\frac{1}{1-\alpha\gamma}}$$

- Assuming constant labour input, a change in the interest rate following a change in forbearance incentives affects the firm's capital stock as follows

$$\Delta \log(k^*_{ijt}) = -\frac{1}{1-\alpha\gamma} \Delta \log(r_{i,j,t})$$

Counterfactual exercises: Methodology

Counterfactual exercises: Results

- Percent deviations from observed aggregate output, capital stock, and capital productivity

Counterfactuals - % change	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**Average**
Capital stock	-4.22 %	-3.76 %	-3.46 %	-3.43 %	-1.58 %	-1.07 %	0.20 %	2.09 %	2.97 %	-1.36 %
Capital productivity	1.47 %	1.38 %	1.12 %	1.23 %	0.53 %	0.36 %	-0.07 %	-0.76 %	-0.87 %	0.49 %
Output, without reallocation	-8.30 %	-6.64 %	-5.86 %	-5.59 %	-2.44 %	-1.66 %	0.30 %	2.89 %	4.42 %	-2.54 %
Output, with reallocation	4.78 %	5.86 %	2.91 %	1.53 %	-0.36 %	-1.64 %	0.00 %	0.00 %	0.00 %	1.45 %

Counterfactuals

Zombie definition

- We classify a firm as a zombie in period t if (based on Fukuda and Nakamura, 2013):

  (i) It receives subsidized credit and the three-year moving average of its ROA is below the three-year moving average of the lower bound interest rate; or

  (ii) It does not receive subsidized credit in period t, but the three-year moving average of its ROA is below the three-year moving average of the lower bound interest rate in period t, its leverage is above the sample's 90th percentile in period $t-1$, and its bank borrowing increased between $t-1$ and t

Zombification

Zombie definition: Lower bound formula

- Compare interest payments to a lower bound interest rate calculated assuming the lowest possible rate of interest for a healthy borrower.

$$R^*_{i,t} = rs_{t-1} BS_{i,t-1} + \left(\frac{1}{5} \sum_{j=1}^{5} rl_{t-j} \right) BL_{i,t-1} + rb_{t-1} \times Bonds_{i,t-1}$$

- $BS_{i,t}$, $BL_{i,t}$ and $Bonds_{i,t}$ are short-term bank loans (maturity of less than one year), long-term bank loans (more than one year) and total bonds outstanding from firm i in year t
- rs_t is Bank of Japan's short-term prime rate, rl_t is equally weighted average of the last five years of the long-term prime rates) and rb_t is zero).

Zombification

Zombification: Results

	(1) Zombie	(2) ln(TFP)	(3) ln(ICR)	(4) Exit
2010	-0.3991***	0.263***	1.045***	-0.0015*
	(0.0298)	(0.0207)	(0.126)	(0.0008)
2011	-0.4591***	0.276***	0.917***	-0.0019*
	0.0329	(0.0247)	(0.143)	(0.0010)
2012	-0.4139***	0.300***	0.907***	-0.0029**
	(0.0322)	(0.0269)	(0.151)	(0.0012)
2013	-0.4580***	0.299***	0.920***	-0.0005
	(0.0347)	(0.0282)	(0.157)	(0.0016)
2014	-0.4007***	0.278***	0.837***	0.0003
	(0.0326)	(0.0298)	(0.152)	(0.0015)
2015	-0.3722***	0.259***	0.784***	0.0016
	(0.0333)	(0.0271)	(0.142)	(0.0021)
2016	-0.2868***	0.263***	0.617***	-0.0020
	(0.0329)	(0.0256)	(0.140)	(0.0019)
2017	-0.3385***	0.247***	0.538***	0.0005
	(0.0350)	(0.0267)	(0.137)	(0.0021)
2018	NA	0.246***	0.475***	NA
		(0.0281)	(0.136)	
Observations	63,367	437,219	437,219	423,592
Firm fixed effects	Yes	Yes	Yes	No
Year fixed effects	Yes	Yes	Yes	Yes
Post *Confounders	Yes	Yes	Yes	Yes