Distorted by Design: Size-Dependent Guarantees and Capital Misallocation

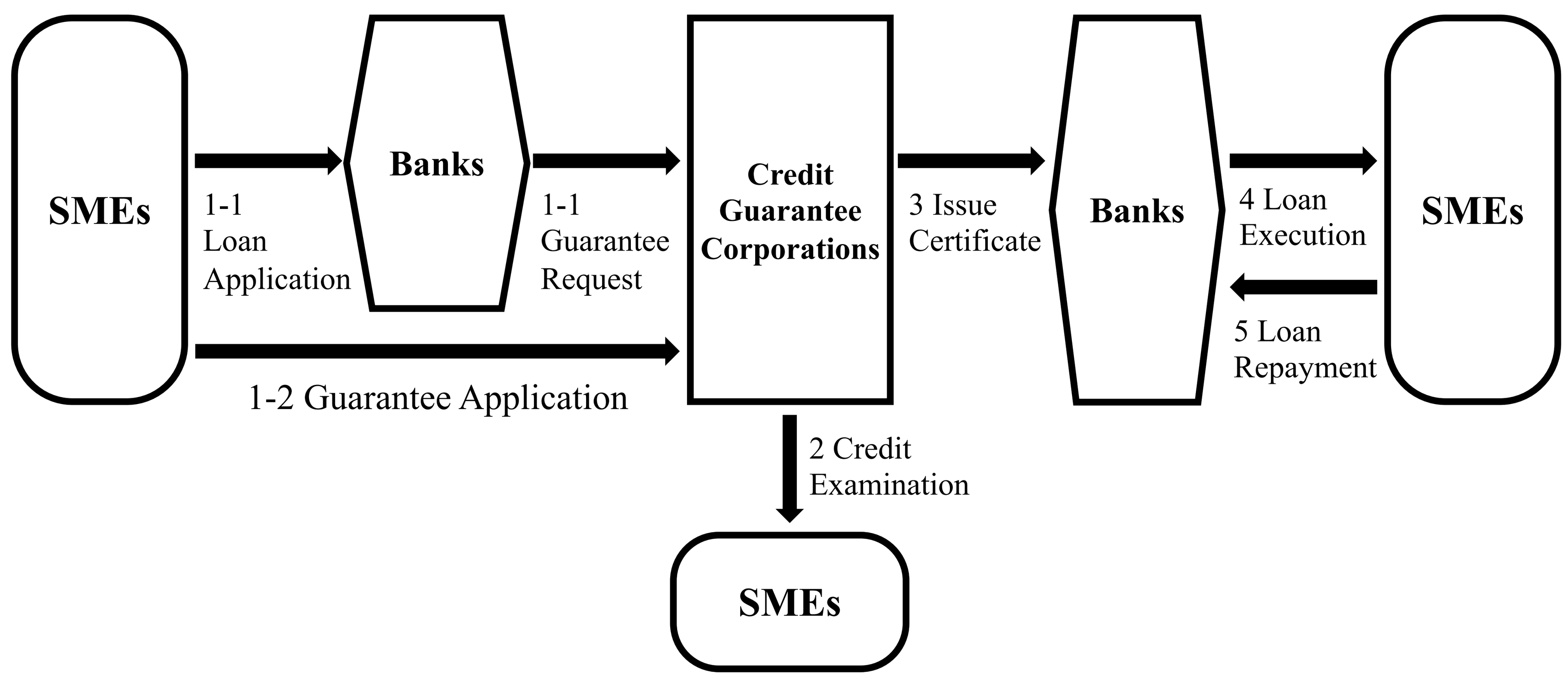
Dongcheng Yang
Columbia University

1. Motivation

- Governments use credit guarantees to ease financing constraints for SMEs during crises.
- **Japan uses guarantees as a permanent policy tool**—amounting to about **5% of GDP (2011–2019)**, compared to less than 0.5% in other G7 economies.
- SME eligibility in Japan is defined by **paid-in capital**, an adjustable accounting measure.

Research question: How do size-dependent, large-scale credit guarantees affect firm dynamism and the efficiency of capital allocation?

2. Credit Guarantee Scheme in Japan



3. Institutional Change

- 1999 reform raised paid-in-capital cutoffs for SME eligibility across industries.
- Three groups: **Always-eligible**, **Newly-eligible**, **Never-eligible** (control group).

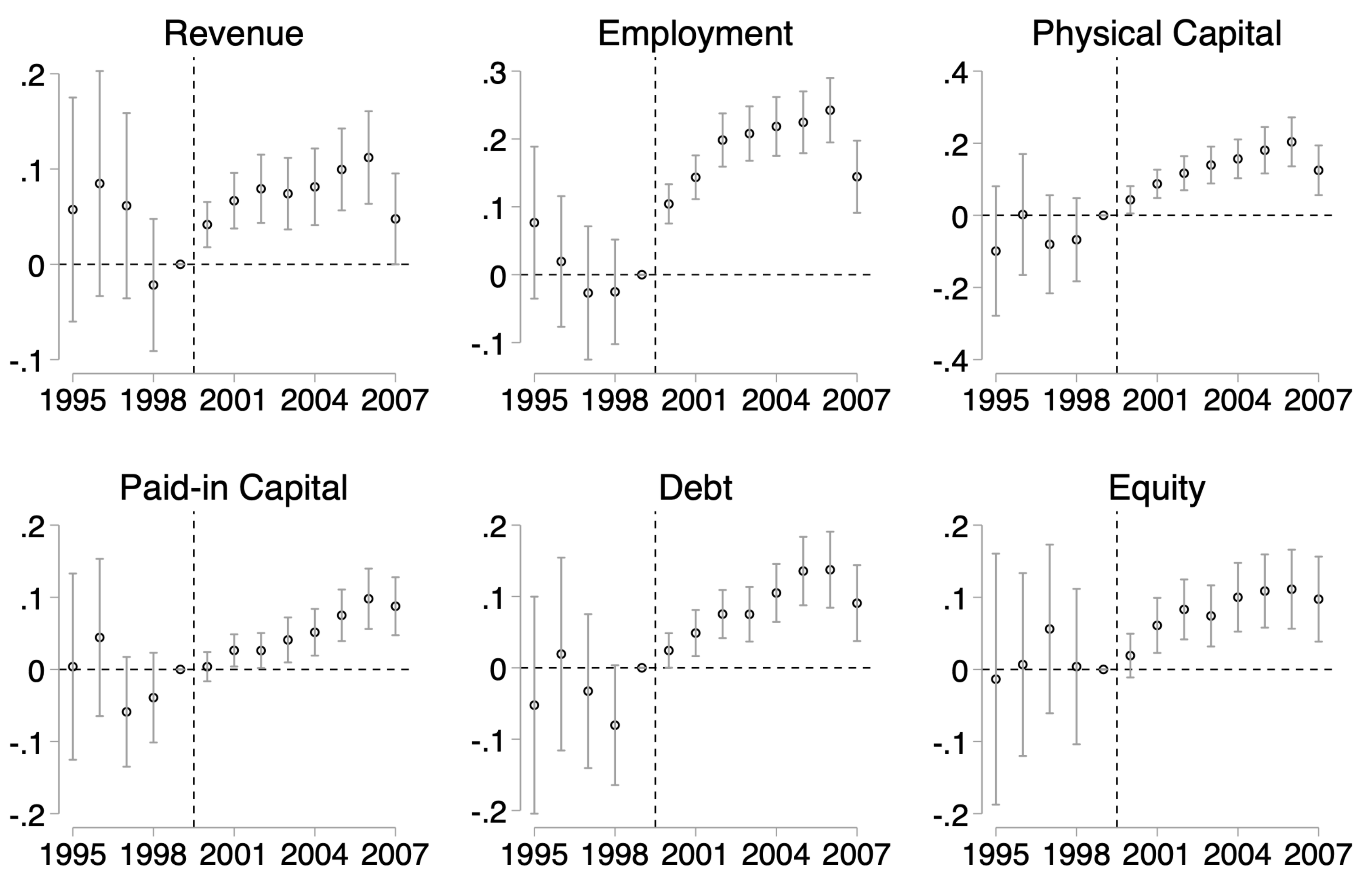
Industry	Before 1999		After 2000	
	Capital	Employees	Capital	Employees
Manufacturing, etc.	100 million	300	**300 million**	300
Wholesale	30 million	100	**100 million**	100
Retail	10 million	50	**50 million**	50
Service	10 million	50	**50 million**	**100**

(unit: yen)

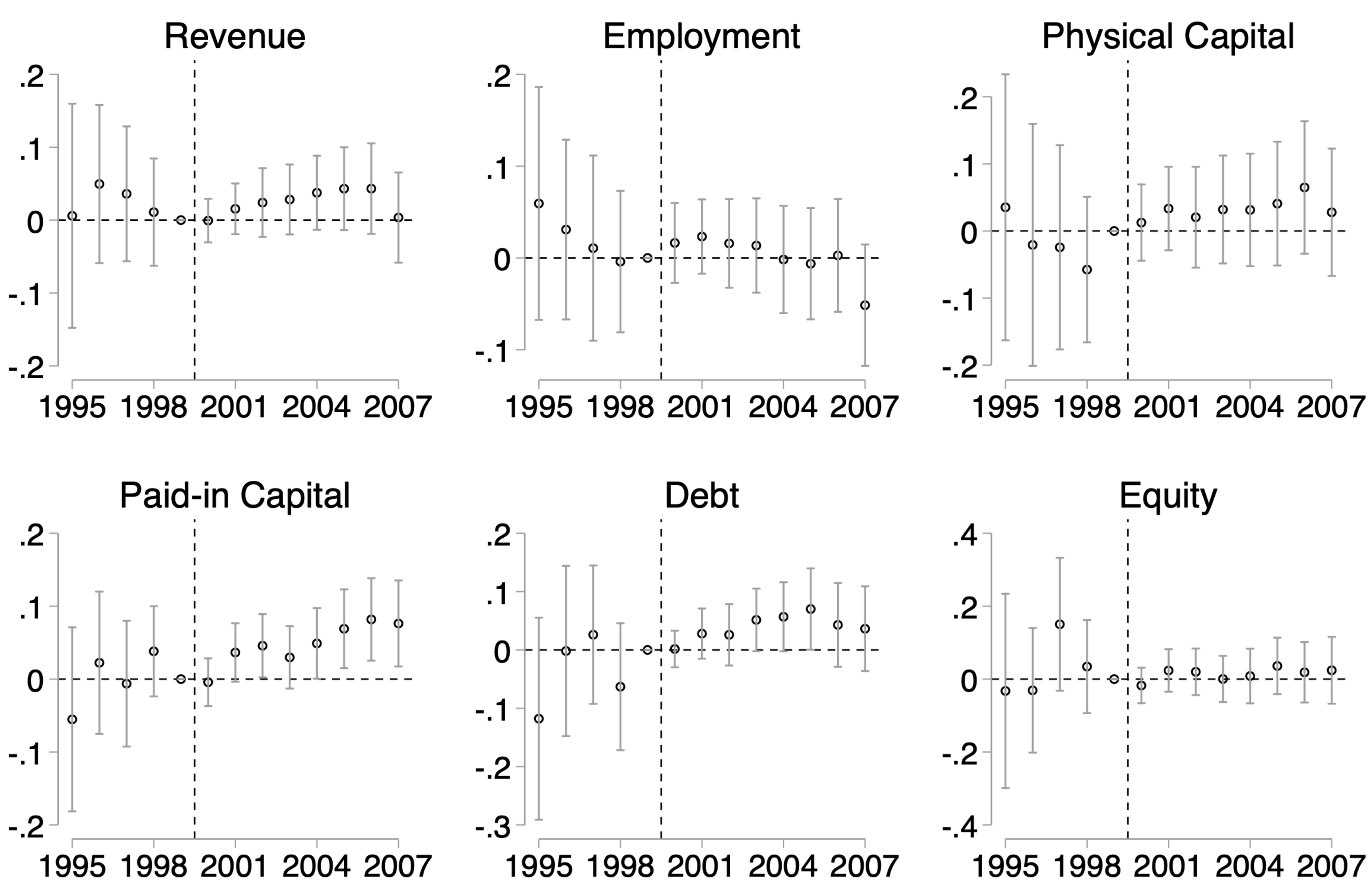
4. Expansion Among Always-Eligible Firms

$$\ln(y_{ft}) = \sum_{t=1995}^{2007} \beta_t \cdot \text{Treated}_{ft} + \alpha_f + \gamma_{pt} + \delta_{it} + \varepsilon_{ft}$$

α_f: firm fixed effects; γ_{pt}: prefecture-year fixed effects; δ_{it}: industry-year fixed effects.



5. No Significant Growth for Newly-Eligible Firms



6. Less-Capitalized Banks Rely More on Guarantees

	Guaranteed Loan/Total Loan		
	(1)	(2)	(3)
Capital Ratio	-0.086**	-0.285***	-0.215***
	(0.043)	(0.038)	(0.037)
N	4,165	4,165	4,165
Time FE	yes	yes	yes
Bank Type FE	no	yes	yes
Prefecture FE	no	no	yes

Bank types include City Banks, Regional Banks, and Shinkin Banks.

7. Theory: Welfare in Size-Dependent Guarantees

Setup

- Agents either deposit at rate r or operate a firm.
- Paid-in capital E finances total assets $K = E + D$.
- Leverage cap: $K \in [E, \bar{\lambda}E]$.
- Firm productivity α; production $Y = F(\alpha, K)$.

Policy

- Eligibility: $E \leq \overline{E}$.
- Borrowing rate: σr (eligible) or r (ineligible), with $0 < \sigma < 1$.
- Lump-sum transfer: $S \geq 0$ to eligible firms.

Firm problem

Stage 0 (equity choice). The entrepreneur chooses paid-in capital $E \geq 0$ to set borrowing capacity and incurs a general issuance cost $\psi(E)$.
Stage 1 (scale choice). Given (α, E), choose $K \in [E, \bar{\lambda}E]$ to maximize

$$\Pi(\alpha, E) = F(\alpha, K) - \tilde{r}(E)\,(K - E)$$

The unconstrained target $K^{\text{FOC}}(\alpha, E)$ satisfies $\partial_K F(\alpha, K^{\text{FOC}}) = \tilde{r}(E)$, and the realized optimal scale is

$$K^*(\alpha, E) = \min\{K^{\text{FOC}}(\alpha, E),\ \bar{\lambda}E\}$$

Cutoffs

Entry threshold: $\Pi(\alpha_{\min}, E^*(\alpha_{\min})) = r$

Bunching starts: $K^{\text{FOC}}(\alpha_c, \overline{E}) = \bar{\lambda}\,\overline{E}$

Exit from eligibility: $\Pi(\alpha_b, \overline{E}) = \Pi(\alpha_b, E > \overline{E})$

Output and welfare

$$Y = \int_{\alpha_{\min}}^{\bar{\alpha}} F(\alpha, K^*(\alpha))\, f(\alpha)\, d\alpha, \qquad M = \Pr[E^* \leq \overline{E}], \qquad W = Y - S\,M$$

Counterfactual (no program). In the no-program economy ($\sigma = 1$, $S = 0$), denote $K^{*N}(\alpha)$ as the optimal scale of firm α, and $\alpha^{\text{N}}_{\min}$ as the entry cutoff. The change in output is

$$\Delta Y^{\text{no-prog}} = Y - Y^{\text{N}}$$

which decomposes into

$$\Delta Y^{\text{no-prog}} = \underbrace{\int_{\alpha_{\min}}^{\alpha^{\text{N}}_{\min}} F(\alpha, K^*(\alpha)) f(\alpha)\, d\alpha}_{(i)\text{ New entrants due to program}} + \underbrace{\int_{\alpha^{\text{N}}_{\min}}^{\alpha_c} [F(\alpha, K^*(\alpha)) - F(\alpha, K^{*N}(\alpha))] f(\alpha)\, d\alpha}_{(ii)\text{ Small-firm gains}}$$

$$+ \underbrace{\int_{\alpha_c}^{\alpha_b} [F(\alpha, K^*(\alpha)) - F(\alpha, K^{*N}(\alpha))] f(\alpha)\, d\alpha}_{(iii)\text{ Bunched-firm distortion}} + \underbrace{\int_{\alpha_b}^{\bar{\alpha}} [F(\alpha, K^*(\alpha)) - F(\alpha, K^{*N}(\alpha))] f(\alpha)\, d\alpha}_{(iv)\text{ Large-firm loss}}$$

Welfare difference:

$$\Delta W^{\text{no-prog}} = \Delta Y^{\text{no-prog}} - S\,M$$

8. Conclusion

- **Size-based credit guarantees distort firm behavior.** The program induced bunching below SME thresholds and persistent distortions in firm growth—when the cutoff increased, always-small firms expanded sharply.
- **Bank fragility amplifies distortions.** Less-capitalized banks relied heavily on guaranteed lending, transferring risk to the public sector.
- **Policy reform and efficiency.** The paid-in-capital–based guarantee scheme generated large efficiency losses. Guarantee eligibility should instead rely on firm characteristics that cannot be strategically manipulated.

dy2426@columbia.edu