Comments by Rafael Repullo on

Banks vs. Firms
Who Benefits from Credit Guarantees?

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Introduction

- Very interesting topic

  → Following widespread use of guarantees during covid-19

- Structure or paper

  → Theoretical model that delivers a set of predictions

  → Test of predictions using the Spanish ICO program

- Focus my discussion on theoretical model

  → After brief summary of empirical results

Summary of empirical results

- Result 1

  → "Riskier firms benefited to a larger extent from loan guarantees"

- Result 2

  → "Captive borrowers (risky relationship borrowers) received a significantly higher share of guaranteed loans"

- Result 3

  → "Captive borrowers did not benefit from lower interest rates on guaranteed loans"

Model setup (i)

- Two dates ($t = 0, 1$)
- Continuum of entrepreneurs and banks
- Entrepreneurs have risky projects that require funding by banks
- Each entrepreneur has a relationship lender

  → Outstanding level of debt
- Entrepreneurs' effort is not verifiable

  → Standard moral hazard problem

Model setup (ii)

- Entrepreneurs characterized by
  - → Preexisting debt with relationship lender B_0
  - → Initial endowment ω
  - → Required investment k
  - → Productivity (success return) of investment A
  - → Liquidation value λ
  - → Cost of effort $c(p)$, where p is probability of success

Model setup (iii)

- Entrepreneurs have to fund at $t = 0$

  → Preexisting debt B_0 + Investment k − Endowment ω

$$b_1 = B_0 + k - \omega$$

- Three types of entrepreneurs

  → Solvent: Can fund b_1

  → Captive: Can fund b_1 by renegotiating preexisting debt

  → Insolvent: Cannot fund b_1

Model setup (iv)

- Loan guarantees cover a fraction of principal in case of default
- Assumption: Banks trade guarantees in competitive market

  → Equilibrium price of guarantees ρ

Main comments

- Model is complicated: too many variables at $t = 0$

  → Preexisting debt with relationship lender B_0

  → Initial endowment ω

  → Required investment k

- Formal analysis is complicated

  → Not easy to get intuition for the results

- Do we need a market for loan guarantees?

  → Such market did not exist in the Spanish case

What I am going to do

- Simple (partial equilibrium) version of the model
  - → Negative cash flow $-k$ to be funded at $t = 0$
  - → New debt with face value D issued at $t = 0$
  - → Debt with relationship lender B to be paid at $t = 1$
  - → Productivity (success return) of investment A
  - → Liquidation value $\lambda = 0$
  - → Interest rate normalized to zero
- No market for loan guarantees
  - → Look at allocation of guarantees by single bank

Funding alternatives

- Two alternative ways to fund k

  → Funding with relationship bank

  → Funding with other (competitive) bank

- What's the difference?

  → Competitive bank maximizes entrepreneur's payoff

  → Relationship bank maximizes bank's (total) payoff

Funding with competitive bank

- Optimal contract: $(\hat{D}, \hat{p})$ such that

$$\hat{p} = \arg\max[\, p(A - B - \hat{D}) - c(p)]$$

$$\hat{p}\hat{D} = k$$

→ Solution for quadratic cost function $c(p) = \alpha p^2 / 2$

$$\hat{D} = \frac{1}{2}\left(A - B - \sqrt{(A-B)^2 - 4\alpha k} \right)$$

→ Feasibility requires

$$(A - B)^2 \geq 4\alpha k \;\; \rightarrow \;\; A \geq \hat{A} = B + 2\sqrt{\alpha k}$$

Funding with relationship bank

- Optimal contract: $(\bar{D}, \bar{p})$ such that

$$\bar{p}(D) = \arg\max[\, p(A - B - D) - c(p)]$$

$$\bar{D} = \arg\max[\, \bar{p}(D)(B + D)]$$

→ Solution for quadratic cost function $c(p) = \alpha p^2 / 2$

$$\bar{D} = \frac{A}{2} - B$$

→ Feasibility requires

$$\bar{p}(B + \bar{D}) \geq k \;\rightarrow\; A \geq \bar{A} = 2\sqrt{\alpha k}$$

Entrepreneurs' payoffs

- Entrepreneur's payoff with competitive bank

$$\hat{u} = \hat{p}(A - B - \hat{D}) - c(\hat{p}) = \frac{1}{8\alpha}\left(A - B + \sqrt{(A-B)^2 - 4\alpha k}\right)^2$$

- Entrepreneur's payoff with relationship bank

$$\bar{u} = \bar{p}(A - B - \bar{D}) - c(\bar{p}) = \frac{1}{8\alpha} A^2$$

- Funding with competitive bank dominates when

$$\hat{u} \geq \bar{u} \quad \Rightarrow \quad A \geq \tilde{A} = B + \sqrt{B^2 + 4\alpha k}$$

→ Limit market power of relationship bank

Numerical illustration

- Parameter values

  → Negative cash flow $k = 1/3$

  → Debt with relationship lender $B = 1$

  → Cost function $c(p) = 3p^2/2 \;\rightarrow\; \alpha = 3$

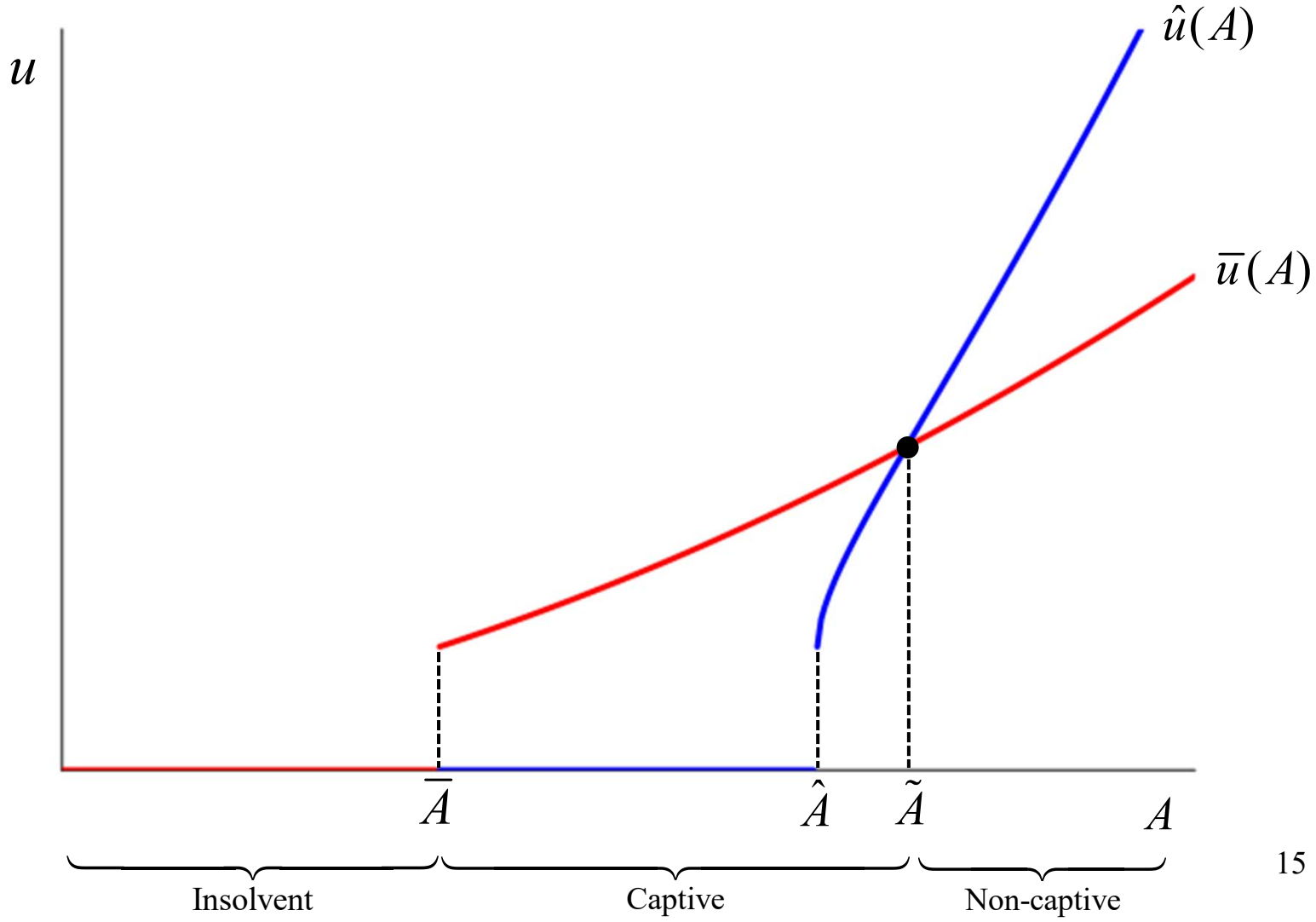
- Critical values

  → Feasibility of relationship funding $A \geq \overline{A} = 2\sqrt{\alpha k} = 2$

  → Feasibility of competitive funding $A \geq \hat{A} = B + 2\sqrt{\alpha k} = 3$

  → Indifference point $\tilde{A} = B + \sqrt{B^2 + 4\alpha k} = 3.24$

An illustration: entrepreneurs' utilities



Four types of entrepreneurs

- Insolvent

  → Cannot get funding and projects are liquidated

- Really captive

  → Can only get funding from relationship bank

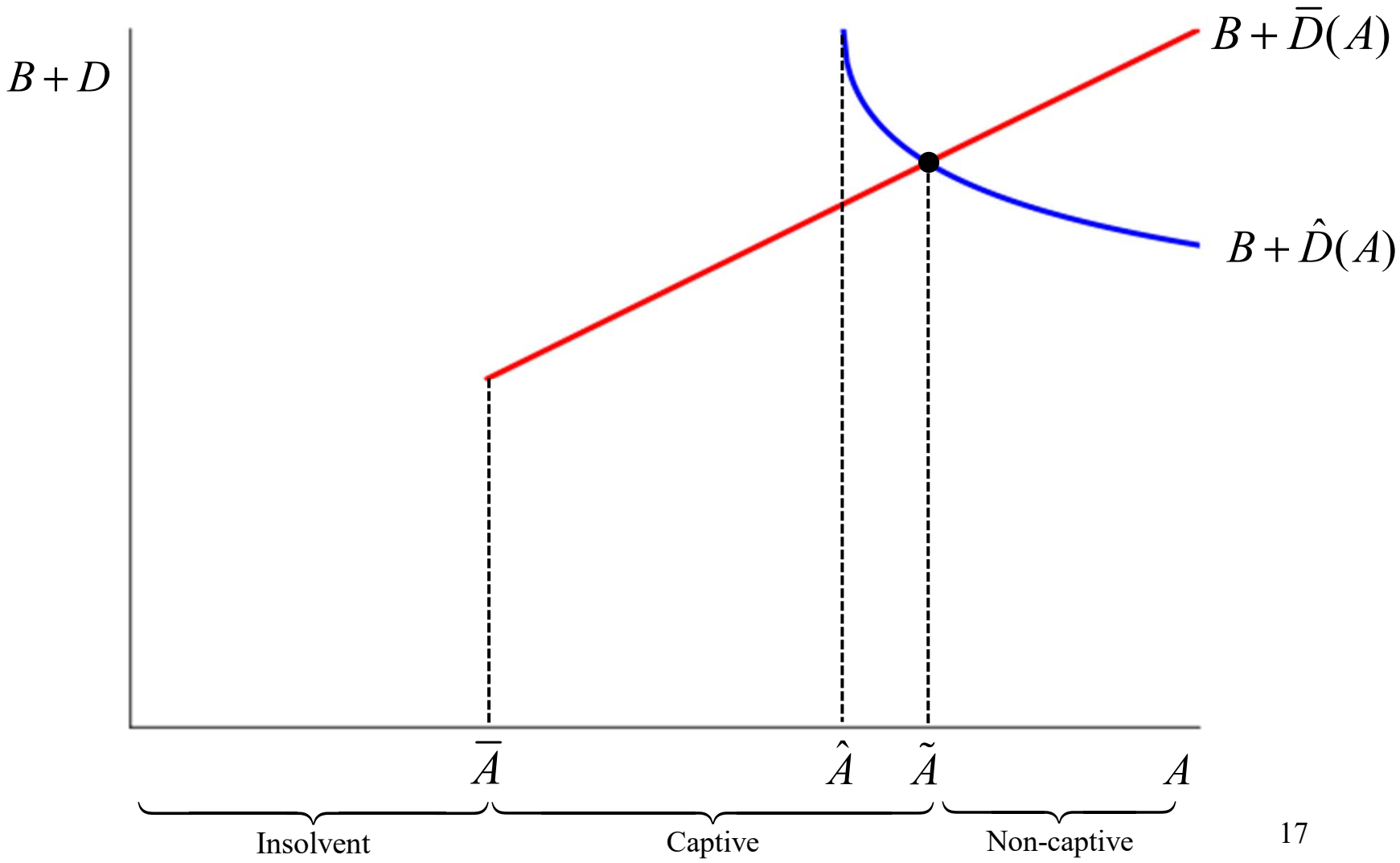
- Happily captive

  → Prefer to get funding from relationship bank

- Non-captive

  → Credible threat to get funding from other banks

An illustration: total debt



Loan guarantees

- A fraction γ of the principal is covered by the guarantee

  → Bank gets

$$pD + (1-p)\gamma k$$

- Two alternative ways to fund k

  → Funding with relationship bank

  → Funding with other (competitive) bank

Funding with competitive bank

- Optimal contract: $(\hat{D}, \hat{p})$ such that

$$\hat{p} = \arg\max[\, p(A - B - \hat{D}) - c(p)]$$

$$\hat{p}\hat{D} + (1 - \hat{p})\gamma k = k$$

$\rightarrow$ Solution for quadratic cost function $c(p) = \alpha p^2 / 2$

$$\hat{D}(A)$$

$\rightarrow$ Feasibility requires $A \geq \hat{A}$

Funding with relationship bank

- Optimal contract: $(\bar{D}, \bar{p})$ such that

$$\bar{p}(D) = \arg\max[\, p(A - B - D) - c(p)]$$

$$\bar{D} = \arg\max[\, \bar{p}(D)(B + D) + (1 - \bar{p}(D))\gamma k]$$

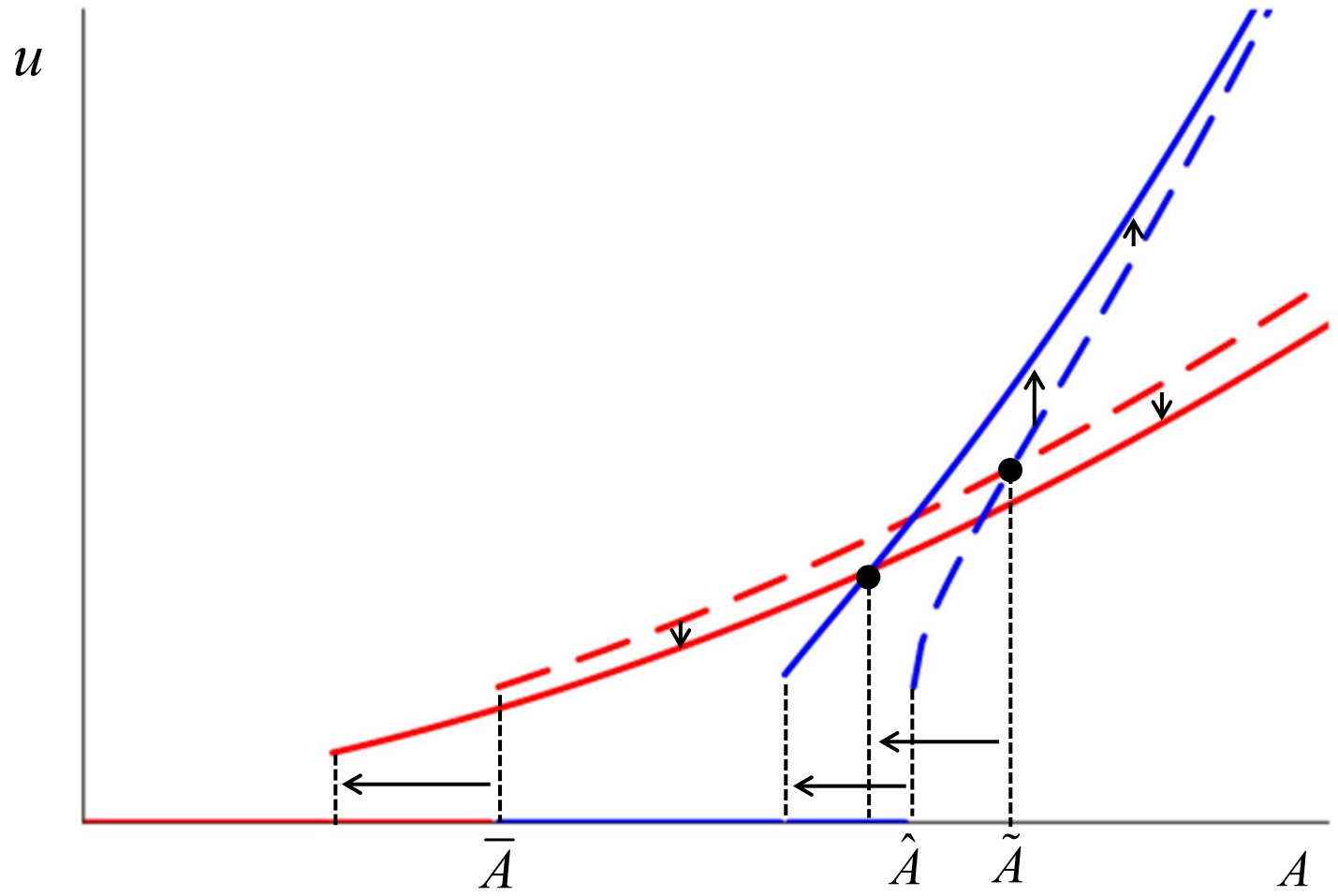
→ Solution for quadratic cost function $c(p) = \alpha p^2 / 2$

$$\bar{D} = \frac{A + \gamma k}{2} - B$$

→ Feasibility requires

$$\bar{p}(B + \bar{D}) + (1 - \bar{p})\gamma k \geq k \;\rightarrow\; A \geq \bar{A}$$

An illustration: entrepreneurs' utilities



Effect of loan guarantees

- Additional entrepreneurs that would otherwise fail get funding
- Previously captive entrepreneurs are worse off
  - → Relationship bank is less eager to provide incentives
  - → Since part of the losses are covered by the guarantee
- Non-captive entrepreneurs are better off
  - → By competition all the surplus goes to the entrepreneur

Allocation of loan guarantees

- Consider a bank with a given amount K of guaranteed loans
- How should K be allocated among its relationship borrowers?

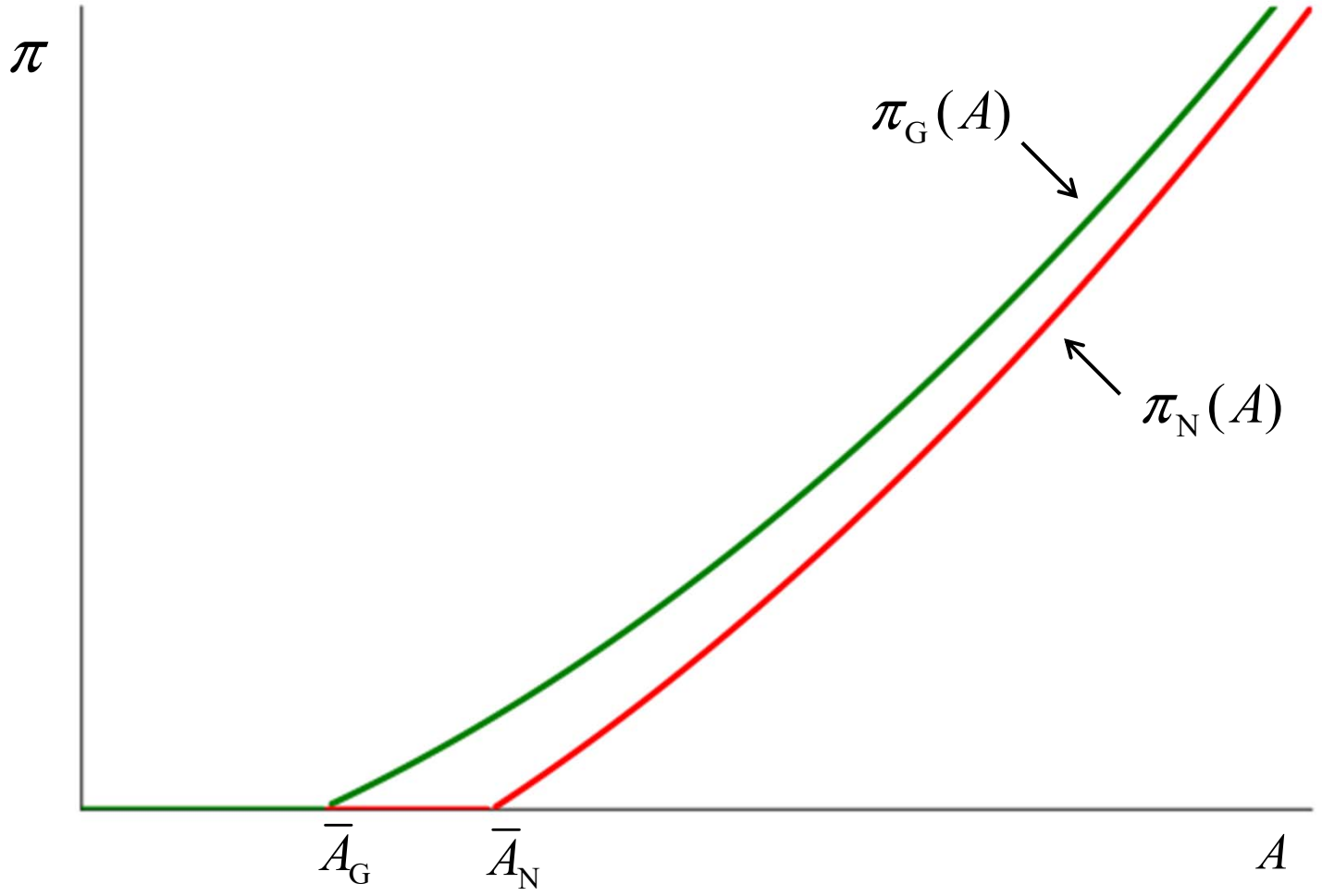
  → How does it get the highest increase in profits?
- Compute gap for different entrepreneurs between

  → Profits with guarantee π_G

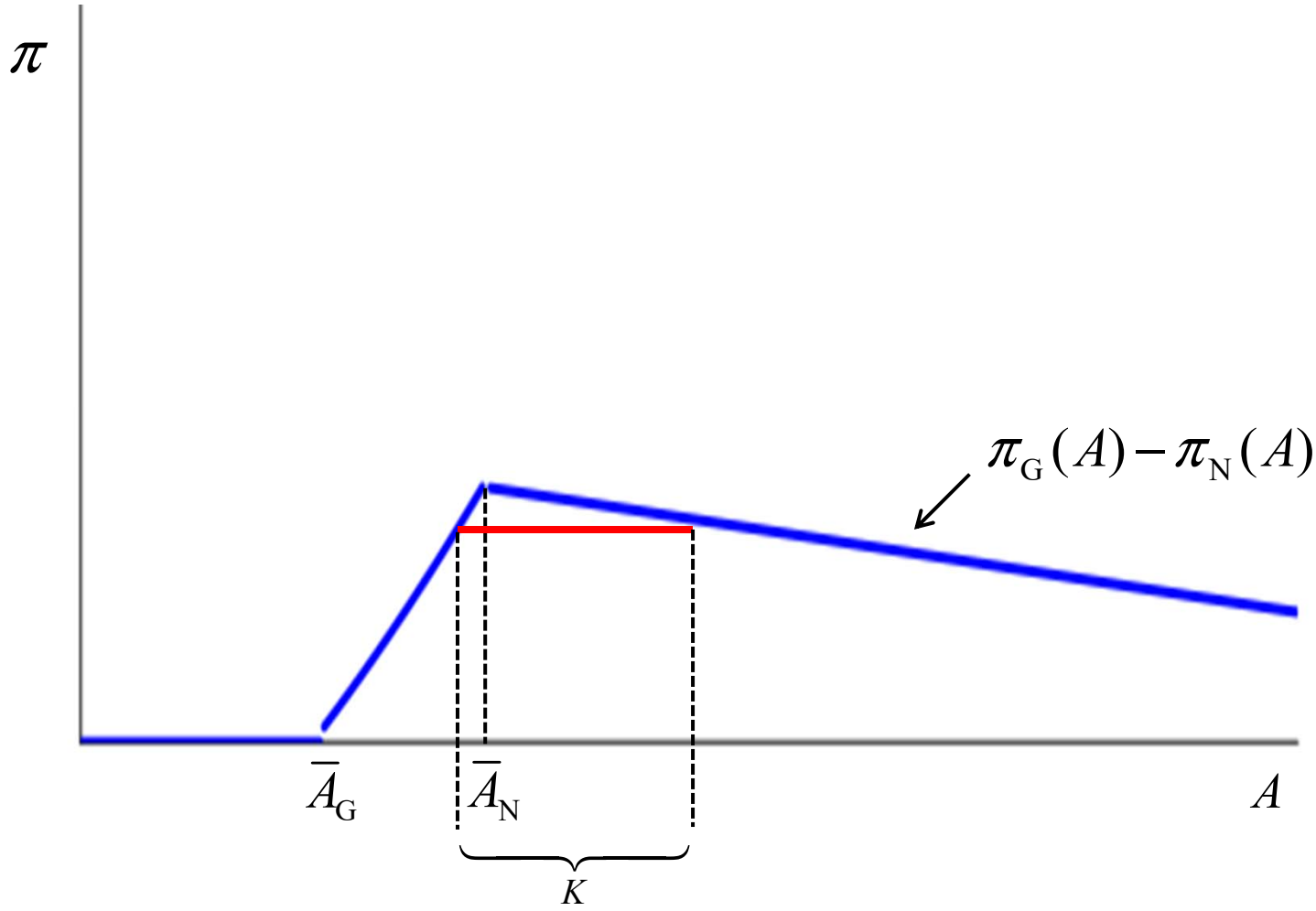
  → Profits without guarantee π_N
- Focus on captive entrepreneurs

  → Non-captives get all the surplus from the guarantee

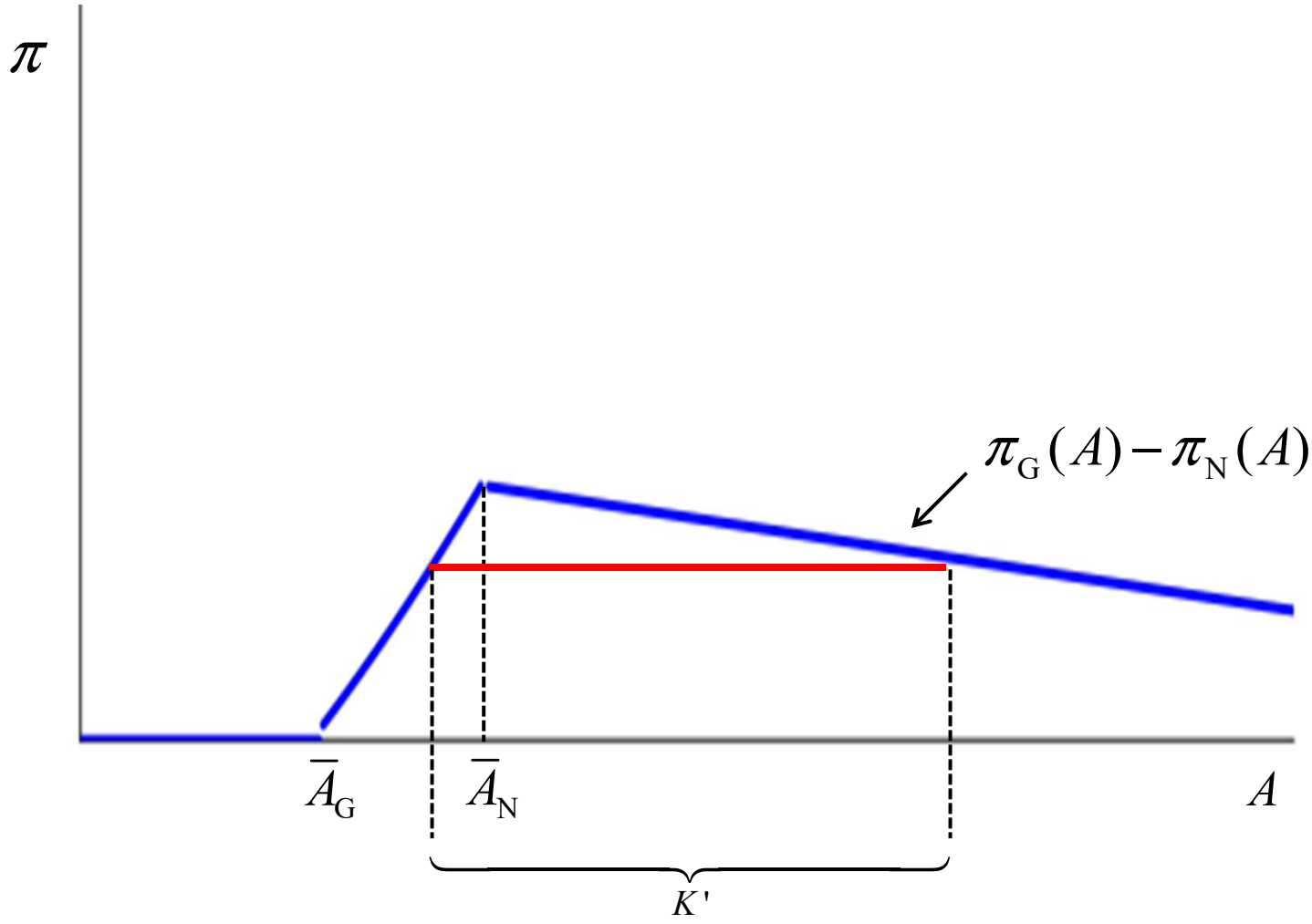
Profits with and without the guarantee



Profit maximizing allocation of guarantees



Profit maximizing allocation of guarantees



Profit maximizing allocation of guarantees

- Guarantees are allocated to the marginal (riskiest) entrepreneurs

  → Some below and some above the cutoff $\bar{A}_{\mathrm{N}}$

- Increases in the total amount of guaranteed loans K

  → Expand the range of entrepreneurs with guaranteed loans

- Entrepreneurs above the cutoff $\bar{A}_{\mathrm{N}}$ funded with guaranteed loans

  → Face higher interest rates

Going back to empirical results

- Result 1

  → "Riskier firms benefited to a larger extent from loan guarantees" **OK!**

- Result 2

  → "Captive borrowers (risky relationship borrowers) received a significantly higher share of guaranteed loans" **OK!**

- Result 3

  → "Captive borrowers did not benefit from lower interest rates on guaranteed loans" **OK!**

Welfare analysis of loan guarantees

- Social welfare associated with captive entrepreneurs

$$\bar{w} = \bar{p}A - c(\bar{p}) - k = \frac{3}{8\alpha} A^2 - k$$

- For marginal entrepreneur with $A = \bar{A}_N = 2\sqrt{\alpha k}$ we have

$$\bar{w}_N = \frac{3}{2}k - k = \frac{1}{2}k > 0$$

→ For $A > \bar{A}_N$ guarantees reduce $\bar{p}$ and reduce welfare

→ For $A < \bar{A}_N$ guarantees allow funding and increase welfare

→ Net effect is ambiguous

Concluding remarks

- Very interesting question: Who benefits from credit guarantees?
- Simple version of the model can account for the evidence
- Market for loan guarantees is not needed

  → Such market did not exist in the Spanish case
- Other interesting questions that could be addressed

  → Effect of deductibles (like in the Chilean case)

  → First losses from guaranteed loans allocated to the bank