Credit constraints, endogenous innovations, and price setting in international trade

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Stylized facts: credit constraints in international trade

1. Negative effects of credit frictions on
   - intensive & extensive margins of international trade
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⇒ sectoral scope for vertical product differentiation

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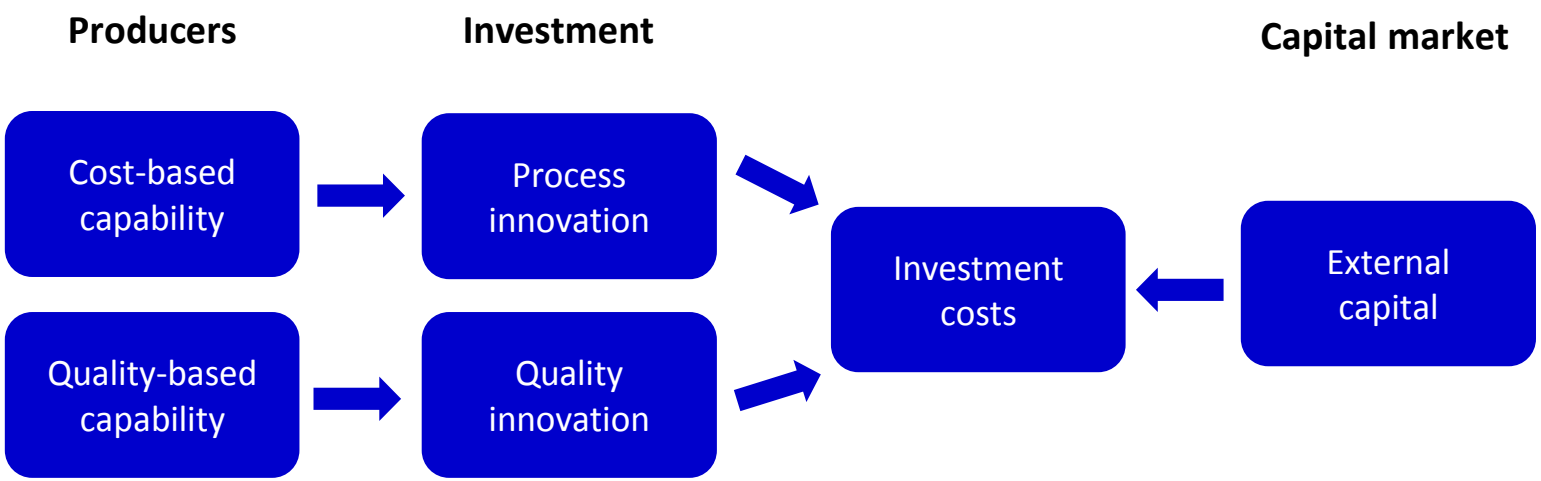

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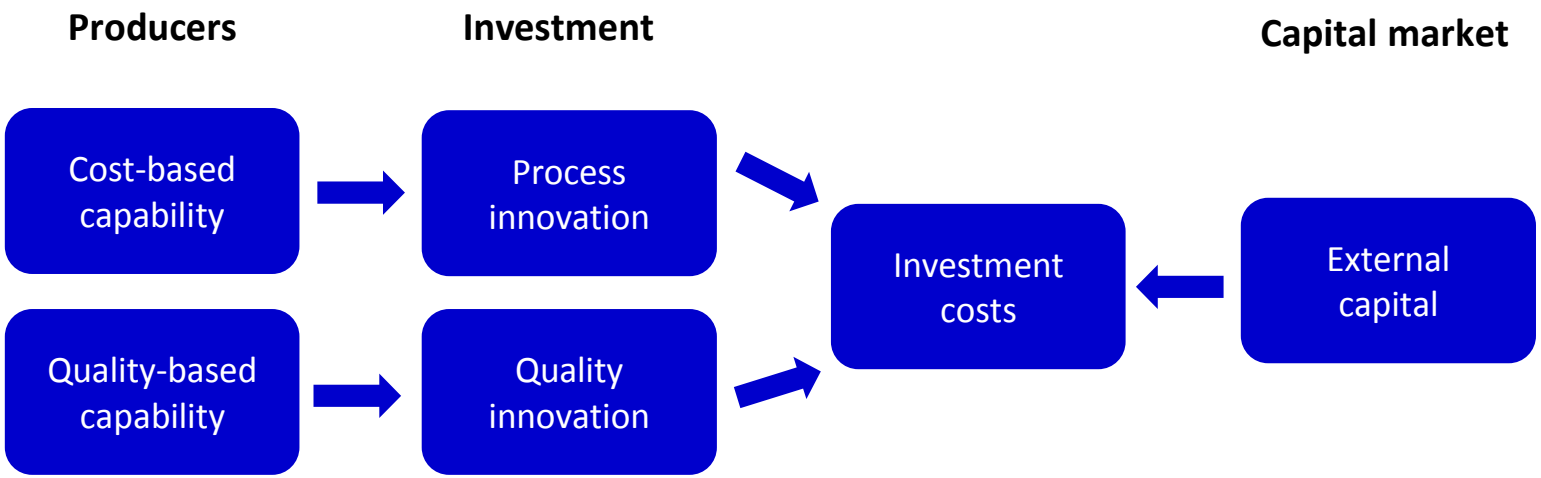

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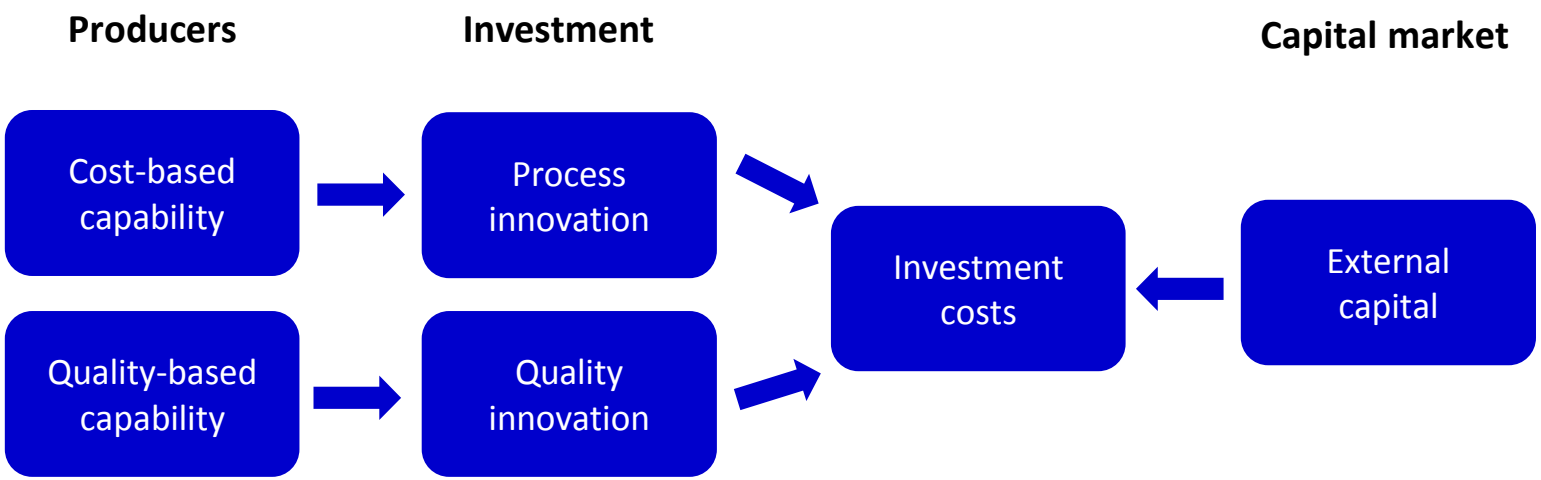

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2. two types of endogenous investment: process / quality innovation
3. financial frictions: ex-post moral hazard (Holmstrom & Tirole, 1997)

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3. Consumer welfare: intensive vs. extensive margin

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1. Entry stage
   - fixed entry cost f_e
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4. Production and profit realization

Quality and process innovations

Capabilities		Innovation	benefit	costs
cost-based (φ_i)	$\Rightarrow$	**process** (e_i)		$\frac{1}{\varphi_i} e_i^c$
quality-based (κ_i)	$\Rightarrow$	**quality** (λ_i)		$\frac{1}{\kappa_i} \lambda_i^a$

where $a, c > (\sigma - 1)(2 - \theta)$

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- Export status: $l \in d, x$
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- Choice of firm manager (moral hazard, Holmstrom & Tirole, 1997):
  - diligent behavior: profit realization and loan repayment $\Rightarrow \pi_l$
  - shirking: no loan repayment $\Rightarrow$ private benefit $b\left(f_d + I_x f_x\right)$

Marginal access curves in open economy

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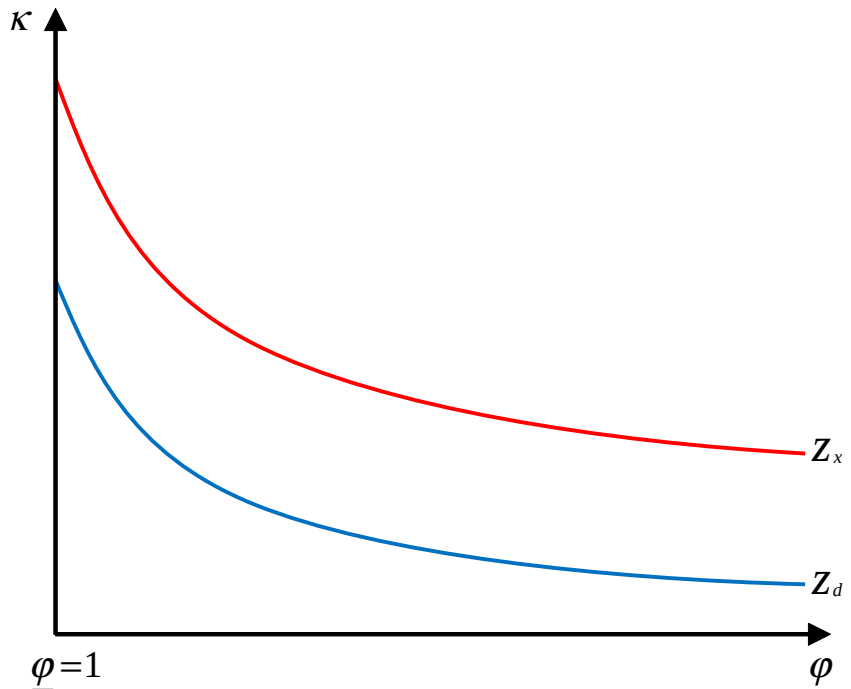

Credit costs, innovation and prices

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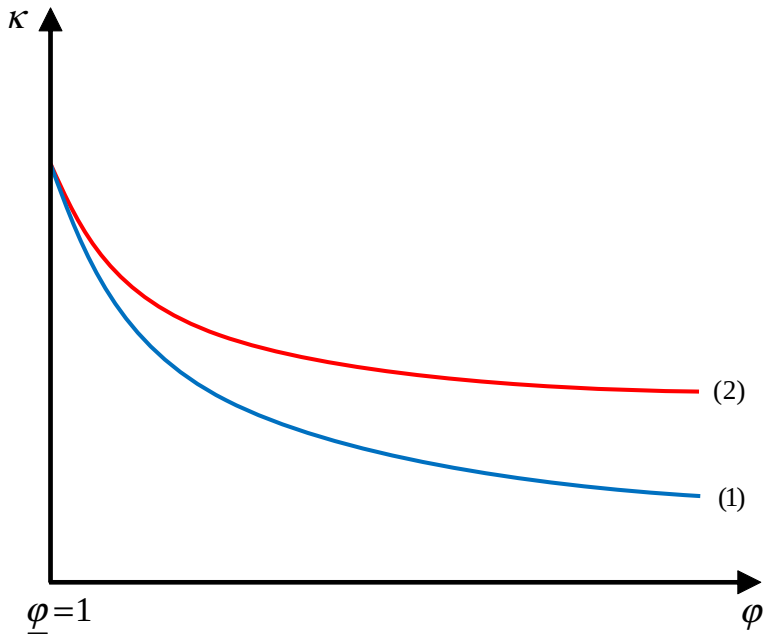
Importance of quality vs. cost effects

- Relative scope for product differentiation: $\frac{\frac{1}{\kappa}\lambda_l^a}{\frac{1}{\varphi}e_l^c} = \frac{(1-\theta)c}{a}$

  $\Rightarrow$ Sutton (2001), Kugler & Verhoogen (2012)

Credit costs and vertical product differentiation



(1) low vertical differentiation
(2) high vertical differentiation

Proposition 1: Effect of credit costs on firm-level variables

If scope for vertical product differentiation high (low):

- relative decrease (increase) in product quality
- decrease (increase) of prices

Credit costs and average FOB prices

Effect of credit costs on average FOB price & export quantity:

$$\frac{d\ln\bar{p}_x}{d\ln\beta} = \underbrace{\frac{a-c\theta}{ac}\frac{b}{\beta+b}}_{\text{direct effect}} + \underbrace{\frac{\theta}{(1-\theta)\,ac}\frac{d\ln z_d}{d\ln\beta}}_{\text{selection effect}}$$

$$\frac{d\ln\bar{q}_x}{d\ln\beta} = \underbrace{\frac{c\theta-a}{ac}\frac{b}{\beta+b}}_{\text{direct effect}} + \underbrace{\frac{a-\theta}{a}\frac{\beta}{\beta+b} - \frac{\theta\,(c-\sigma+1)}{\gamma c\,(1-\theta)}\frac{d\ln z_d}{d\ln\beta}}_{\text{selection effect}}$$

Proposition 2: Effect of credit costs on average export performance

If scope for vertical product differentiation high (low):

- decrease (increase) of average FOB price
- increase (decrease) of average export quantity

Credit costs and consumer welfare

Effect of credit costs on consumer welfare:

$$\frac{d \ln W}{d \ln \beta} = \underbrace{-\frac{a + c(1-\theta)}{ac}}_{\text{intensive margin}} \underbrace{- \frac{1}{ac}\left(\frac{\gamma}{\sigma - 1}\frac{\beta}{\beta + b} - \frac{d \ln z_d}{d \ln \beta}\right)}_{\text{extensive margin}} < 0$$

Proposition 3: Effect of credit costs on consumer welfare

If scope for vertical product differentiation high:

- stronger increase in cutoff efficiency
- stronger adjustment along intensive margin
- weaker adjustment along extensive margin
- stronger welfare loss

Summary

- Financial frictions and endogenous investment
- Two sources of firm heterogeneity:
  - cost-based capability $\Rightarrow$ process innovation
  - quality-based capability $\Rightarrow$ quality innovation

  $\Rightarrow$ efficiency: credit access and export status
- If the sectoral product differentiation is low (high), an increase in credit costs leads to:
  - stronger price (quality) competition
  - higher (lower) FOB prices
  - lower (higher) average export quantity
  - stronger adjustment of intensive (extensive) margin

Thank you very much for your attention!