

Imperfect Capital Markets and Trade Liberalization in General Equilibrium

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Credit constraints and international trade

- Negative effect of credit frictions on firm-level exports
 - Muûls (2014), Manova (2013), Minetti & Zhu (2011)
 - Theory: partial equilibrium analysis
- Firm heterogeneity with respect to financial constraints
 - Berman & Héricourt (2010)
 - Beck et al. (2006)

This paper: Effects of globalization on firm outcomes and welfare with:

- (1) Capital market adjustments in general equilibrium **and**
- (2) Firm-specific credit frictions

Contribution

- New **empirical patterns** from World Bank Data
 - Large firm-level variation of financial constraints within industries
 - Industries with higher competition: larger fraction of financially constrained firms
 - More financially constrained industries / countries: larger variance of firm sales
- New **international trade model** with firm-specific credit frictions and capital market equilibrium
- ① Firm-specific credit frictions
 - Credit frictions at firm-level: agency problem
 - Credit frictions at industry-level: imperfect financial institutions

⇒ Interaction frictions at firm- & country-level: **Firm heterogeneity**

⇒ Endogenous share of (un-)constrained firms
- ② Capital market equilibrium

⇒ Endogenous interest rate

Preview of main results

- 1 Endogenous share of unconstrained firms
- 2 Endogenous interest rate

Main idea: Implications of globalization are very different if general equilibrium effects on capital costs are taken into account.

⇒ Differential responses across producers

⇒ Differential aggregate outcomes, esp. consumer welfare

Effects of globalization:

- Increase in interest rate
- Higher share of financially constrained producers
- Within-industry reallocation towards unconstrained firms
- Negative welfare channel: higher price heterogeneity

Outline

- 1 Empirical motivation
- 2 Model setup
- 3 Partial equilibrium analysis
- 4 General equilibrium analysis
- 5 Welfare effects of globalization

Empirical patterns from the World Bank Enterprise Surveys

Empirical pattern 1: The majority of variation in financial constraints is across firms within industries rather than between industries.

Empirical pattern 2: Industries with a higher degree of product competition show a larger fraction of financially constrained firms.

Empirical pattern 3: More financially constrained industries and countries with lower financial development are characterized by a larger variance of firm sales, as well as a higher share of financially constrained producers.

⇒ All patterns hold after controlling for firm characteristics such as productivity or size and are captured by our theoretical model.

Utility function

- Consumer's utility:

$$U = aQ - \frac{1}{2}b \left[(1-e) \int_{i \in \Omega} q(i)^2 di + eQ^2 \right]$$

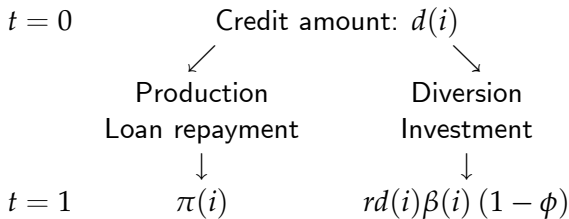
- Total consumption: $Q \equiv \int_{i \in \Omega} q(i) di$
- Inverse measure of product differentiation: $e \in (0, 1)$
- Budget constraint: $\int_{i \in \Omega} p(i)q(i) di \leq I$
- Market demand: $x(i) = kLq(i)$ k : # countries; L : # consumers

$$p(i) = a - b' [(1-e)x(i) + eX]$$

- Industry scale: $X \equiv \int_{i \in \Omega} x(i) di$
- Inverse measure of market size: $b' \equiv \frac{b}{kL}$

Firm's maximization problem

- Profits of firm i : $\pi(i) = p(i)x(i) - rd(i)$
- Budget constraint: $d(i) \geq cx(i)$
- Financial constraint: $\pi(i) \geq rd(i)\beta(i) (1 - \phi)$
- Moral hazard: non-verifiable action (Holmstrom & Tirole, 1997)



- Credit constraints at firm-level: $\beta(i) \in [0, 1]$
- Quality of financial institutions: $\phi \in [0, 1]$ (Antràs et al., 2009)

Optimal firm behavior

- Investors restrict credit provision:

$$d(i) \leq \frac{p(i)x(i)}{r[1 + \beta(i)(1 - \phi)]}$$

Two groups of firms:

- Price and output of **constrained** firms:

$$p_C(\beta) = cr[1 + \beta(i)(1 - \phi)]; \quad x_C(\beta) = \frac{a - b'eX - p_C(\beta)}{b'(1 - e)}$$

- Price and output of **unconstrained** firms:

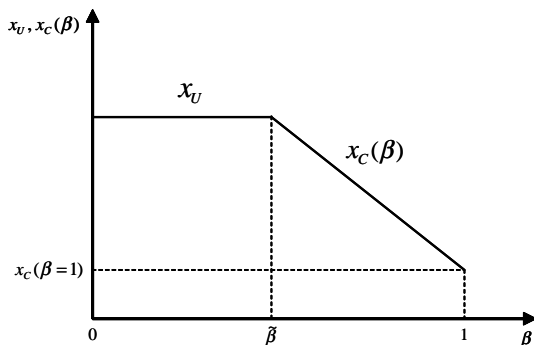
$$p_U = \frac{a - b'eX + (1 - e)rc}{2 - e}; \quad x_U = \frac{a - b'eX - rc}{b'(2 - e)}$$

Agency costs and firm output

Share of unconstrained firms:

$$\tilde{\beta} = \frac{a - b'eX - cr}{(2 - e)(1 - \phi)cr}$$

with $\frac{\partial \tilde{\beta}}{\partial e} < 0 \Rightarrow$ **empirical pattern 2**; & $\frac{\partial \tilde{\beta}}{\partial \phi} > 0 \Rightarrow$ **empirical pattern 3**.

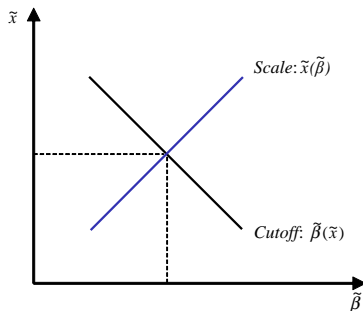


Partial equilibrium: system of equations

① Cutoff condition: $\tilde{\beta} = \frac{a-b'eX-cr}{(2-e)(1-\phi)cr}$

② Average industry scale: $\tilde{x} = \int_0^{\tilde{\beta}} x_U di + \int_{\tilde{\beta}}^1 x_C(\beta) di$

Total industry scale: $X = km\tilde{x}$; with m : # firms



Effects of globalization

- Globalization (Eckel & Neary, 2010):

\Rightarrow Increase in number of countries $k \uparrow \Rightarrow L \uparrow$ and $m \uparrow$

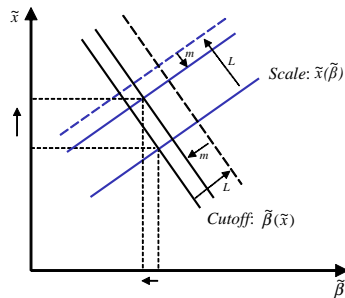
- Effect of globalization on average industry scale:

$$\frac{d \ln \tilde{x}}{d \ln k} = \underbrace{1}_{\text{Market size effect}} - \underbrace{\frac{(2 - e - \tilde{\beta}) e k m}{(2 - e)(1 - e) + (2 - e - \tilde{\beta}) e k m}}_{\text{Competition effect}} > 0$$

- Effect of globalization on share of unconstrained firms:

$$\frac{d \ln \tilde{\beta}}{d \ln k} = - \underbrace{\frac{(1 - e) b' e X}{(1 - \phi) c r \tilde{\beta} \left[(2 - e)(1 - e) + (2 - e - \tilde{\beta}) e k m \right]}}_{\text{Competition effect}} < 0$$

Globalization in partial equilibrium

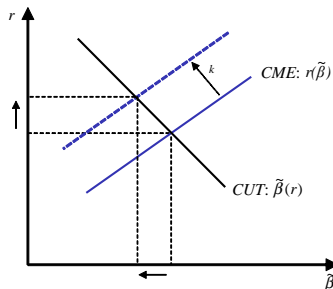


Proposition 1 (Globalization in partial equilibrium)

In partial equilibrium, globalization increases industry scale as the positive market size effect dominates the counteracting competition effect. The latter increases the share of financially constrained producers.

Effects of globalization in general equilibrium

Capital market clearing: $K_S = K_D = cm\tilde{x}$



Proposition 2 (Globalization in general equilibrium)

In general equilibrium, globalization increases the interest rate and the share of financially constrained firms, but has no effect on industry scale.

Output profiles and globalization (I)

Effect of globalization on (un)constrained output

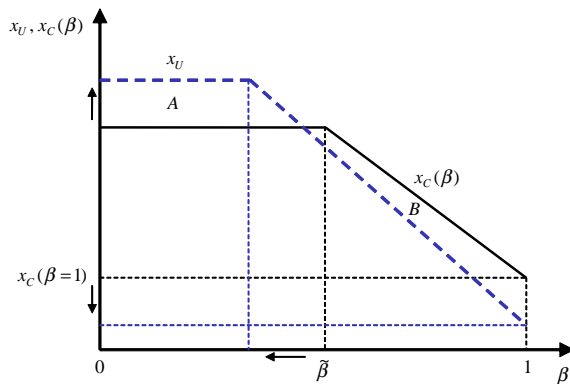
$$\frac{d \ln x_C(\beta)}{d \ln k} = 1 - \frac{[1 + \beta(i)(1 - \phi)] cr}{a - b'eX - cr[1 + \beta(i)(1 - \phi)]} \underbrace{\frac{d \ln r}{d \ln k}}_{(+)} < 0,$$

$$\frac{d \ln x_U}{d \ln k} = 1 - \frac{cr}{a - b'eX - cr} \underbrace{\frac{d \ln r}{d \ln k}}_{(+)} > 0$$

Proposition 3 (Output profiles in general equilibrium)

In general equilibrium, globalization leads to an output expansion among unconstrained firms, whereas financially constrained producers have to reduce output due to increased capital costs.

Output profiles and globalization (II)



Consumer welfare

- Indirect utility function (cf. Neary, 2009):

$$U = km \frac{a^2(1-e) + ekm (\bar{p}_U + \bar{p}_C)^2 - [1 + e(km - 1)] (\gamma_c^2 + \gamma_u^2)}{2b(1-e) [1 + e(km - 1)]}$$

- First moments of prices:

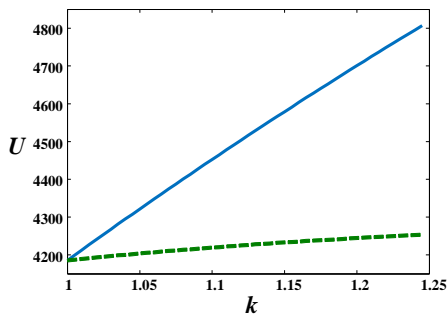
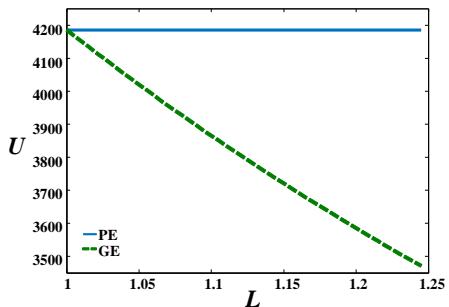
- $\bar{p}_U = \tilde{\beta} p_U$
- $\bar{p}_C = \int_{\tilde{\beta}}^1 p_C(\beta) di$

- Second moments of prices:

- $\gamma_U^2 = \int_0^{\tilde{\beta}} p_U^2 di$
- $\gamma_C^2 = \int_{\tilde{\beta}}^1 (p_C(\beta))^2 di$

- Variance of prices: $\sigma_j^2 = \gamma_j^2 - \bar{p}_j^2$ for $j \in C, U$

Welfare effects of globalization



Summary

- New empirical patterns:
 - Large firm-level variation of financial constraints within industries
 - Industries with higher competition: larger fraction of financially constrained firms
 - Positive relation of financial constraints and variance of firm sales
- New trade model with firm-level credit constraints and endogenous borrowing rate
- General equilibrium effects of globalization:
 - Increase in interest rate
 - Different responses across firms
 - Higher share of financially constrained firms
- Negative welfare channel of globalization:
higher price heterogeneity