Harmful Pro-Competitive Effects of Trade in Presence of Credit Market Frictions

Reto Foellmi and Manuel Oechslin

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Introduction (I)

Background:

- The recent literature emphasizes positive pro-competitive forces of international trade on productivity and output
- Stiffer competition is predicted to boost productivity by:
  - reallocating production factors from less to more productive firms (Melitz, 2003; Melitz and Ottaviano, 2008)
  - improving firm productivity: Companies trim their fat (e.g., Pavcnik, 2002) or focus on their core products (Bernard et al., 2011)

This paper:

- We explore the effects of stiffer foreign competition on productivity and output in an economy characterized by:
  - significant credit-market frictions (CMF)
  - asset inequality

  i.e., under circumstances we encounter throughout the developing world (Banerjee and Duflo, 2010)

Introduction (II)

This paper (continued):

- We are interested in whether, and through which channels, stiffer competition affects factor misallocation (due to CMF) $\cdots$
- $\cdots$ and identify and describe two harmful pro-competitive effects of international trade on productivity and output
- We further provide evidence (from 7 Latin American countries) in support of the key mechanism discussed in the paper

Theoretical set-up:

- We consider a monopolistically competitive economy with an endogenous distribution of mark-ups due to CMF and wealth inequality
- Loan repayment is imperfectly enforceable so that borrowing depends on wealth – which implies that poorer entrepreneurs:
  - run smaller firms
  - charge higher mark-ups

Introduction (III)

Preview of theoretical results:

- Exposure to international trade narrows down the mark-ups charged by smaller firms since:
  - import competition reduces the maximum prices that can be charged
  - borrowing costs increase (as bigger firms increase factor demand)
- Smaller mark-ups reduce the borrowing capacity – and hence investments – of the less-affluent firm owners
- Impact on economic performance depends on the degree to which the country integrates into the world economy:
  - "High" degree: Economic performance unambiguously improves as low-productivity firms are forced to exit
  - "Intermediate" degree: Economic performance may deteriorate through two different channels, both related to the credit market friction

Introduction (IV)

Preview of theoretical results (continued):

- The two adverse effects are called:
  - *Polarization effect*: Smaller firms are forced to use less productive technologies but are not driven out of the market
  - *Replacement effect*: Smaller firms produce less which requires the economy to spend more resources on trade-related costs

Preview of empirical results:

- Empirical analysis is based on a firm-level dataset (with a two-period panel structure) that includes 544 manufacturing firms
- Results are supportive of the key theoretical mechanism:
  - Reduction in tariff protection impairs access to finance enjoyed by smaller and medium-sized firms
  - Among larger firms, no such effect of tariff reductions on access to finance can be identified

Introduction (V)

Agenda:

- Related Literature
- The Closed Economy
- Integrating into the World Economy:
  - Overview / Assumptions
  - An Equilibrium with Intermediate Trade Costs
  - The Effects of Lower Trade Costs on Real Output
- From Autarky to Full Integration
  - From Autarky to Partial Integration
  - From Partial Integration to Full Integration
- Evidence on Trade and Access to Finance
- Summary and Conclusions

Related Literature

International trade and heterogeneous firms:

- Bernard et al. (2003), Melitz (2003), Melitz and Ottaviano (2008)
- Bustos (2011)

Credit market frictions and resource misallocation:

- Matsuyama (2000), Banerjee and Duflo (2005)
- Hsieh and Klenow (2009)
- Song et al. (2011)

International trade and credit market frictions:

- Banerjee and Newman (2004), Matsuyama (2005), Foellmi and Oechslin (2010)
- Feenstra et al. (2013), Manova (2013), Brooks and Dovis (2017)

Assumptions:

- Continuum 1 of entrepreneurs who are heterogeneous regarding their capital endowment, ω_i, $i \in [0,1]$, and their production possibilities
- Capital endowments are distributed according to $G(\omega)$, and the aggregate endowment is $K \equiv \int_0^\infty \omega dG(\omega)$
- Each entrepreneur is a monopoly supplier of a differentiated good
- All goods are produced with a simple technology that requires capital as the only input into production
- Following much of the CMF literature (e.g., Matsuyama, 2000), this technology is characterized by a non-convexity:

$$y_i = \begin{cases} bk_i & : \quad k_i < \kappa \\ ak_i & : \quad k_i \geq \kappa \end{cases}, \quad b < a, \tag{1}$$

Assumptions (continued):

- The entrepreneurs' utility function is of the familiar CES-from,

$$U = \left(\int_0^1 c_j^{(\sigma-1)/\sigma} dj \right)^{\frac{\sigma}{\sigma-1}}, \ \sigma > 1, \tag{2}$$

- and each entrepreneur maximizes (2) subject to

$$\int_0^1 p_j c_j dj = m(\omega_i), \tag{3}$$

where c_j and p_j are consumption and price of good j, respectively, and $m(\omega_i)$ is entrepreneur i's nominal income

- Moreover,

$$\kappa < K(b/a)^{\sigma-1} \tag{R1}$$

Implications:

- The equilibrium real price of good j is

$$\frac{p_j}{P} = \frac{p(y_j)}{P} \equiv \left(\frac{Y}{P}\right)^{\frac{1}{\sigma}} y_j^{-1/\sigma}, \tag{4}$$

where:

  - $P \equiv (\int_0^1 {p_j}^{1-\sigma} dj)^{1/(1-\sigma)}$ is the CES price index
  - $Y \equiv (\int_0^1 p_j y_j dj)$ is the aggregate nominal output

Assumptions:

- Entrepreneurs may borrow and lend in an economy-wide credit market
- The credit market is:
  - competitive in the sense that lenders and borrowers take the borrowing rate ρ as given
  - imperfect in the sense that borrowing at the equilibrium rate ρ may be limited
- Borrowing limit arises because repayment can be avoided by incurring a cost that is a fraction $\lambda \in (0, 1]$ of the current firm revenue, $p_i y_i$
- The parameter λ mirrors how well the credit market works:
  - λ close to 0: strong friction
  - λ close to 1: weak friction

Implications:

- Lenders will give credit only up to the point where the borrower has just the incentive to pay back – which means that:

$$\lambda p(y_i) y_i \geq \begin{cases} \rho(y_i/b - \omega_i) & : \quad y_i < a\kappa \\ \rho(y_i/a - \omega_i) & : \quad y_i \geq a\kappa \end{cases} \tag{5}$$

- Expressions (4) and (5) imply a maximum output level,

$$\overline{y} = \begin{cases} b(\omega + \lambda x \overline{y}^{(\sigma-1)/\sigma}) & : \quad \omega < \omega_\kappa \\ a(\omega + \lambda x \overline{y}^{(\sigma-1)/\sigma}) & : \quad \omega \geq \omega_\kappa \end{cases}, \tag{6}$$

where:

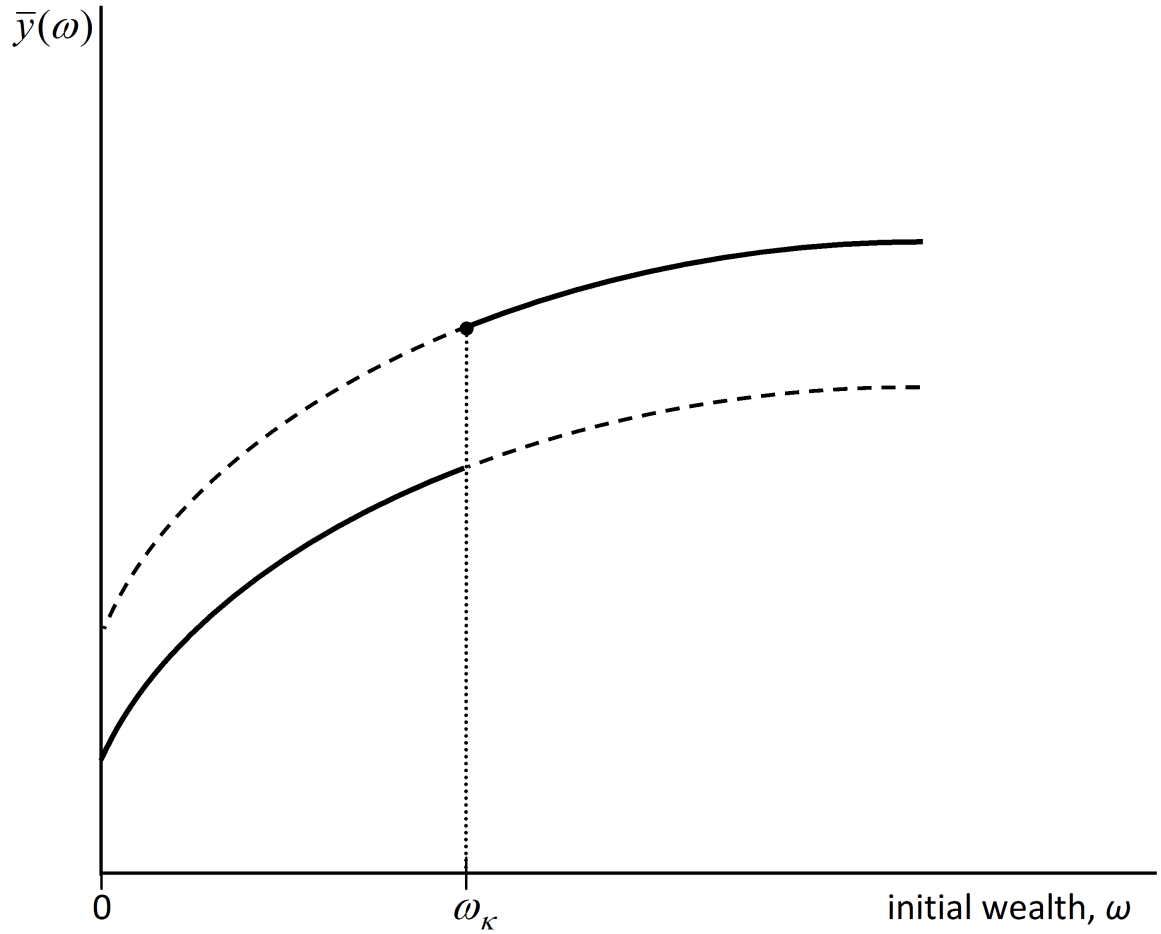
  - ω_κ is the endowment required to be able to exactly invest κ units
  - $x \equiv (Y/P)^{1/\sigma}/(\rho/P)$

Implications (continued):

* LEMMA 1: A firm's maximum output, $\overline{y}(\omega)$, is a strictly increasing function of the initial capital endowment, ω

- A higher ω means that an entrepreneur can invest more since:
  - there are more own resources under the entrepreneur's command
  - the borrowing capacity is higher as there is more "skin in the game"
- Note further that ($\rightarrow$ Figure 1):
  - the function is locally concave since the marginal return to investment falls in the investment level
  - there is a discontinuity at ω_κ since, at that point, entrepreneurs switches to the more productive technology

Figure 1– Maximum firm output



Entrepreneurs using the high-productivity technology $(\omega \geq \omega_\kappa)$**:**

- Resources permitting, these entrepreneurs increase output up to the point where marginal revenues equal marginal costs
- The profit-maximizing output level is denoted by $\tilde{y}$ and $\tilde{\omega}$ is the wealth level which allows exactly for a production of $\tilde{y}$ units:

$$\tilde{y} = \left(a x \frac{\sigma - 1}{\sigma} \right)^{\sigma} \quad \text{and} \quad \tilde{\omega} = \left(1 - \lambda \frac{\sigma}{\sigma - 1} \right) \frac{\tilde{y}}{a}, \tag{7}$$

* Lemma 2: If $\lambda < (\sigma - 1)/\sigma$, firms with $\omega \in [\omega_\kappa, \tilde{\omega})$ produce the maximum output, $\overline{y}(\omega)$, and firms with $\omega \in [\tilde{\omega}, \infty)$ produce $\tilde{y}$. If $\lambda \geq (\sigma - 1)/\sigma$, all firms produce $\tilde{y}$.

Entrepreneurs using the low-productivity technology $(\omega < \omega_\kappa)$:

* LEMMA 3: Suppose $\lambda < (\sigma - 1)/\sigma$. Then, firms with $\omega < \omega_\kappa$ produce the maximum output, $\overline{y}(\omega)$.

Putting things together:

- Lemmas 2 and 3 imply that equilibrium firm outputs are given by

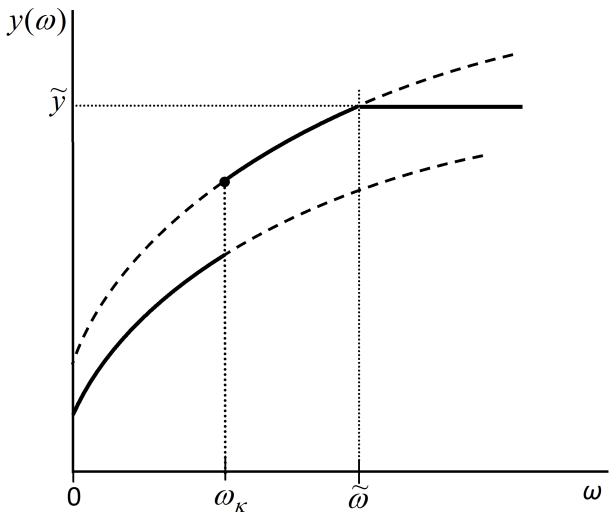
$$y(\omega) = \begin{cases} \overline{y}(\omega) & : \quad \omega < \tilde{\omega} \\ \tilde{y} & : \quad \omega \geq \tilde{\omega} \end{cases}, \tag{8}$$

  where $\overline{y}(\omega)$ is implicitly determined by (6) and $\tilde{y}$ is given in (7)

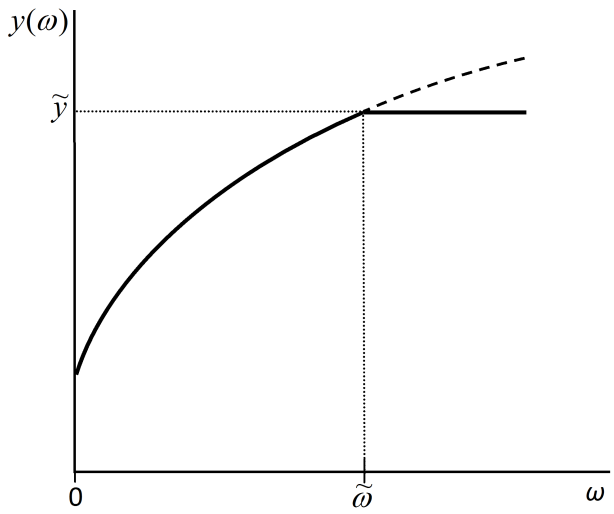
- Figure 2 shows two possible situations, $\omega_\kappa > 0$ (a.) and $\omega_\kappa \leq 0$ (b.)

Figure 2 – Equilibrium firm outputs ($\lambda < (\sigma - 1)/\sigma$)

a. Some firms use the low-productivity technology



b. All firms use the high-productivity technology



Capital demand and supply:

- So far, $x = (Y/P)^{1/\sigma}/(\rho/P)$ has been kept constant
- In equilibrium, x adjusts to ensure

$$\int_0^{\omega_\kappa} \frac{\overline{y}(\omega;x)}{b} dG(\omega) + \int_{\omega_\kappa}^{\widetilde{\omega}} \frac{\overline{y}(\omega;x)}{a} dG(\omega) + \int_{\widetilde{\omega}}^{\infty} \frac{\tilde{y}(x)}{a} dG(\omega) = K, \quad (9)$$

  where the LHS is aggregate gross capital demand

The macroeconomic equilibrium:

* Proposition 1: There exists a unique macroeconomic equilibrium. If $\lambda < (\sigma-1)/\sigma$, some entrepreneurs are credit-constrained (and the poorest ones may use the low-productivity technology). Otherwise, if $\lambda \geq (\sigma-1)/\sigma$, no one is credit-constrained.

The macroeconomic equilibrium (continued):

- The properties of the equilibrium are broadly consistent with a large body of evidence from developing countries
- We have a coexistence of:
  - more and less advanced technologies
  - high and low marginal (revenue) products of capital

  → See Banerjee and Duflo (2005)
- There is variation in revenue productivities (TFPR) across firms, as has been documented for China and India

  → See Hsieh and Klenow (2009)

Integrating into the World Economy

Overview

Focus:

- The focus is now on how a reduction in trade barriers affects the equilibrium in the home economy
- We consider international trade between two trading partners, the
  - home economy (South) which represents a developing economy
  - rest of the world (North) which represents an advanced economy

Assumptions:

- 'Iceberg' trade costs: $\tau \geq 1$ units of a good have to be shipped in order for 1 unit to arrive at the destination region
- Northern markets work perfectly (i.e., there are no credit market frictions and the goods markets are perfectly competitive)
- The price level in the North is set to 1 (which means that the prices of all northern goods – and also the marginal cost – are 1)

Intermediate per-unit trade costs:

- Price of any good produced in the North and exported to the South is given by τ so that:
  - all southern producers face a northern competitive fringe
  - cannot set a price above τ
- To illustrate through which channels trade affects the economy, we first assume that τ is such that:
  - the price that would make domestic demand (for a given good) equal to an output of $a\kappa$ exceeds the upper bound τ
  - the profit-maximizing price charged by entrepreneurs who are not credit-constrained lies below the upper bound

Formally, with $p(y)$ given in (4), this means:

$$p(a\kappa) > \tau > p(\tilde{y})$$

Changes relative to the closed economy:

- An equilibrium with a positive mass of price-constrained entrepreneurs involves imports and hence exports – which pins down ρ:

$$\rho = a/\tau$$

- The fact that there is a binding upper bound on prices changes the $\overline{y}-$function (for price-constrained firms):

$$\overline{y}^I = \begin{cases} b\left(\omega + \lambda\tau\rho^{-1}\overline{y}^I\right) & : \quad 0 \leq \omega < \omega_\kappa^I \\ a\left(\omega + \lambda\tau\rho^{-1}\overline{y}^I\right) & : \quad \omega_\kappa^I \leq \omega < \omega_\tau^I \end{cases}, \tag{6'}$$

where:

  - $\omega_\kappa^I = \left(1 - \lambda\tau^2\right)\kappa$
  - $\omega_\tau^I = \left(1 - \lambda\tau^2\right)(Y/P)(\tau/P)^{-\sigma}/a$

Required parameter restrictions (for the case analyzed first):

- To ensure that $p(a\kappa) > \tau > p(\widetilde{y})$:

$$\frac{\sigma}{\sigma - 1} < \tau^2 < \frac{1}{\lambda}. \tag{R2}$$

- To ensure that the low-productivity technology is used:

$$a/b < \tau^2 \tag{R3}$$

Establishing the equilibrium – aggregate exports:

- In a balanced trade equilibrium, the total value exports must be equal to the total value of imports
- In formal terms,

$$EXP = YP^{\sigma-1}\tau^{1-\sigma}G(\omega_\tau^I) - \tau\int_0^{\omega_\kappa^I}\frac{b}{1-\lambda\tau^2 b/a}\omega dG(\omega) - \tau\int_{\omega_\kappa^I}^{\omega_\tau^I}\frac{a}{1-\lambda\tau^2}\omega dG(\omega), \quad (10)$$

  where (on the RHS):
  - 1st term on 1st line: Total expenditure on goods that are imported
  - 1st term on 2nd line: Value of production by firms with $\omega < \omega_\kappa^I$
  - 2nd term on 2nd line: Value of production by firms with $\omega_\kappa^I \leq \omega < \omega_\tau^I$

Establishing the equilibrium – resource constraint:

- The credit market equilibrium condition is now given by

$$\int_0^{\omega_\kappa^I} \frac{1}{1-\lambda\tau^2 b/a}\omega dG(\omega) + \int_{\omega_\kappa^I}^{\omega_\tau^I} \frac{1}{1-\lambda\tau^2}\omega dG(\omega) + \int_{\omega_\tau^I}^{\widetilde{\omega}} \frac{\overline{y}^I(\omega)}{a} dG(\omega)$$

$$+ \int_{\widetilde{\omega}}^{\infty} \frac{\tilde{y}}{a} dG(\omega) + \tau\frac{EXP}{a} = K$$

- Taking (10) into account gives

$$\int_0^{\omega_\kappa^I} \frac{1-\tau^2 b/a}{1-\lambda\tau^2 b/a}\omega dG(\omega) + \int_{\omega_\kappa^I}^{\omega_\tau^I} \frac{1-\tau^2}{1-\lambda\tau^2}\omega dG(\omega) + \int_{\omega_\tau^I}^{\widetilde{\omega}} \frac{\overline{y}^I(\omega)}{a} dG(\omega)$$

$$+ \frac{1}{a} YP^{\sigma-1}\tau^\sigma \left(\frac{\sigma-1}{\sigma}\right)^\sigma [1-G(\tilde{\omega})] + \frac{1}{a} YP^{\sigma-1}\tau^{2-\sigma} G(\omega_\tau^I) = K$$

The macroeconomic equilibrium:

- PROPOSITION 2: Suppose that (R2) and (R3) hold. Then, there is a unique equilibrium where (i) the poorest entrepreneurs use the low-productivity technology; (ii) all poorer ones are price-constrained; (iii) all richer entrepreneurs set the profit-maximizing price; (iv) the richest ones export parts of their output

- The properties of the equilibrium are broadly consistent with stylized facts (see, e.g., Bernard et al., 2003)

- In particular, we have that exporting firms
  - are the biggest ones and are more productive than the average firm
  - are a small minority (if the set of richest entrepreneurs is small)

Polarization effect (−):

- A fall in τ forces some firms to switch from the high-productivity to the low-productivity technology:
  - The maximum price τ decreases while $\rho = a/\tau$ rises so that small firms make lower profits and hence can put up less collateral
  - Less collateral implies a lower borrowing capacity so that some additional firms turn unable to meet the $\kappa-$threshold
- As a result, the number of firms using the low-productivity technology, $G(\omega_\kappa^l) = G((1-\lambda\tau^2)\kappa)$, increases
- The impact on aggregate firm productivity is ambiguous, though. The share of K invested in low-productivity firms is:

$$\frac{1}{1-\lambda\tau^2 b/a}\int_0^{\omega_\kappa^l} \omega dG(\omega)/K$$

Replacement effect $(-)$**:**

- A fall in τ forces the remaining price-constrained high-productivity firms to produce less (as credit constraints become tighter):

$$\bar{y}'(\omega) = \frac{1-\lambda}{1-\lambda\tau^2} a\omega$$

- As a result, part of the output that used to be produced by these firms needs to be replaced with imports from abroad
- This replacement is a source of inefficiency because it leads to an increase in aggregate trade costs

Better availability of consumption goods $(+)$**:**

- A fall in τ reduces the dispersion of prices and mark-ups
- Individuals thus consume a more balanced basket of goods

Overview:

- How is aggregate real output is affected by the three different channels as trade costs fall from prohibitive levels to zero?
- Analysis is based on:
  - the general model when we explore the impact of τ at the border (called τ^{AT}) between the "no-trade" and the "trade" equilibrium
  - a model version relying on a two-point distribution when we explore the impact of τ if $\tau < \tau^{AT}$

Trade costs and real output at τ^{AT}:

* PROPOSITION 3: Consider an equilibrium where the poorest entrepreneurs use the low-productivity technology. Suppose further that $\tau = \tau^{AT}$. Then, a (marginal) reduction in trade costs, τ, leads to a fall in aggregate real output, Y/P:

$$d(Y/P)/d\tau|_{\tau=\tau^{AT}} > 0$$

Trade costs and real output at τ^{AT} (continued):

- Output falls although some smaller firms rely on the low-productivity technology (and the supply of goods is particularly uneven)
- This result continues to hold in the alternative case where all firms have access to the high-productivity technology under autarky
- The negative impact of international trade in the neighborhood of τ^{AT} is due to the fact that:
  - the adverse replacement effect has first-order consequences
  - the improvement in consumption possibilities is a second-order effect

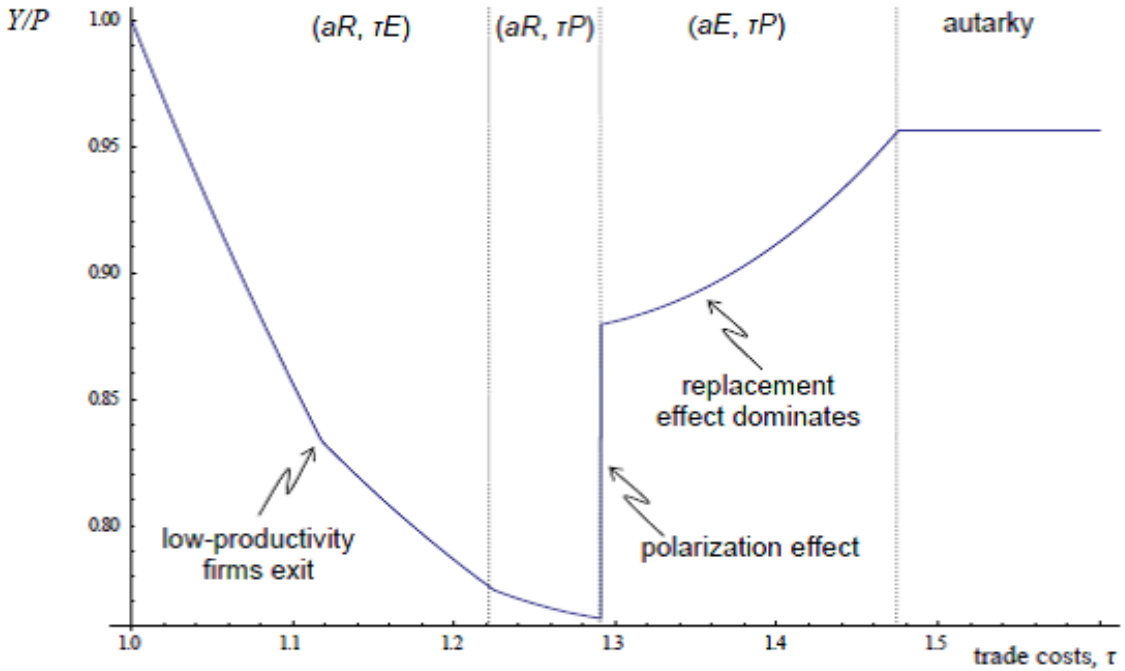
A specific distribution:

- We assume a two-point distribution:
  - A fraction β of entrepreneurs (the "poor", P) is endowed with $\omega_P = \theta K$, where $\theta < 1$
  - A fraction $1 - \beta$ of entrepreneurs (the "rich", R) is endowed with $\omega_R = (1 - \beta\theta)K/(1 - \beta)$
- Advantage: Real output and group-specific real incomes can be calculated explicitly (which is done in the paper $\cdots$)
- Here: Focus on numerical example

Two different situations:

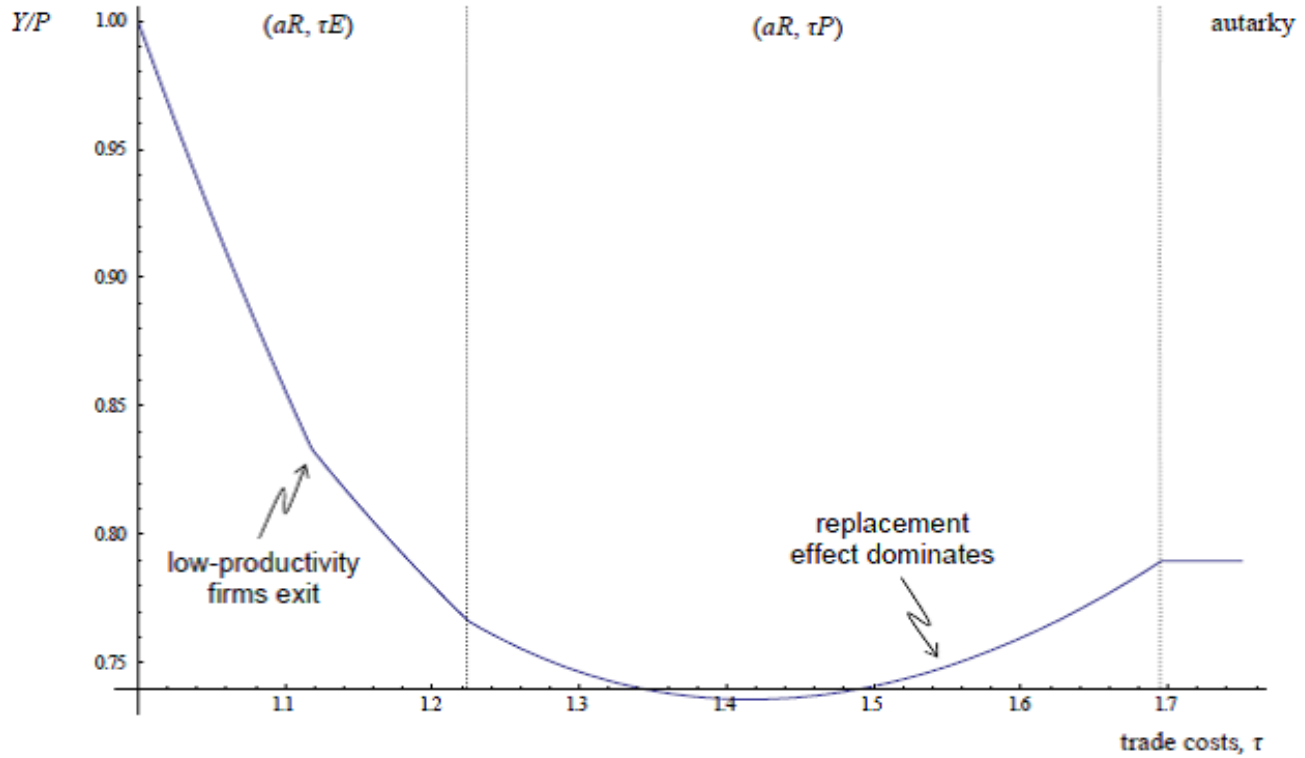
- Figure 3: "Mild" credit-market friction
- Figure 4: "Severe" credit-market friction

Figure 3 – Real output as a function of τ



$K = 1,\ a = 1,\ b = 0.8,\ \beta = 0.8\ ,\kappa = 0.6\ ,\lambda = 0.2,\ \sigma = 3,\ \theta = 0.4$

Figure 4 – Real output as a function of τ ("severe" CMF)



$K = 1,\ a = 1,\ b = 0.8,\ \beta = 0.8\ ,\kappa = 0.6\ ,\lambda = 0.1,\ \sigma = 3,\ \theta = 0.4$

Evidence on Trade and Access to Finance (I)

Overview:

- There is substantial evidence on the relationship between firm size and credit constraints (e.g., Beck and Demirguc-Kunt, 2006)
- Only little is known, however, about the effect of trade openness on access to finance by (smaller) firms
- We present some new findings in this regard

Data:

- We rely on a firm-level dataset that has recently been put together by Foellmi, Legge, and Tiemann (2016)
- The dataset combines two data sources:
  - WBES: Provides firm-level survey data, including information on access to finance, firm size, and industry classification
  - WITS: Provides information on tariff rates at the four-digit ISIC level

Evidence on Trade and Access to Finance (II)

Data (continued):

- The dataset covers all Latin American countries,
  - in which firms were interviewed twice (in 2006 and 2010)
  - for which tariff rates were available,

  i.e., Argentina, Bolivia, Chile, Colombia, Paraguay, Peru, Uruguay
- Our regression sample consists of 544 manufacturing firms:
  - which were interviewed in both years
  - which did not change industry between 2006 and 2010
- Main variable of interest is *FIN_CONS*,
  - a dummy variable that takes on the value 1 if a firm responds "access to finance" (atf) when asked $\cdots$
  - $\cdots$ which element of the business environment represents the biggest obstacle (15 possible answers)

Evidence on Trade and Access to Finance (III)

Two (related) questions:

- Did the share of firms saying "atf" increase by more in the subset of firms which were in industries that saw a substantial tariff reduction?
- Is the negative effect (if any) of such a substantial tariff reductions on access to finance stronger among smaller firms?
- We consider tariff cuts of 0.5 percentage points or more to be substantial

Results: Table 1,

- Panel A: Sample of smaller firms includes firms with less than 20 employees (i.e., firms classified as small by WBES)
- Panel B: Sample of smaller firms consists of firms with less than 100 employees (i.e., firms classified as either small or medium-sized)

Evidence on Trade and Access to Finance (IV)

Table 1 – Tariff protection and access to finance

	substantial tariff reduction (1)	no substantial tariff reduction (2)	substantial tariff reduction (3)	no substantial tariff reduction (4)
	PANEL A:			
	small firms		medium-sized and large firms	
Share of firms with FIN_CONS= 1 in 2006	0.020	0.138	0.106	0.114
Share of firms with *FIN_CONS* = 1 in 2010	0.100	0.124	0.133	0.106
Difference estimator	0.080* (0.095)	-0.014 (0.729)	0.027 (0.541)	-0.008 (0.769)
DiD est. (country fixed effects included)	0.111^ (0.142)		0.110* (0.059)	
Number of observations	50	145	113	236
	PANEL B:			
	small and medium-sized firms		large firms	
Share of firms with *FIN_CONS* = 1 in 2006	0.083	0.129	0.071	0.1
Share of firms with *FIN_CONS* = 1 in 2010	0.132	0.125	0.095	0.057
Difference estimator	0.049 (0.215)	-0.004 (0.904)	0.024 (0.697)	-0.043 (0.350)
DiD est. (country fixed effects included)	0.135*** (0.003)		0.006 (0.965)	
Number of observations	121	311	42	70

Note: *p*-values in parentheses; ***, **, *, and ^ denote significance at the 1, 5, 10, and 15% levels, respectively; the *p*-values are based on *t*-tests with unequal variances (difference estimator) or robust standard errors (difference-in-difference estimator).

Summary and Conclusions (I)

Main points:

- We study the macroeconomic implications of a fall in trade barriers in a monopolistically competitive economy with credit-market frictions
- We show that a piecemeal proportional reduction in trade barriers
  - may/must have a negative impact on aggregate real output
  - may have a negative effect on aggregate firm productivity

  although the average markup and the dispersion of markups fall
- The reason is that lower trade barriers imply lower markups and hence less access to finance for smaller firms (something we see in the data)
- The deterioration in the access to finance has two adverse effects:
  - *Polarization effect*: More smaller firms are forced to use the low-productivity technology
  - *Replacement effect*: Trade costs increase as loss in output needs to be replaced with imports

Summary and Conclusions (II)

Main points (continued):

- This finding echoes an insight highlighted by Bhagwati (1971):

  Lowering trade barriers may lead to losses if the result is an even sharper deviation of the actual output distribution from the undistorted distribution

- From this perspective, the contribution here is that to show that credit-market friction exactly imply such harmful adjustments