Introduction

Observations

- **Monopolistically Competitive Model** of trade is developed with heterogenous firms & endogenous differences in the toughness of competition across countries.

- Model Predictions: "Trade forces the least productive firms to exist and reallocate market share towards more productive exporting firms."

- Market size and trade affect the toughness of competition in a market.
Introduction

Relevant Questions

• How the **toughness of competition** (larger number of sellers and lower average price -higher productivity-) varies across not perfectly integrated markets of **different size**?
• What are the effects of different trade **liberalization policies** in this framework?

Motivation (Why is this important? Differences with other papers)

• Modeling Structure: **Monopolistic Competition** with **Free Entry & Product Differentiation**.
• This paper provides a useful **modelling framework for the analysis of trade** and liberalization policies.
• In previous modeling, the distribution of markups is invariant to country characteristics and to geographic barrier. Here, **endogenous determination of the mark-ups**.
Utility of a representative consumer is given by:

\[ U = q_0^c + \alpha \int_{i \in \Omega} q_i^c \, di - \frac{1}{2} \gamma \int_{i \in \Omega} (q_i^c)^2 \, di - \frac{1}{2} \eta (\int_{i \in \Omega} q_i^c \, di)^2 \]

where

- \( i \in \Omega = \{ \text{continuum of differentiated varieties} \} \)
- \( q_0^c \) & \( q_i^c \) individual consumption level of a homogenous good chosen as numerarie & each variety \( i \)
- \( \gamma \) is an index of product differentiation
- \( \alpha, \eta \) govern the substitutability of varieties with the numeraire good.

Then, linear inverse demand for all varieties:

\[ p_i = \alpha - \gamma q_i^c - \eta Q^c \]

where \( Q^c = \int_{i \in \Omega} q_i^c \, di \)
The Model of Closed Economy

- With $L$ consumers, **total demand for a differentiated variety:**
  
  $$q_i = L q^c_i$$

  (by integrating):  
  $$Q^c = \frac{N(\alpha - \bar{p})}{\gamma + \eta N}$$  
  where  
  $$\bar{p} = \frac{1}{N} \int_{i \in \Omega^*} p_i \, di$$

  $$N = \text{measure of consumed varieties}$$

- Marginal utilities are bounded, so there exists a **threshold price level** over which demand is zero

  $$q_i > 0 \quad \text{iff} \quad p_i \leq \frac{\alpha \gamma + \eta N \bar{p}}{\eta N + \gamma} \equiv p_{\text{max}}$$

- this threshold goes down with tougher competition ($\uparrow N$ or $\bar{p} \downarrow$).

- $\epsilon_i \equiv \left[ \frac{p_{\text{max}}}{p_i} - 1 \right]^{-1}$ increases with tougher competition ($\bar{p} \downarrow$ or $\uparrow N$).
The Model of Closed Economy

- Indirect utility of each consumer $c$:
  $$U = I^c + \frac{1}{2} (\eta + \frac{\gamma}{N})^{-1} (\alpha - \bar{p})^2 + \frac{1}{2} \frac{N}{\gamma} \sigma_p^2$$

where $\sigma_p^2 = \frac{1}{N} \int_{i \in \Omega} (p_i - \bar{p})^2 \, di$

- Then Welfare rises with:
  - a decrease in average prices, $\bar{p}$
  - an increase in the variance of price, $\sigma_p^2 = \frac{1}{N} \int_{i \in \Omega^*} (p_i - \bar{p})^2 \, di$
    (consumers reoptimize their consumption across varieties)
  - an increase in the number of varieties ($\uparrow N \downarrow p_{\text{max}} \uparrow \epsilon_i \implies$ tougher competition)
The Model of Closed Economy

Production & Firm Behavior

- One unit of homogenous good is produced by one unit of labor $\Rightarrow$ wage $= 1$.
- Numeraire good is produced CRS at unit cost
- Entry in the differentiated product sector is costly:
  - pay sunk investment cost $f_E \rightarrow$ draw $c$ from a common & known distrib $G(c)$, $c \in [0, c_M]$
- A firm with cost level $c$ maximize profits based on their linear residual demand curve, taking $N$ and $\bar{p}$ as given:

$$\max_{q(c) \geq 0} \pi(c) = \left[ (\alpha - \frac{\gamma}{L} q(c) - \eta Q^c) - c \right] q(c)$$
The Model of Closed Economy

- First order Condition

\[ FOC : \left[ \left( \alpha - \frac{2\gamma}{L} q(c) - \eta Q^c \right) - c \right] = 0 \]

\[ \frac{2\gamma}{L} q(c) = \underbrace{(\alpha - \eta Q^c) - c}_{c_D} \]

where \( c_D \) is the endogenous cutoff \( \Rightarrow \) if \( \Pi(p(c_D)) = 0 \)

then if \( c > c_D \equiv (\alpha - \eta Q^c) \) Exit \( (q(c) = 0) \),

if \( c < c_D \) firms earn positive profits & \( q(c) = \frac{L}{2\gamma} (c_D - c) \)
The Model of Closed Economy

- The endogenous cutoff \( c_D \) is a **sufficient statistic** that completely summarizes the relevant competitive environment (\( L = \text{market size} \)):

  \[
  p(c) = \frac{1}{2}(c_D + c) \quad \text{prices}
  \]

  \[
  q(c) = \frac{L}{2\gamma}(c_D - c) \quad \text{quantity}
  \]

  \[
  \mu(c) = p(c) - c = \frac{1}{2}(c_D - c) \quad \text{markups}
  \]

  \[
  r(c) = \frac{L}{4\gamma} [(c_D)^2 - c^2] \quad \text{revenues}
  \]

  \[
  \pi(c) = \frac{L}{4\gamma} (c_D - c)^2 \quad \text{profits}
  \]

- More productive firms (lower \( c \)):
  - set **lower prices** but **higher markups**
  - are **bigger**: higher output and revenue
  - have **higher profits**
The Model of Closed Economy

Free Entry Condition

- The expected profits of a potential entrant must be driven down to zero from free entry:

\[
\int_0^{c_D} \pi(c) dG(c) - f_E = 0 \quad \text{Free Entry Condition}
\]

\[
\frac{L}{4\gamma} \int_0^{c_D} (c_D + c)^2 dG(c) = f_E \Rightarrow \quad c_D = \frac{\gamma \alpha + \eta N \bar{p}}{\eta N + \gamma}
\]

This yields to the cutoff profit condition

\[
N = \frac{2\gamma}{\eta} \frac{\alpha - c_D}{c_D - \bar{c}} \quad \text{where} \quad \bar{c} = \frac{\int_0^{c_D} cdG(c)}{G(c_D)}
\]

- Pareto distribution on productivity \( \frac{1}{c} \) with lower productivity bound \( \frac{1}{c_M} \):

\[
G(c) = \left( \frac{c}{c_M} \right)^k, \quad (k \geq 1)
\]

\[
\int_0^{c_D} \frac{L}{4\gamma} (c_D + c)^2 \pi(c) dG(c) = f_E \quad \text{Free Entry Condition}
\]
Then, the **threshold for survival** is given by:

\[
c_D = \left( \frac{2\gamma(k+1)(k+2)c_M^k f_E}{L} \right)^{1/(k+2)}
\]

where we assume \( c_M > \sqrt{[2(k + 1)(k + 2)\gamma f_E] / L} \implies c_D < c_M \)

- ↓ \( c_D \) (↑avg. productivity) as **competition is tougher**: ↑ \( L \), ↓ (\( \gamma \), \( c_M \), \( f_E \))
- as **competition is tougher** ↑elasticity of demand \( \varepsilon_i \), and ↓mark-ups

\[
N = \left( \frac{2(k+1)\gamma}{\eta} \right) \frac{\alpha - c_D}{c_D}
\]
The Model of Closed Economy

- The previous parametrization yields simple derivation for the averages of all the firm-level performance:

\[
\bar{c} = \frac{k}{k+1} c_D \quad \text{average cost}
\]

\[
\bar{q} = \frac{L}{2\gamma k+1} c_D \quad \text{average quantity}
\]

\[
\bar{p} = \frac{2k+1}{2k+2} c_D \quad \text{average price}
\]

\[
\bar{\mu} = \frac{1}{2} \frac{1}{k+1} c_D \quad \text{average markups}
\]

- Welfare is determined by:

\[
U = 1 + \frac{1}{2\eta} (\alpha - c_D) (\alpha - \frac{k+1}{k+2} c_D) \quad \text{where} \quad U \uparrow \text{if} \ c_D \downarrow \quad \text{and} \quad \bar{p} \downarrow
\]

\[
\bar{\pi} = f_E \left( \frac{c_M}{c_D} \right)^k \quad \text{average profits}
\]
The Model of Closed Economy Results

- Bigger markets induced tougher selection (lower cutoff $c_D$), higher average productivity ($1/\bar{c}$) and lower average price.

- Under parametrization of cost draws:
  - Average markups are lower, because of increased competition on firm level.
  - Average firm size and profits are higher in larger markets
  - Average industry profitability $\bar{\pi}/\bar{r}$ does not vary with market size
The Open Economy Model

Trade as a bigger closed economy. We can see the transition from autarky to free trade as an increase in market size

- Larger markets are characterized by:
  - Lower mark-ups and prices (\(\uparrow\)average productivity)
  - Bigger firms and more profitable firms
  - Increase in product varieties
  - Lower variance of productivity (costs), price, and mark-ups
  - Higher variance of firm size (output and sales)
Open Economy (costly trade)

- Two economies, $H$ and $F$, with respective size $L^H, L^F$.
- Separated by trade barriers modelled as iceberg transport cost $\tau$.
- Cost of selling a unit to country $l$ ($l = H, F$) is $c$, and $c\tau^l$, respectively.
- Price threshold:

$$p_D^l = \frac{\alpha \gamma + \eta N^l \bar{p}^l}{\eta N^l + \gamma} = c_D^l \quad l = H, L$$

$N^l$ total number of firms selling in country $l$ (domestic firms + foreign exporters) and $\bar{p}^l$ average price (across both local and exporting firms) in country $l$. 
Open Economy (costly trade)

- $p_D^l(c)$ and $q_D^l(c)$ are domestic level of the profits maximizing price and quantity sold for a firm of country $l$.

- $p_x^l(c)$ and $q_x^l$ are the quantity and price for exports of country $l$.

- $c_D^l = \sup \{ c : \pi_D^l(c) > 0 \} = p^l \text{ max}$

- $c_x^l = \sup \{ c : \pi_x^l(c) > 0 \} = \frac{p^h \text{ max}}{\tau^h}$ where $h \neq l$

- This implies $c_X^h = c_D^l / \tau^l$
Open Economy: Free Entry Condition

- Firms choose a location prior to entry and paying the sunk entry cost.
- **Free entry Cond**: a domestic firm compares the cost of entry to the $E(profits \text{ from domestic sales})$, and $E(profits \text{ from exporting})$:

$$\int_0^{c^l_D} \pi^l_D(c) dG(c) + \int_{c^l_x}^{c^l_M} \pi^l_x(c) dG(c) = f_E \quad \text{Free Entry}$$

Under pareto dist. for $\frac{1}{c}$ the cut-off and number of firms for both countries are:

$$c^l_D = \left[ \frac{\alpha \phi}{L^l} \frac{1-\rho^h}{1-\rho^l \rho^h} \right]^{\frac{1}{k+2}} < c^l_{autarky} \quad \text{where} \quad \phi = 2(k+1)(k+2)c^k_M f_E \quad \rho^l = (\tau^l)^{-k}$$

$$N^l = \frac{2(k+1)\gamma}{\eta} \frac{\alpha-c^l_D}{c^l_D} > N^l_{autarky}$$

$$N^l = N^l_E G(c^l_D) + \underbrace{N^h_E G(c^h_x)}_{\text{exporters selling in } I} \quad \text{(number of varieties consumed)}$$

then we can solve for the number of entrants in each country: $N^l_E, N^h_E$
Open Economy: Results

- Opening up to trade reduces the cost cutoff $c_D \Rightarrow$
  - only the most productive firms survive
  - labor reallocated towards most productive firms
  - only most productive among survivors export ($c < c_{xh}^{lh} < c_D^l$)
  - least productive surv. prod. for domestic mkt ($c_{xh}^{lh} < c < c_D^l$)

- Trade does not completely integrate markets. This is because size still matters: **Bigger markets attract more firms and induce a “tougher” competitive environment:**
  - $c_D^l$ cutoff is lower in bigger markets,
  - higher average productivity (bigger firms)
  - higher product variety
  - lower mark-ups and prices (higher welfare).
Unilateral Trade Liberalization

- Unilateral trade liberalization leads to welfare changes in **opposite directions** across countries:
  - productivity and welfare **improve** in **protected countries**
  - while they **fall** in **liberalizing countries**

- The **liberalized** country becomes a **less attractive location** relative to the protected trading partner (the latter have access to domestic markets and cheaper access to export markets).

- The **liberalized country** loses more **domestic firms** than it gains in new importers (because not all firms located in protected markets export).

- These forces combine to make **competition tougher in protected countries** and **weaker in the liberalized one**.
Conclusions

- The paper develops a model that predicts how industry performance measures (productivity, size, price, mark-up) respond to changes in the world trading environment.

- It incorporates
  - heterogeneous firms and endogenous mark-ups that respond to the toughness of competition in a market.
  - the important feedbacks between entry and firm selection into domestic and export markets.

- In such a setting:
  - larger markets exhibit tougher competition resulting in lower average mark-ups and higher aggregate productivity
  - costly trade does not completely integrate markets and thus preserves the important consequences of market size differences across trading partners.
This paper considers the selection effect in a model with heterogeneous firms in the sense of the elimination of the least efficient firm within a country, but does not consider the possibility of spatial relocation.

Baldwin and Okubo consider the spatial dimension of selection

"Relocating to the big region is more attractive for the most productive firms"

the most productive firms are the ones that moves first to the big region (non-random selection)