

Returns to scale and imperfect competition in trade

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Introduction

In Neoclassical Trade Theory, firms are treated as a black box. The supply side of the economy is characterized by a set of production functions (production set) according to which the factors of production (capital, labor) are transformed into consumption goods.

⇒ Three essential problems in traditional trade theories :

1. No returns to scale : Size does not matter neither for specialization nor for the direction of trade.
2. Perfect competition : Trade does not increase competition.
3. They predict exchanges of **different goods between different countries**

New trade theories rely on imperfect competition with increasing returns to scale

Size of the country matters for the determination of the price

Trade openness allows firms to benefit from larger market

Within industry reallocation of resources \neq traditional trade theories

In monopolistic competition (Krugman, 1980)

Trade openness allows consumers to access more varieties of the same good, and to consume varieties at a lower price

New New trade theory (Melitz, 2003)

- ▶ Firms differ in their productivity
- ▶ Reallocation of resources within industry implies aggregate productivity gains

1. Increasing returns to scale

Internal returns to scale : Output increases more than proportionally with the quantity of inputs used

External returns to scale : Productivity depends upon a set of factors external to the firm (output of the industry...). Firms still set their price at the apparent marginal cost. \Rightarrow No profit and perfect competition

External returns to scale

Typology of different types of external economies of scale (A. Marshall, 1890) :

- ▶ Local specialized skilled labor force
- ▶ Technological spillovers
- ▶ Pecuniary externalities : Linkages between suppliers and sellers of intermediate products, final goods and services

Reallocation of resources over space can promote economic growth

Examples and related economic policy.

Silicon-Valley (US)

- ▶ Pool of computer experts

FDI & externalities : Bangladesh in the 1970's

- ▶ Daewoo (Korean firm) enters + collaboration agreements with Desh Garments, Bangladesh leader in the industry (trainee of workers and capital investments).
- ▶ by mid-1981, 115 out of the 130 Daewoo-trained workers had left Desh Garments to set up or join another firm ⇒ larger industry, with external returns to this increase.
- ▶ In 1980 : almost 0 exporters. By 1985, 700 garment export-manufacturing factories in Bangladesh (at the same time, protection raised by industrialized countries).

Javorcik (AER, 2004) using firm-level data in Lithuania :

- ▶ Evidence of local technological spillovers due to FDI
- ▶ Channel is mainly vertical, between foreign multinationals and their local suppliers of intermerdiate inputs

Local spillovers : **“pôles de compétitivité”** :

- ▶ July 2005, creation of 67 pôles, presented as a central tool of industrial policy (coordination of public and private efforts around certain technological advantages).

Martin, Mayer and Mayneris (2008) : “natural clusters” in France and the “pôles de compétitivité”

French government devoted recently 1.5 billion euros to the creation of competitiveness clusters.

- ▶ Expect Marshall-type externality and \uparrow productivity
- ▶ Public policy is necessary if significant unrealized gains from agglomeration
- ▶ Risk = congestion costs

Empirical investigations on French firms : \uparrow 10% employment in the same industry \uparrow firm productivity by 0.5%

Relation between size of local production and productivity of the firm is bell-shaped

\Rightarrow Natural clusters are rather small : about 1,250 employees on average

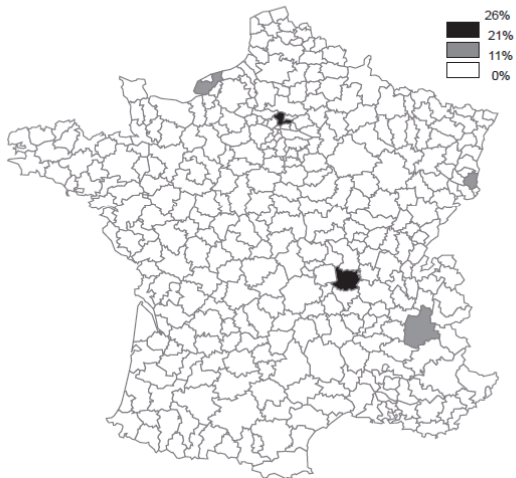
\Rightarrow Further increasing the size of local productions may decrease firm productivity

Koenig, Mayneris & Poncet (2009) : local export spillovers

- ▶ French firm-level export data (1998-05)
- ▶ 348 employment areas in France
- ▶ evidence of the presence of export spillovers on the export decision but not on the exported volume

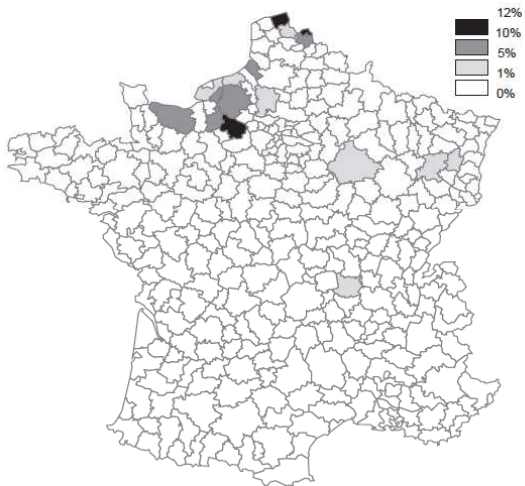
Chapter 19

Preparations of cereals, flour, starch or milk ; pastrycook products

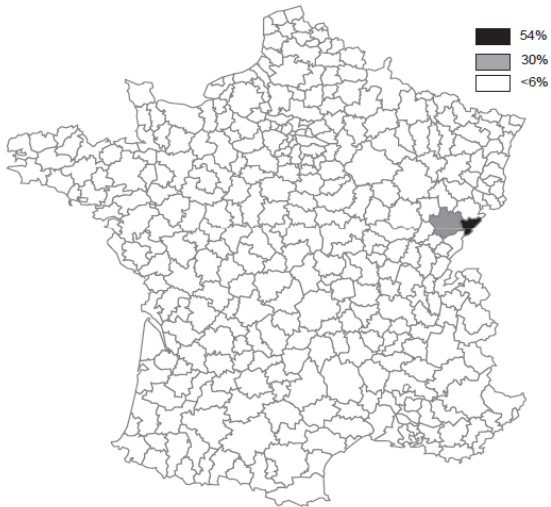


Chapter 53

Other vegetable textile fibres, paper yarn and woven fabrics of paper yarn



Chapter 91
Clocks and watches and parts thereof



Externalities are generally **limited in space** (human capital, technology transfers. . .).

1. Openness and externalities

- ▶ Trade as a transmission channel of spillovers ⇒ Facilitates economic catch up.
- ▶ Increased specialization & reinforcement of inequalities ⇒ Initial advantages and disadvantages get reinforced.

2. Market size and trade direction

- ▶ If externalities are intra-national, the size of countries will influence relative productivities.

Graham's argument for protection (1923) :

Economist at Princeton. *"Some Aspects of Protection Further Considered"* (*Quarterly Journal of Economics*, 1923)

- ▶ Larger countries specialize in increasing return sectors
⇒ gains of productivity for these countries ;
- ▶ Smaller countries specialize in constant return industries and might loose from trade

Important Argument :

- ▶ Contrary to traditional models, **all specializations are not equal**.
- ▶ Specialization in industries with increasing returns can lead to larger gains

Justifies trade (and other) policies that enable specialization in the “good industry” .

Internal returns to scale

- ▶ Cost paid before starting producing (R&D, design, machinery)
- ▶ Foreign market entry cost (marketing, advertising, research of a trade partner)
- ▶ **Fixed cost** (paid every year *licence*) or **sunk cost** (paid once for all)
- ▶ Unit cost decreasing with quantity produced and sold

Das, Roberts & Tybout (Econometrica, 2007)

- ▶ Quantify *average* foreign market entry costs for different industries, using firm-level data in Colombia
- ▶ 300 thousands \$US to 500 thousands \$US according to industry

Important consequences in terms of economic policy

- ▶ Baldwin & Krugman (QJE, 1989) : Persistence of current account deficit in the US consecutive to large appreciation of US dollar
- ▶ How to finance entry costs ? Issue of the efficiency of financial markets, role for public policies (subsidies ?) etc.

2. Intra-Industry Trade

Reminder :

- ▶ Most of world trade takes place between rich countries.
- ▶ Regional Agreements are more and more frequent and important in world trade. Almost 2/3 of French trade is with EU countries.

Countries that are proximate in geographical and economic terms have usually very little technological or endowments differences.

External economies of scale can explain trade between similar countries, but . . .

. . .predict inter-industry trade, whereas most trade between them is in fact **intra-industry**

Methodology to differentiate intra and inter-industry trade : Grubel & Lloyd (1975) indicator

Export flows X_{ij} and import flows M_{ij} observed between two countries with notation i and j , for a single industry

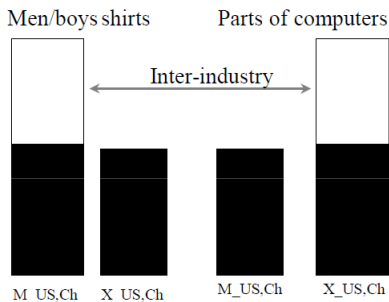
- ▶ Export and import flows can be compared to determine the importance of “Two-way trade”, i.e. the country exports and imports the same good
- ▶ Indicator can be more or less disaggregated in terms of industries or destinations

$$GL_{ij} = \frac{X_{ij} + M_{ij} - |X_{ij} - M_{ij}|}{X_{ij} + M_{ij}}$$

Indicator gives the proportion of Two-way trade

- ▶ $GL_{ij} = 1 \Rightarrow$ Exports in the industry similar to imports (IIT)
- ▶ $GL_{ij} = 0 \Rightarrow$ One-way trade

Figure 1: Grubel & Lloyd-type trade decomposition



Note:

M_US,Ch: Value of US imports from China

X_US,Ch: Value of US exports to China

FIGURE 2
IIT by Income Group, 2006

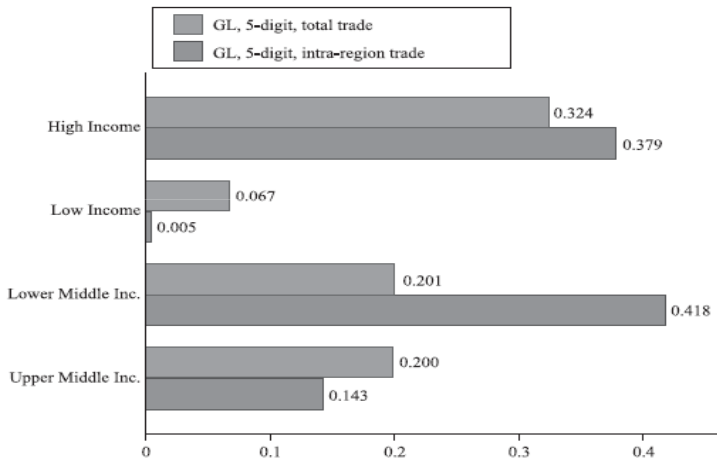
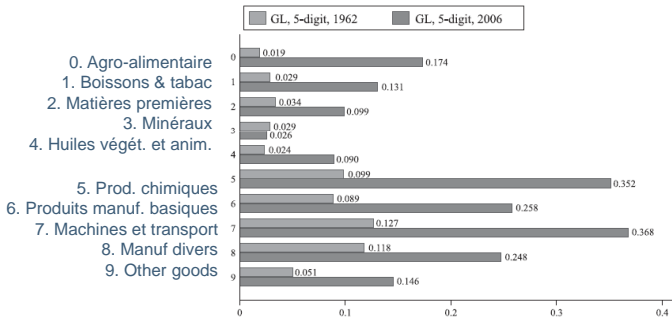


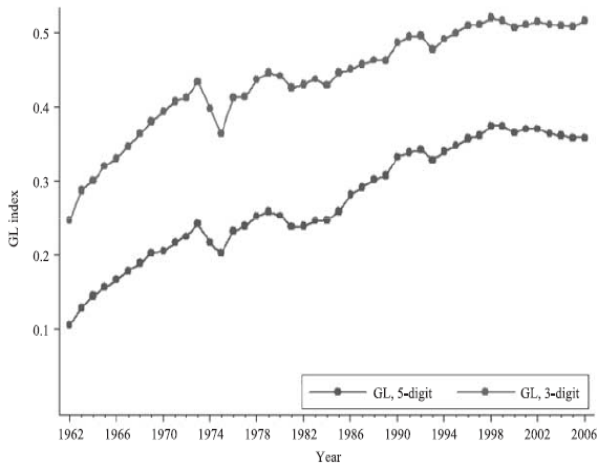
FIGURE 6
Global IIT by SITC 1-Digit Sector, 1962 and 2006



Notes:

'wide coverage' dataset; SITC 1-digit sectors: 0 – Food and Live Animals, 1 – Beverages and Tobacco, 2 – Crude Materials Excluding Fuels, 3 – Mineral Fuels Etc., 4 – Animal & Vegetable Oils & Fats, 5 – Chemicals, 6 – Basic Manufactures, 7 – Machines & Transport Equipment, 8 – Misc. Manufactures, 9 – Goods Not Classified by Kind.

FIGURE 7
Evolution of Global IIT, 1962–2006 ('Long Coverage' Sample)

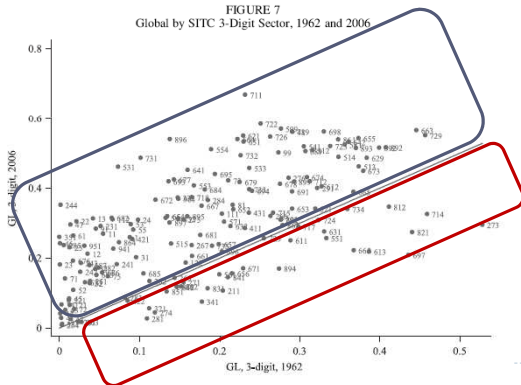


- This growth is being observed for mostly all of the goods

Products for
whivh IIT more
important in
2006 compared
to 1962

Only 29 over 177
sectors have
experienced a
reduction in IIT

FIGURE 7
Global by SITC 3-Digit Sector, 1962 and 2006



Measurement issues :

Aggregation matters : the more disaggregated the data, the more likely trade is one-way

Two-way trade can be further decomposed :

- ▶ **Horizontal differentiation** : different varieties of the same product, but similar characteristics
- ▶ **Vertical differentiation** : similar product with different characteristics (quality)

Recent empirical works have been using trade data at the product level, between country pairs

- ▶ Comtrade data from United Nations, about 6,000 products
- ▶ Ex. Tourism cars are differentiated by power category & type of oil they use
- ▶ Values and quantity reported can be used to compute **Unit values = value / quantity**

Unit values considered as good proxy for the average price at which the good is exported

⇒ UVs' have been used to classify varieties across different **quality categories**

Fontagné and Freudenberg (1999) and Fontagné, Freudenberg and Gaullier (2005, 2006)

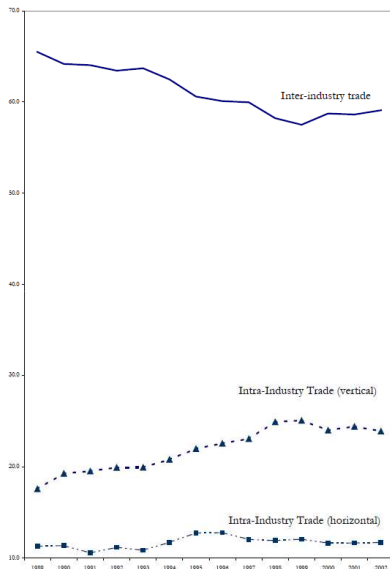
1. Intra-industry trade ?

- ▶ Yes, if $\text{min flow} > 10\% \text{ max flow} \Rightarrow$ Intra-industry
- ▶ If no \Rightarrow Inter-industry

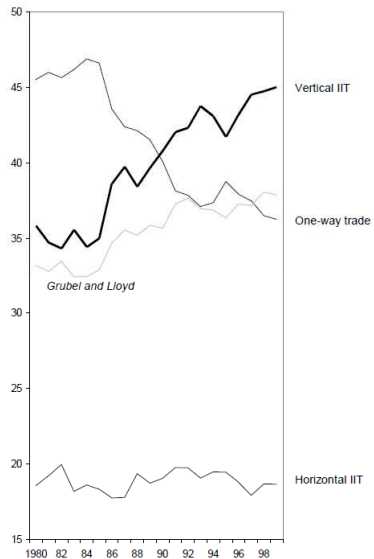
2. Vertical or horizontal differentiation ?

- ▶ If price difference $> 25\% \Rightarrow$ vertical differentiation
- ▶ If price difference $< 25\% \Rightarrow$ horizontal differentiation

Share of trade by type, in World trade



Share of trade by type in EU12



- ▶ A large part of trade between developed countries is *intra-industry*
- ▶ The bigger, richer and closer the countries, the larger the trade flows, and the more those flows will be intra-industry.

How to explain two-way trade in similar good between similar countries ?

↪ **New trade theories** developed in the 70s

Application to international economics of imperfect competition models from industrial economics

- ▶ Helpman, Krugman (monopolistic competition)
- ▶ Brander, Krugman, Spencer (oligopolistic competition)...

New gains from trade :

- ▶ Scale effect : efficiency gains
- ▶ Pro-competitive effect : increase of competition decreases prices
- ▶ Rationalisation effect : selection within the industry
- ▶ Variety effect : more varieties available for consumption

3. Returns to scale and market power

Returns to scale and market power

Simplest way to have increasing returns to scale = fixed costs of production (R&D, training, advertizing...):

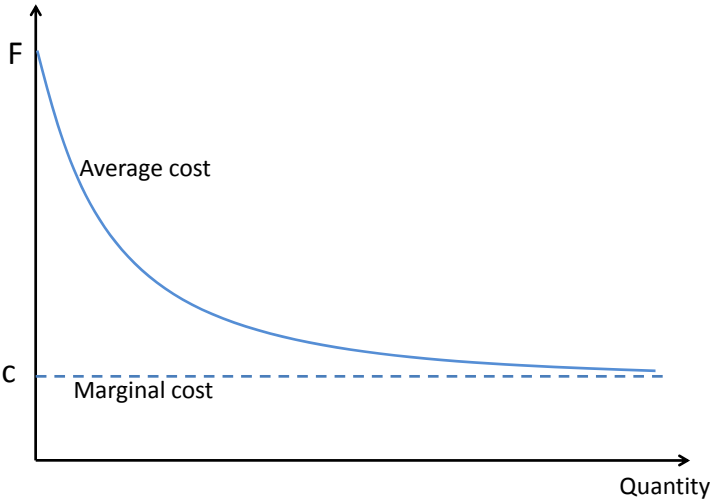
$$C = F + cQ$$

C : total costs

F : fixed costs

c : marginal costs

Q : production



- ▶ Average costs fall with Q : $AC = F/Q + c$
- ▶ The profit of a firm depends on the wedge between price and average costs :

$$\pi = pQ - C = pQ - (cQ + F) = Q[p - (c + F/Q)]$$

$$\pi = (p - AC)Q$$

- ▶ with p a (decreasing) function of Q (inverse demand), and price elasticity $\varepsilon = -\frac{\partial Q}{\partial p} \frac{p}{Q}$
- ▶ With fixed costs, competitive pricing is impossible since all firms would make losses ($c < AC$).

- ▶ Equilibrium pricing of a monopoly with $\pi = pQ - cQ - F$

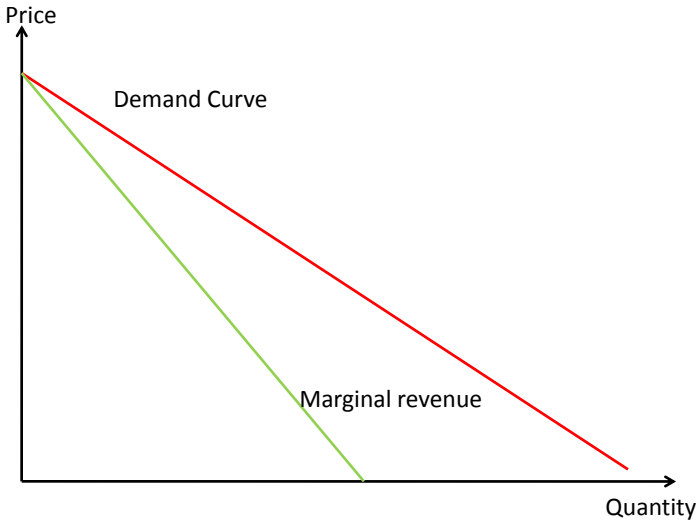
$$\text{Max } \pi \Rightarrow \frac{\partial \pi}{\partial Q} = 0 \Rightarrow \frac{\partial(pQ)}{\partial Q} - \frac{\partial(cQ)}{\partial Q} = 0$$

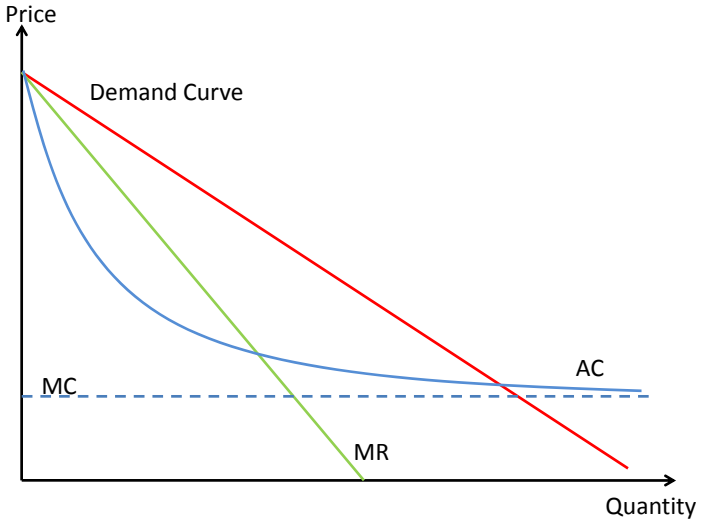
$$\text{Max } \pi \Rightarrow MR = c \Rightarrow \text{with}$$

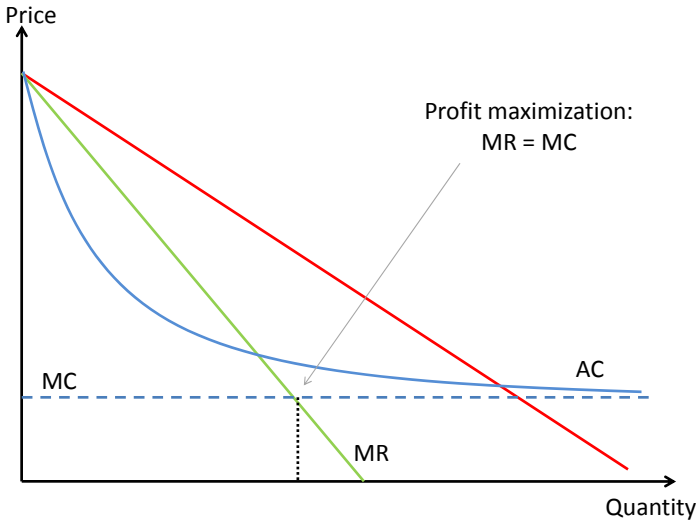
$$MR = p \left[1 + \frac{\partial p}{\partial Q} \frac{Q}{p} \right] = p - 1/\epsilon = c$$

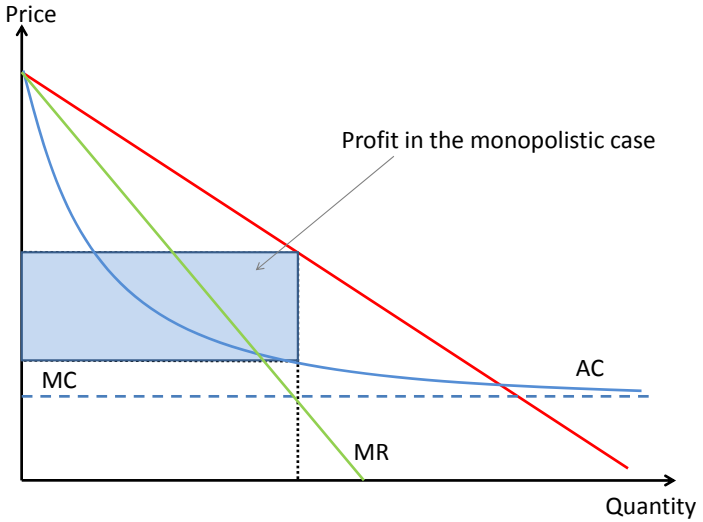
$$\Rightarrow p = c + 1/\epsilon > c$$

- ▶ \Rightarrow **Price > marginal cost** : A firm with *market power* makes a positive *operating profit*. This profit enables (notably) to pay for the fixed cost.







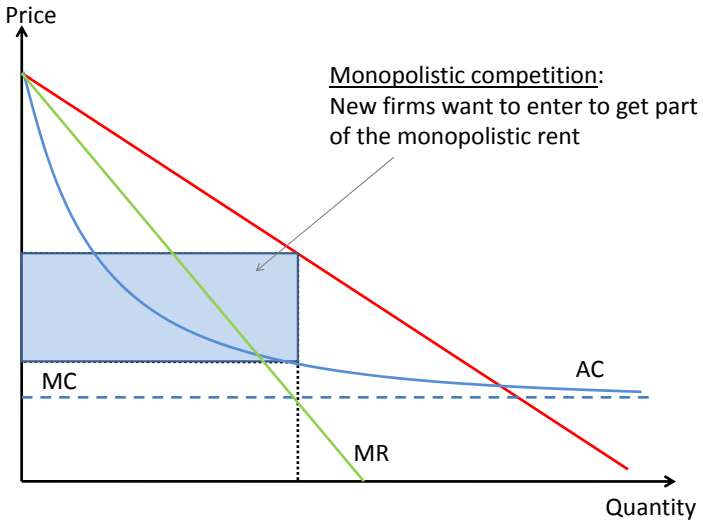


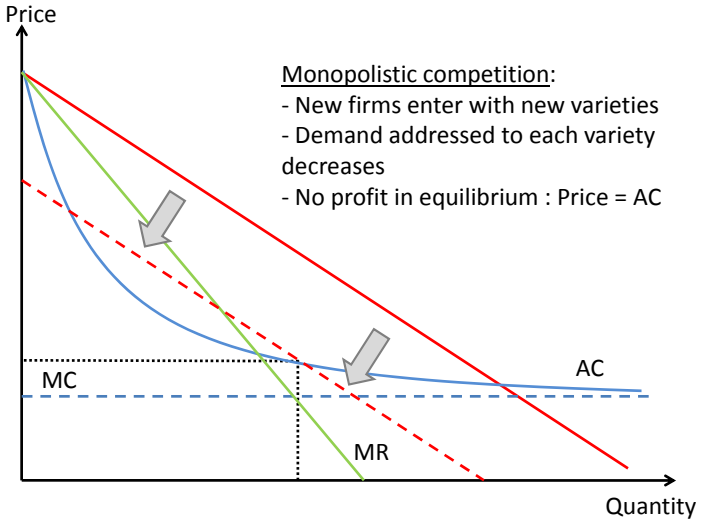
4. Monopolistic competition

a. Supply

Lancaster, Spence-Dixit-Stiglitz + Krugman (1980) + Helpman.

1. Only one good, but several varieties **differentiated**
Horizontal differentiation (no difference in quality)
2. Internal increasing returns (fixed costs) + no differentiation costs
⇒ Each producer is in **monopoly** on its variety.
3. Free entry in the industry ⇒ as long as there are profits, firms will propose new varieties.
⇒ Long run equilibrium : very large number of firms, each making zero profits \simeq **perfect competition**.
4. But price $>$ marginal cost : operating profits just sufficient to cover fixed costs.





b. Demand

Consumers benefit from increased variety.

- ▶ Krugman (1980), Helpman & Krugman (1985), build on Dixit and Stiglitz (1977) and Chamberlin (1933) : all consumers demand all varieties → **taste for variety** model.
- ▶ Lancaster (1980), Helpman (1981) build on Hotelling (1929) : each consumer has a preferred variety → **variety of tastes** model.

Krugman (1979, 1980) : taste for variety

- ▶ All agents are endowed with 1 unit of labor.
- ▶ All agents have the same utility function given by

$$U = \sum_{i=1\dots N} v(c_i)$$

where

- ▶ $v(0)=0$, $v' > 0$, $v'' < 0$ (love for variety)
- ▶ n is the number/mass of varieties i consumed
- ▶ budget constraint : $w = \sum_{i=1\dots N} p_i c_i$
- ▶ FPO : $v'(c_i) = \lambda p_i$, $i = 1, \dots, N$
- ▶ Price change effect : (λ given because of the large number of variety) :

$$v'' dc_i = dp_i \lambda$$

- ▶ Demand Elasticity for i : $\varepsilon_i = \frac{dc_i}{dp_i} \frac{p_i}{c_i} = -\frac{v'}{v'' c_i} > 0$

One single product which is horizontally differentiated

- ▶ Each producer is a monopoly $\Rightarrow \mathbf{c} = \mathbf{MR}$
 - ▶ increasing return to scale
 - ▶ zero conjectural variation.
- ▶ The labor used in the production of each variety is a linear function of output :

$$L_i = \alpha + \beta y_i$$

\Rightarrow Average Costs : $AC_i = wL_i/y_i = w\alpha/y_i + w\beta$

\Rightarrow Marginal Costs : $c_i = w\beta$

Autarky equilibrium

Determination of : p_i/w , y_i et N .

3 steps :

1. Demand addressed to each firm ;
2. Pricing strategy : $c = Rm$;
3. Free entry : $p = CM \rightarrow$ (Long Run)

1. Demand addressed to each firm (**firms are symmetric**) :

$$p = p_i = \lambda^{-1} v'(y/L)$$

2. $c = Rm$ (PP curve)

$$\Pi_i = p_i y_i - w(\alpha + \beta y_i) \Rightarrow \frac{p}{w} = \frac{\varepsilon}{\varepsilon - 1} \beta$$

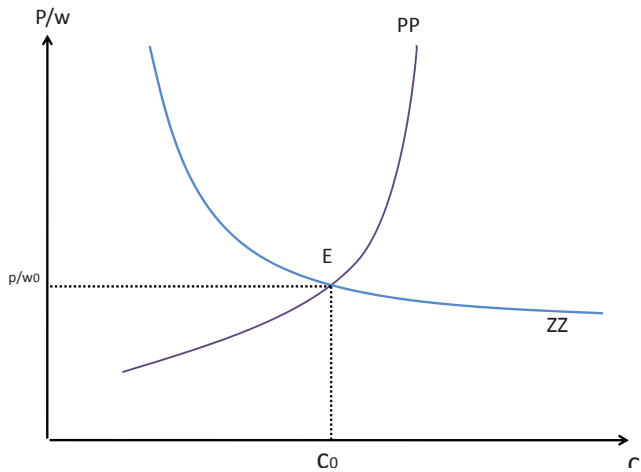
3. $p = AC$ (ZZ curve)

$$\frac{p}{w} = \frac{\alpha}{y} + \beta = \frac{\alpha}{Lc} + \beta$$

Equilibrium without labor market friction : full employment

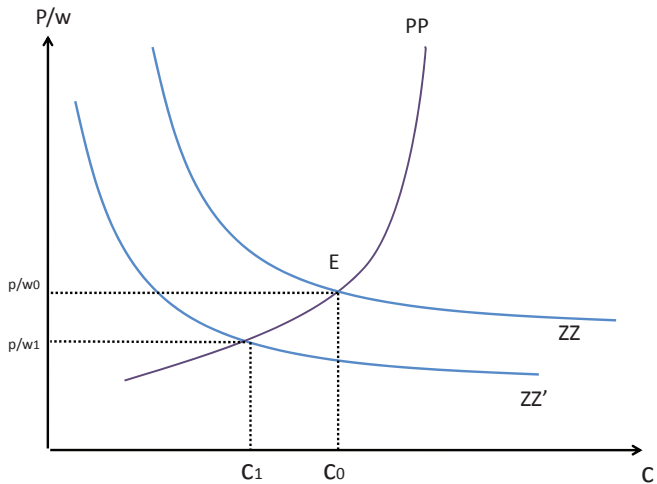
$$L = \sum_i L_i = \sum_i (\alpha + \beta y_i) = N(\alpha + \beta Lc)$$

therefore $N = \frac{1}{(\alpha/L) + \beta c}$.



Trade Openness : Market Size Effect

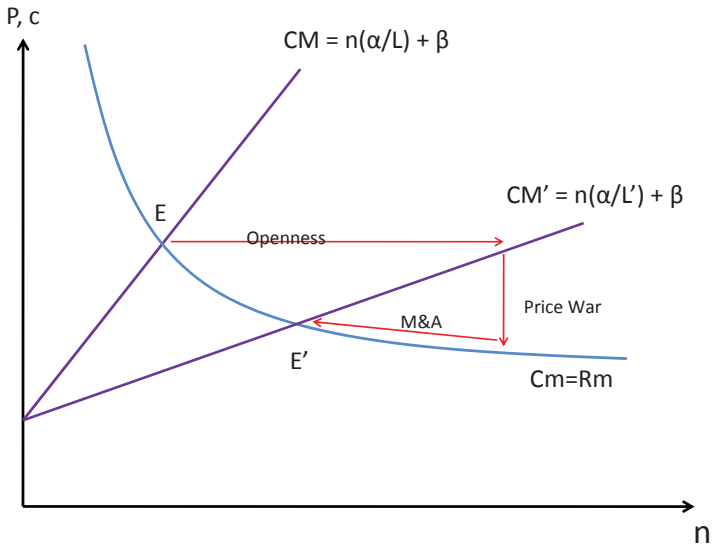
- ▶ $N = \frac{1}{(\alpha/L) + \beta c}$
 $\Rightarrow \Delta^+ L \Rightarrow \Delta^+ N.$
- ▶ $p = CM \Leftrightarrow \frac{p}{w} = \frac{\alpha}{Lc} + \beta$
 $\Rightarrow \Delta^+ L \Rightarrow \Delta^- p/w.$
- ▶ $\frac{p}{w} = \frac{\alpha}{y} + \beta \Leftrightarrow y = \frac{\alpha}{p/w - \beta}$
 $\Rightarrow \Delta^- p/w \Rightarrow \Delta^+ y.$



Trade openness : Decomposing the movement

1. Two identical countries open up to reciprocal trade, size of market doubles, and so does number of firms.
2. Faced with higher number of competitors \Rightarrow “price war” .
3. All firms then make losses, the net number of firms has to decrease whereas the average size of firms increases (equivalent to Mergers and Acquisitions, M&A)

Convergence to long run equilibrium



Summary

Gains from trade :

- ▶ Lower prices for each variety
- ▶ Larger number of available varieties
- ▶ More efficient scale of operation for all surviving firms.

Remarks :

- ▶ The number of varieties produced in the world decreases as compared to autarky.
- ▶ Uniformisation process through trade

Specialization & reallocation of resources

- ▶ More varieties available to consumer but fewer varieties produced in the World
- ▶ Reallocation of resources within each industry : fewer firms but each surviving is larger
- ▶ Net effect only : we do not observe which firms exit (all are similar in their characteristics)

Helpman and Krugman (1985) :

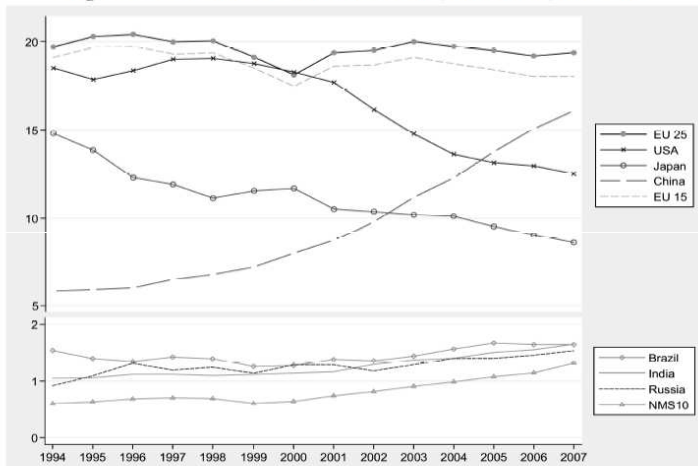
Different countries specialise in different industries, while similar countries specialise in different varieties shipped at the same price.

- ▶ Larger countries expected to produce and export more horizontally differentiated varieties of the same good
- ▶ More intra-industry trade between similar countries
- ▶ Intra and inter-industry trade can coexist depending on the extent of comparative advantage
- ▶ Important policy message : trade openness does not require to drop production in some industries
⇒ Different varieties of the same good within industry

5. Competition and new forms of specialization

Will China produce everything ?

Figure 1 – Evolution of world market shares, value terms, 1994-2007



Evidence is contradictory with Helpman and Krugman (1985)

Peter schott (2008), and Gaullier, Fontagné and Zignago (2008) in *Economic Policy*

- ▶ China is not only increasing market shares in labour intensive industries
- ▶ Trade structure in terms of industries is similar to rich countries'
- ▶ Specialization on different product categories (Almost 6,000 such categories in detailed trade data)
- ▶ Specialization on different varieties of the same product category
 - ⇒ Vertically differentiation according to the price of varieties
 - ⇒ Chinese goods receive a lower price on foreign markets

- ▶ Specialization on different products within industries associated with outsourcing
 - ⇒ Comparative advantage in different steps of the production process within industries
- ▶ But competition between the OECD and China is heating up, as China enters more and more product categories in which the OECD is present
- ▶ Widening of price differences between China and the OECD countries suggests some quality upgrading in the North
 - ⇒ Differences between product attributes (quality, sophistication) allows to reduce the extent of competition from the South

How to interpret price differences between North and South for a single product category ?

- ▶ Differences in production costs between high wage and low wage countries ?
- ▶ If there was no difference in product attributes, OECD varieties would be kicked out of the market
- ▶ Suggests differences in quality/sophistication exists

Khandelwal (Forthcoming, *Review of Economic studies*)

- ▶ Uses price and quantity information for product categories
- ▶ Quality index : some varieties obtain a higher price for a similar market share
- ▶ Quality index positively correlated with GDP per capita

Summary

- ▶ Competition between North and South now operates within sector, across product categories
- ▶ Within product categories, rich countries specialize on high quality varieties (upgrading)
- ▶ Increase of capital intensity / skill upgrading within firms
- ▶ Solutions have to be provided to some types of workers that loose from globalization