Imperfect competition and intra-industry trade

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References for this lecture

- BBGV
  - Chapter 4, paragraphs 4.1, 4.2, 4.3, 4.4, 4.5, 4.6

Inter- vs intra-industry trade

- **Inter-industry** trade
  - Trade in **different** types of **commodity**
  - Country 1 **exports (only) cloth**, country 2 exports (only) steel

- **Intra-industry** trade
  - **Similar trade** within one broad **product category**
  - **Both** country 1 and country 2 **export cars**

Ricardo and HOS

- The **Ricardo** and **HOS** models only predict **inter-industry** trade

- This is due to **four assumptions**
  - **Constant returns to scale**
  - **Perfect competition**
  - **Homogeneous** commodities
  - **Costless** trade

Intra-industry trade in Ricardo and HOS models

- Within the **Ricardo model**, **intra-industry** trade would be **unsutainable** and **market forces** would **induce** countries to pursue **full specialization** in both production and export

- Within the **HOS model**, with the assumption of **no trade cost**, **some intra-industry** trade **could** still **happen**
  - The relatively **labour-abundant** country **specializes** in producing cloth
  - The country will **also produce** a certain amount of **steel** but also **import** a lot of steel from the other country
  - The labour-abundant country will be a **net importer** of steel
  - With no trade costs, it is **indifferent** (in equilibrium) to **buy domestically produced** steel or **imported** steel
  - The country could p**Potentially export** all its **steel** and **re-import** an even greater amount of **steel** ➔ there is **no reason** to do that in the HOS model…

Measuring intra-industry trade

- There are **statistical issues** in measuring **intra-industry** trade

- Even very detailed **classifications** of commodities do **not** allow to **distinguish** goods that are **not identical**

- Section: 0 - Food and live animals
- Division: 04 - Cereals and cereal preparations
- Group: 048 - Cereal preparations and preparations of flour or starch of fruits or vegetables
- Subgroup: 048.4 - Bread, pastry, cakes, biscuits and other bakers' wares, whether or not containing cocoa in any proportion; communion wafers, empty cachets of a kind suitable for pharmaceutical use, sealing wafers, rice-paper and similar products
- **Basic heading: 048.42 - Sweet biscuits, waffles and wafers, gingerbread and the like**
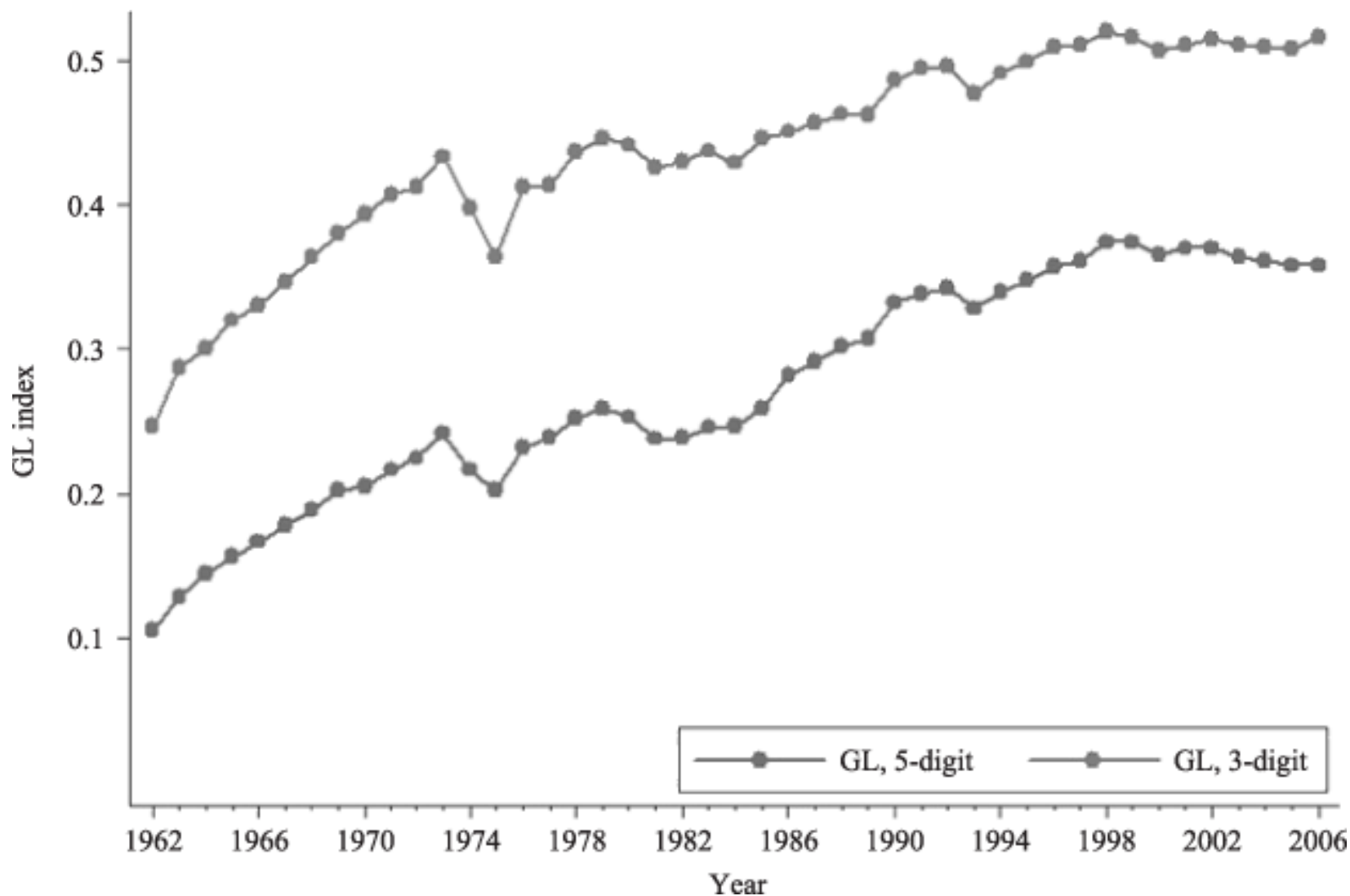
Intra-industry trade

- If, for a country, we observe **both import and export** of '**Sweet biscuits**, waffles and wafers, gingerbread and the like', that is defined as **intra-industry** trade

- A **synthetic indicator** of the importance of intra-industry trade is the **Grubel-Lloyd index** (GL)

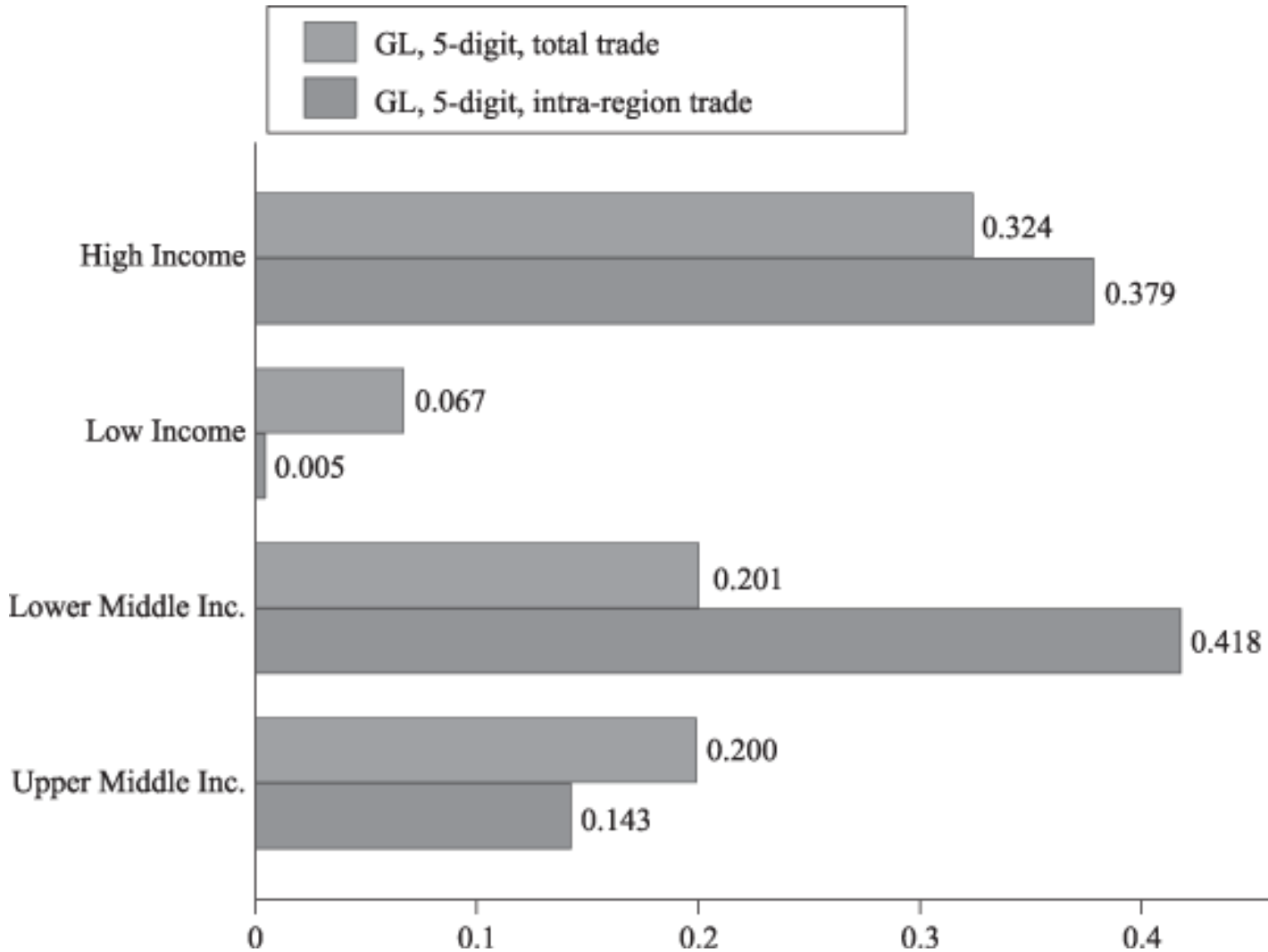- For each sector and country, the index is defined as

$$GL = 1 - \frac{|\text{Export - Import}|}{\text{Export + Import}}$$

- The index is **equal to** 1-1 = **0** if trade is **unidirectional** (i.e. if export>0 and import=0 or export=0 and import>0)

- The index is **equal to** 1-0 = **1** if **export = import** and both import and export are >0 ➔ the country **exports** and **imports** the **same amount** of a specific commodity (e.g. Italy imports 6M€ of spaghetti and exports 6M€ of spaghetti)

An Account of Global Intra-industry Trade, 1962–2006

An Account of Global Intra-industry Trade, 1962–2006

Legend:
- GL, 5-digit, total trade
- GL, 5-digit, intra-region trade

High Income: 0.324 (total trade), 0.379 (intra-region trade)
Low Income: 0.067 (total trade), 0.005 (intra-region trade)
Lower Middle Inc.: 0.201 (total trade), 0.418 (intra-region trade)
Upper Middle Inc.: 0.200 (total trade), 0.143 (intra-region trade)

Intra-industry trade by sector

Top ten sectors in terms of intra-industry trade		
Sector Name	**% of World Trade**	**GL Index, 5-Digit**
ELEC PWR MACH, SWITCHGEAR	0.50188	0.527
ARTICLES OF PLASTIC NES	0.09527	0.509
POWER MACHINERY NON-ELEC	1.62557	0.499
ELECTRO-MEDCL, XRAY EQUIP	0.05262	0.477
PLASTIC MATERIALS ETC	1.65085	0.458
ELECTR DISTRIBUTING MACH	0.26685	0.453
SOAPS, CLEANING ETC PREPS	0.06767	0.434
ELECTRICAL MACHINERY NES	10.49781	0.431
METAL MANUFACTURES NES	1.83187	0.426
MACHINES NES NONELECTRIC	14.58087	0.423
Bottom ten sectors in terms of intra-industry trade		
Sector Name	**% of World Trade**	**GL Index, 5-Digit**
WHEAT ETC UNMILLED	0.02286	0.023
COAL, COKE, BRIQUETTES	0.22438	0.017
IRON ORE, CONCENTRATES	0.058	0.017
RICE	0.01597	0.015
NONFER BASE MTL ORE, CONC	0.41198	0.012
CRUDE PETROLEUM, ETC	0.99246	0.01
SILK	0.00094	0.009
JUTE	0.00014	0.009
COTTON	0.03397	0.008
URANIUM, THORIUM ORE, CONC	0.00053	0

Source: Brülhart (1999)

Intra-industry trade

- Intra-industry trade is high in **highly 'differentiated'** sectors

- Intra-industry trade is high in **sophisticated** manufactured **products**

- **Homogenous commodities** (e.g. raw materials, agricultural products) show very **little** levels of **intra-industry** trade
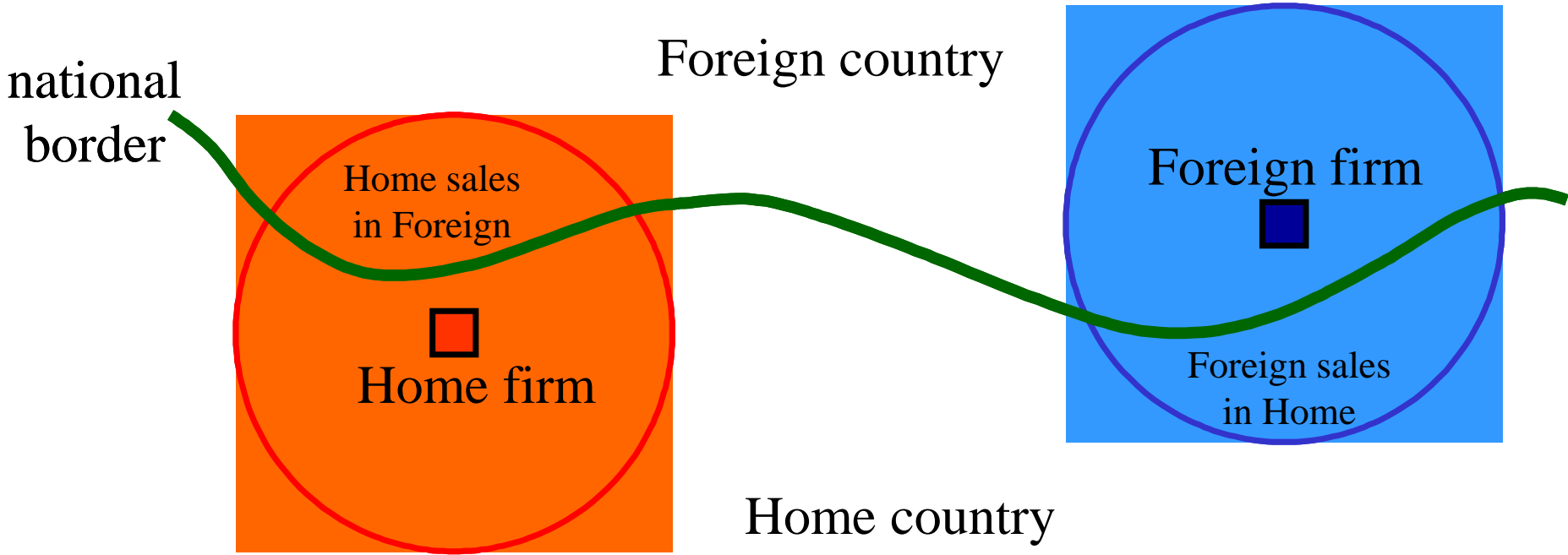
Reasons for intra-industry trade

- Transportation costs
- Climate differences
- Imperfect competition
- Non-homogeneous commodities

Transportation costs and intra-industry trade

- Assume that **transportation costs** for shipping a commodity (e.g. cement) are **high** (relative to its market value)

- If a **customer** is located **near** to a national **border** (or near to a port), it could be **cheaper** to import from **foreign producers** located just on the **other side** of the **border than** from **domestic** producers

- If this happen in both sides of the border, official trade data will record **intra-industry** trade

Figure 4.4 Intra-industry trade as a result of transportation costs

national
border

Foreign country

Home sales
in Foreign

Home firm

Foreign firm

Foreign sales
in Home

Home country

Climate differences

- The **seasonality** of **agricultural products** may drive intra-industry trade

- **Oranges** are picked-up in **winter**
  - **December-February** in the **Northern hemisphere** (e.g. Italy)
  - **June-August** in the **Southern hemisphere** (e.g. South America)

- **Consumers** of oranges in the **Northern** hemisphere will buy **oranges** in **summer** from countries in the **Southern hemisphere**
- **Consumers** of oranges in the **Southern** hemisphere will buy oranges in **'their' summer** from countries in the **Northern hemisphere**

- **Over the year**, **trade** of oranges between Northern and Southern hemispheres goes in **both directions**

Imperfect competition

- **Perfect competiton**
  - Producers and consumers are **price takers**

- **Imperfect competition**
  - Producers and/or consumers have some **influence** on **prices**

- **Monopoly** or **oligopoly**
  - Firms face a **downward sloping demand**
  - **P=f(Q)** while in perfect competition P=P*

Measuring competition

- **Markets** with **imperfect competition** generally feature a **small number** of active **firms**
  - **Number** of firms
  - **Market share** of the largest firms (concentration ratios)
  - **Herfindahl** index (sum of squared market share)

- However:
  - Markets with **few firms** can be **highly competitive** if the **threat** of **entry** of new firm is **substantial**
  - Markets with **many colluding firms** can feature very **low competition**

Imperfect competition and increasing returns to scale

- The main reason behind the presence of imperfect competition is the presence of **increasing returns to scale within** the **firm** (internal increasing returns to scale)

- Increasing returns to scale ➜ by **doubling** all **inputs, output more than doubles**

- **Consequence** ➜ as firm's volume of **production increases**, the **average costs** of production **fall**

- Decreasing average costs are generally driven by the **presence of fixed costs** (that do not depend on the quantity that is produced)

Increasing returns to scale and entry

- **Perfect competition** (i.e. constant returns to scale)
  - If the market **price** is **larger** than the **marginal cost** (i.e. positive profits), **new firms** will **enter** the market and **expand** the **supply** up to the point in which **profits** are **zero**
  - **Entry** is 'costless' ➔ **no** need to pay a **fixed cost**
  - Absence of fixed costs ➔ **size of firms does not matter** for firm's unit **cost**

- **Increasing returns to scale**
  - Even if **incumbent firms** make some **positive profit**, potential **entrants** might **not decide to enter** if expected profits are **not large enough** to cover the **fixed cost** of entry

Internal vs external increasing returns to scale

- **Internal** increasing returns to scale
  - Firm's **average costs fall** with the **volume** of output that is **produced** by the **firm**
  - Internal increasing returns to scale **induce** a market structure characterized by **imperfect competition**

- **External** increasing returns to scale
  - Firm's **average costs fall** with the **volume** of output that is **produced** by **all firms** in the **industry**
  - They are **compatible** with **perfect competition**

Monopoly

- **Differently** from firms in **perfectly competitive** markets, the **monopolist** faces a **downward sloping demand** function
- The monopolist is **not price-taker**
- The **price** is **set** by the **monopolist**

Profit maximization in monopoly

- The monopolist will **maximize** the following **profit function**:

$$\max_{\{Q\}} \pi = Q * P(Q) - C(Q)$$

- Where **Q*P(Q)** are **total revenues** and **C(Q)** are **total costs**

- Recall that **revenues** in **perfectly competitive** markets **were Q*P** and not Q*P(Q)

Profit maximization in monopoly

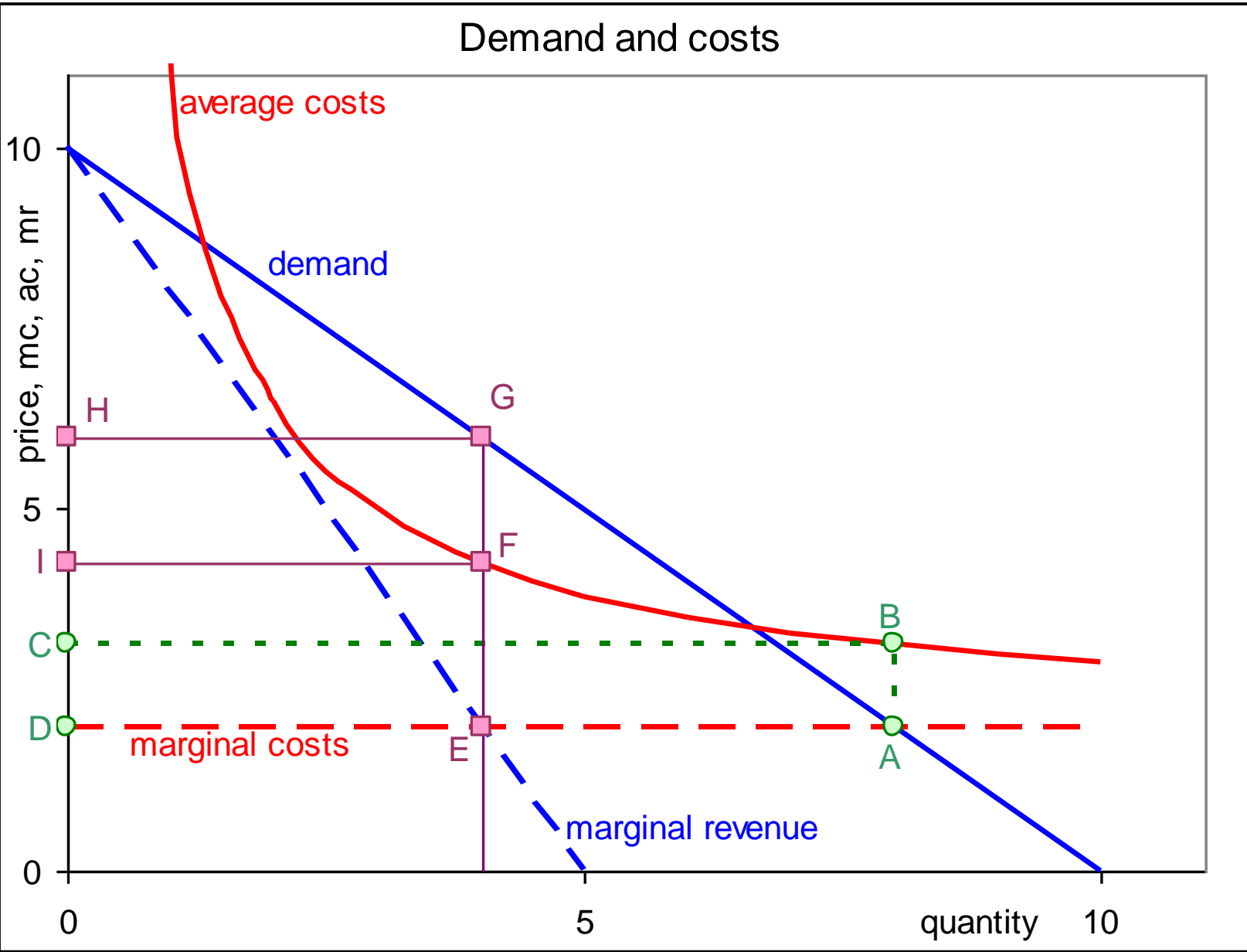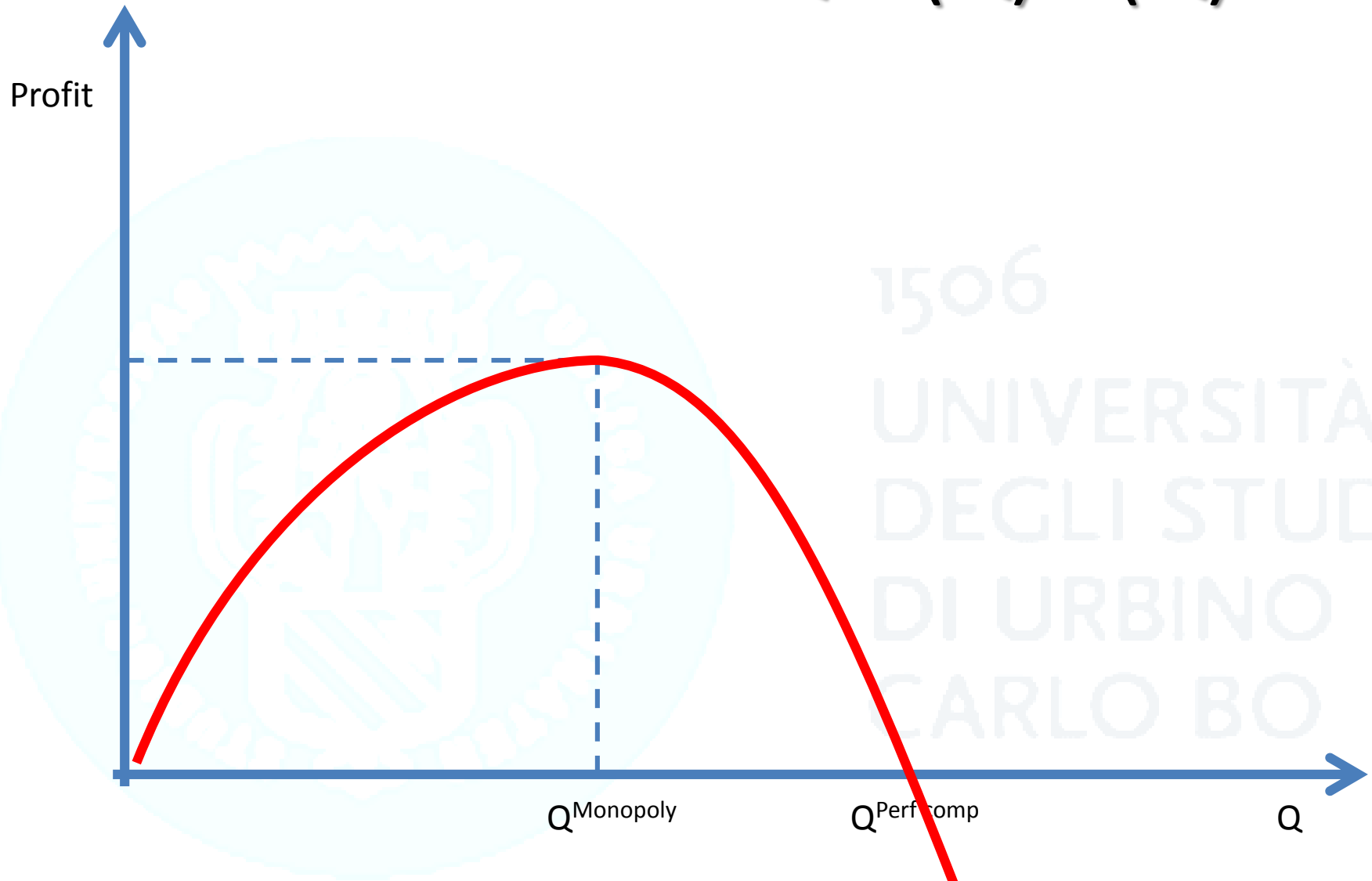- Profits are **maximized** when:

$$MR(Q) = MC(Q)$$

- **where:**

$$MR(Q) = d[Q * P(Q)] / dQ = P(Q) + dP(Q) / dQ$$

$$MC(Q) = dC(Q) / dQ$$

Figure 4.2 Increasing returns to scale and perfect and imperfect competition, demand and costs
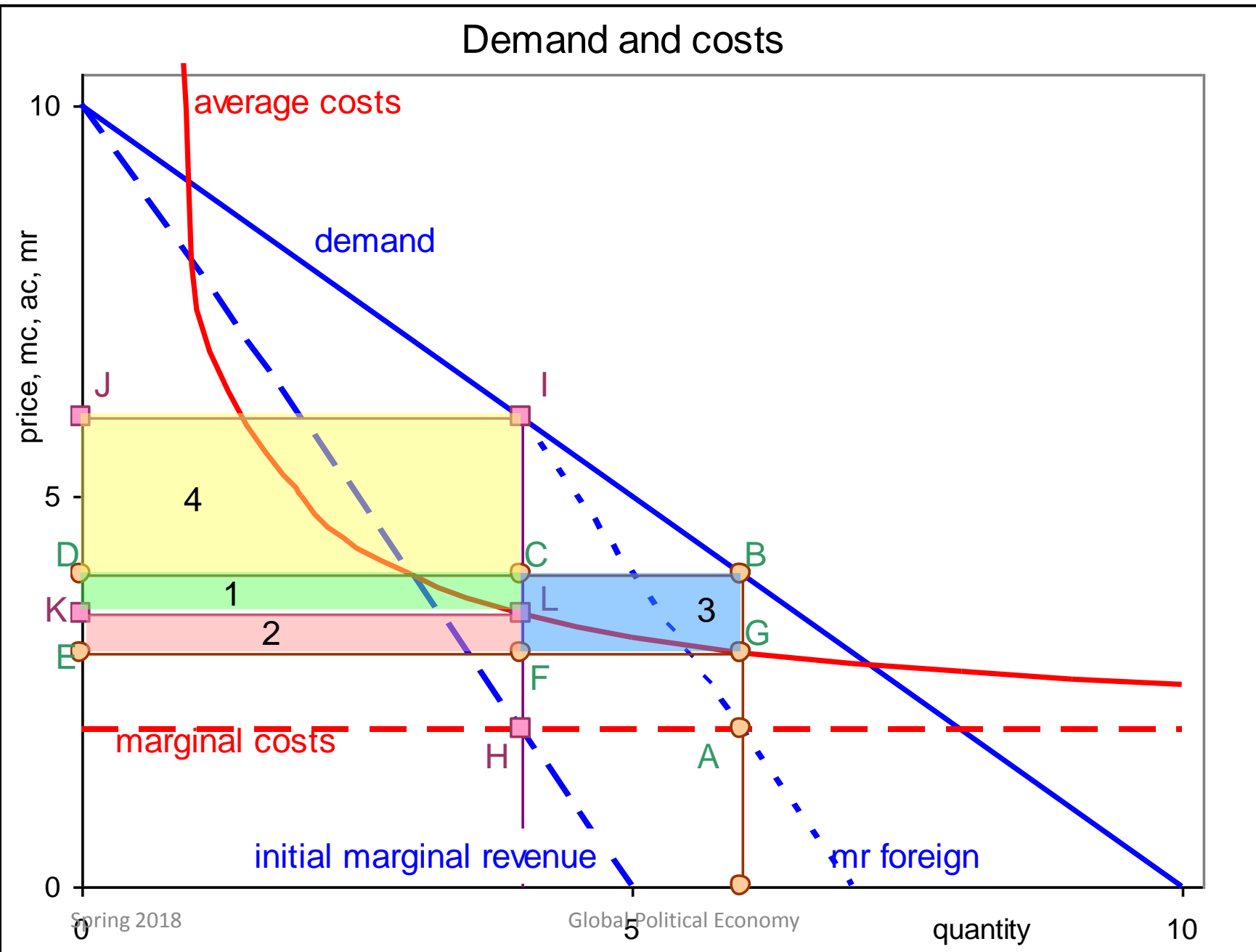

Demand and costs

Profit function=Q*P(Q)-C(Q)

Profit

$Q^{Monopoly}$ $Q^{Perf.Comp}$ Q

From autarchy to trade

- We assume that a specific **homogeneous commodity** is produced in **monopoly** in **two countries**, 1 and 2
- **Monopolists** in the two countries are **identical** ➔ same **cost structure**
- In **autarchy**, each monopolists sets a **price** such that **MR = MC**

- **Trade**
  - **Each monopolist** can in principle serve **both home and foreign** markets
  - The **foreign firm assumes** that the **home firm** will **continue** to produce the **same quantity** as before
  - There is a **residual demand abroad** to be served

Figure 4.3 A trading equilibrium: monopoly versus duopoly, demand and costs

Demand and costs

average costs

demand

price, mc, ac, mr

J
I
4
D
C
B
1
K
L
3
2
G
E
F
marginal costs
H
A
initial marginal revenue
mr foreign
quantity

Trade and monopoly

- Opening a **monopolistic market** to **trade**:
  - **Reduces** the equilibrium **price**
  - **Increases** the equilibrium **quantity**
  - **Increases welfare** (consumers are better off)
  - **Decreases profits** (at home and abroad)

- Both firms have an **incentive** to **enter** each other's **market**
  - Firms **think** they can **consolidate profits** at **Home** and gain some **extra profit** in the **Foreign** market

From monopoly to monopolistic competition

- **Pure monopolies seldom exist** in practice
  - **Natural monopolies** are usually **regulated** by the government
  - If a firm tries to maintain a monopoly, **anti-trust** authorities kick-in to protect consumers

- **Paul Krugman (1979)** proposed a **model of trade** with **monopolistic competition** and **product varieties** to account for the **role** of **economies** of **scale** and **imperfect competition**

Non-homogeneos goods and monopolistic competition

- Assuming **homogeneous** / identical **goods** is a **strong assumption**

- Non-homogeneous goods (**varieties**) + **increasing returns** to scale ➜ **monopolistic competition**

- Each producer is a **monopolist** in the **production** of a certain **variety**

- **Varieties compete** among each other as consumers are **willing to substitute** (to a certain degree) **expensive varieties** with **cheaper** varieties

Cars that cost about 20k-25k euro

Citroen Picasso

Fiat Panda 4x4

Honda Civic

Monopolistic competition

- **Consumers** love **variety**
  - They **chose** the **variety** that is **closest** to their **'ideal'** variety
  - If a **new variety** is introduced on the market and it is **closer** to the **'ideal'** variety than any other pre-existing variety, the consumer will **shift** its consumption to the new variety (if the price is the same for both varieties)

- **Varieties compete** among each other
  - If the **'ideal' variety** for a consumer turns out to be **too expensive**, the consumer will **shift** to a **cheaper** similar variety
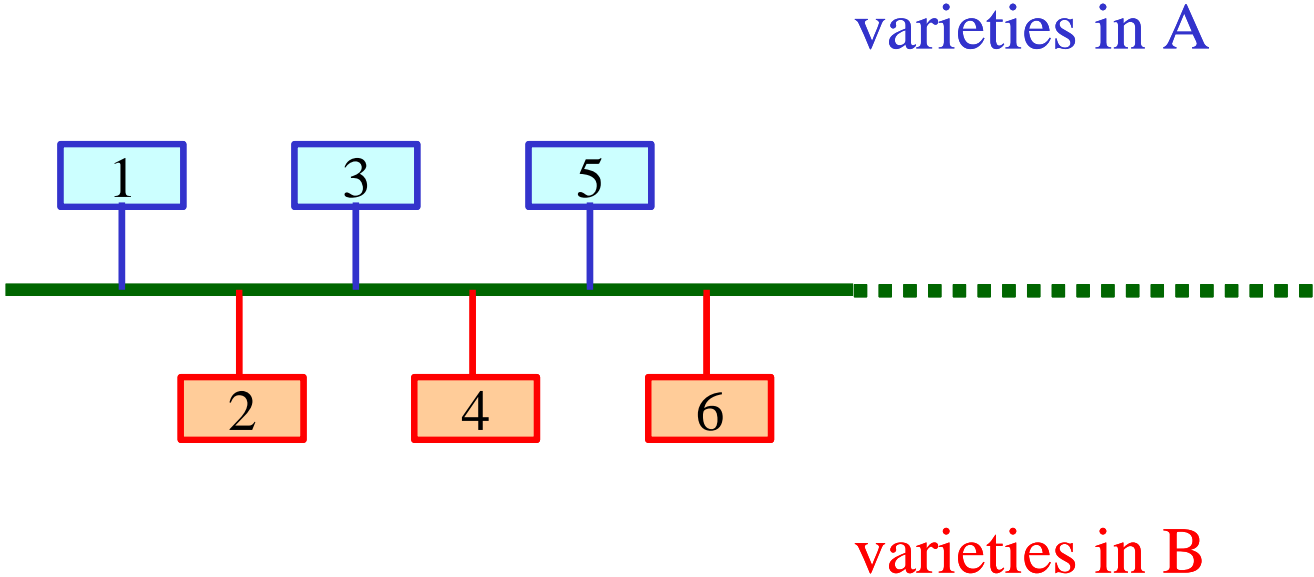
Monopolistic competition

- **Producers** are **not price takers**
  - Each producer is a **monopolist** in the production of a **certain variety**
  - For that variety, the producer faces a **downward sloping demand** function
  - **Profit maximization** ➔ MC = MR

- Each firm takes the **behaviour** of **other firms** as **given**
  - The **number** of **producers** is sufficiently **large**
  - Each firm **assumes** that its **competitors** do **not react** if it **lowers** its **price**

Varieties

- In presence of **increasing return to scale** (i.e. fixed cost), **producers** in a **country** can **only produce** a **limited** number of **varieties** (n)
  - As the **market size** is **limited** at home, **more varieties** are **not possible**
  - If a **new variety** enters the market, the **switch** of **consumers** to this new variety will **not allow** to **incumbent producers** to **cover fixed costs**

- **Assumption**
  - **Consumers** are **evenly distributed** over a **horizontal line** that indicates the **market area** of a specific variety ➔ <u>**product characteristic line**</u>
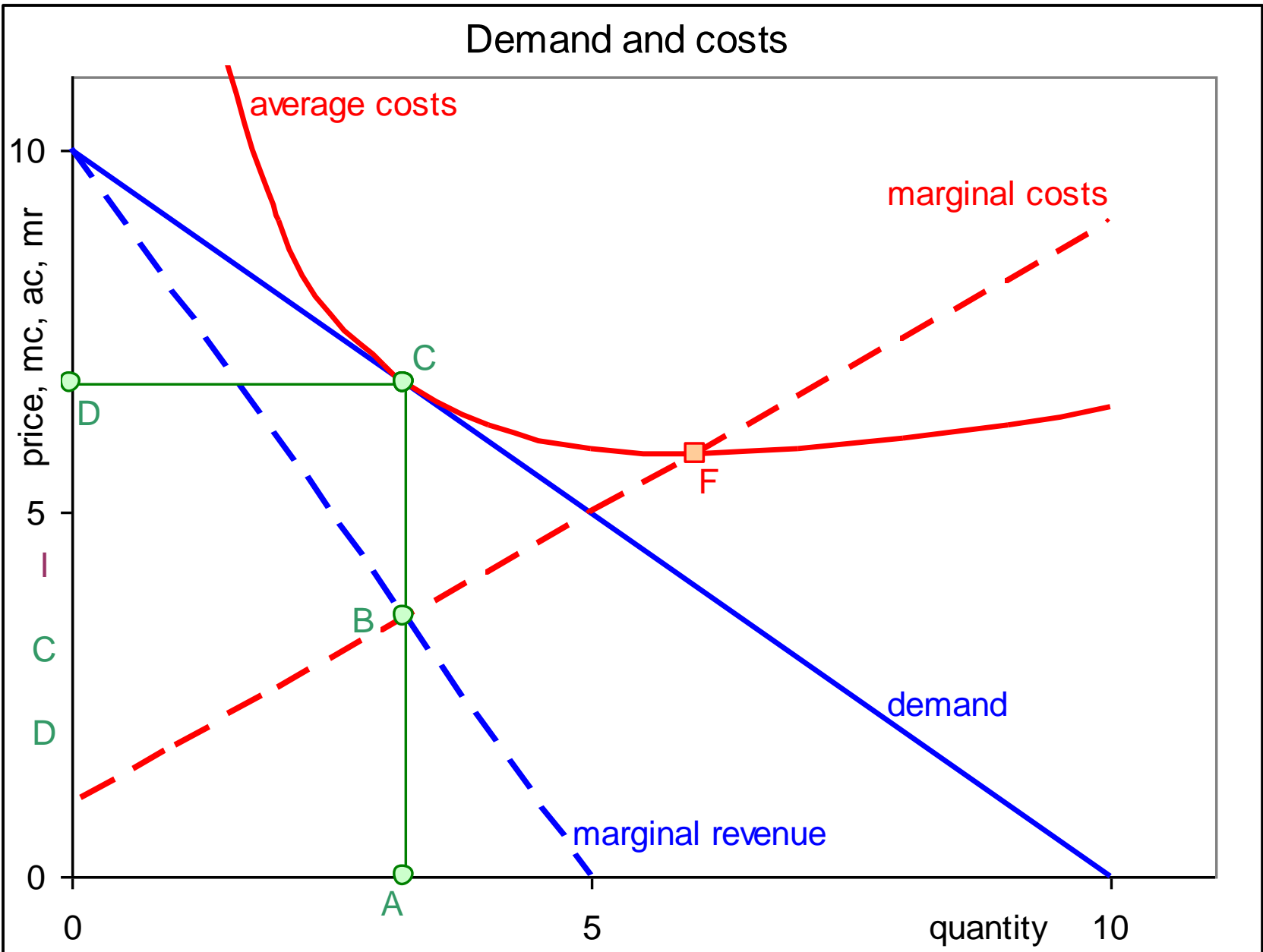
Figure 4.5 The varieties approach of monopolistic competition

varieties in A

varieties in B

Monopolistic competition: entry and exit

- **Free entry** and **exit** give rise to a **competitive pressure**

- **Entry** of a new firm producing a **new variety** induces a **switch** of **consumers** from other varieties **to** the **new variety**
- **Demand** for **other varieties shifts** toward the **origin**
- As long as **incumbent firms** make **positive profits** (by equating MR=MC), **new firms** will **enter** the market
- **Entry reduces profits** of **incumbent** firms up to the point that profits shrink **to zero** and **no new firm** will **enter** the market

- **Exit** ➔ if **profits** on the market are **negative**, some **incumbent** firms will **exit** the market ➔ **shift away from** the **origin** of the **demand** for each variety and **increase** in **profits** up to **zero**

Figure 4.6 Monopolistic competition, demand and costs

Demand and costs

average costs

marginal costs

10

price, mc, ac, mr

D

C

5

I

C

D

B

demand

A

marginal revenue

0

5

quantity

10

F

0

Monopolistic competition

- In **equilibrium**, for **each variety** the **market price** will be equal to the **average cost** (but > MC)
- **Profits** are **zero** for all incumbent firms
- Condition ➔ **average cost** function is **tangent** to the **demand** curve ➔ price = average cost (Chamberlain, 1933)

- **Economies of scale** are **not fully exploited** (average costs are not at their minimum) ➔ **inefficiency**?
- The **large number** of **varieties benefits consumers** that love variety

From autarchy to trade

- What happens when **trade** is allowed in a market with monopolistic competition?
- **Costless trade** is **equivalent** to assuming an **increase** in **market size**

- **Competition effect** ➜ **prices** go **down** both at home and abroad
- **'Love for variety'** effect ➜ **consumers** are **happier** because they have now **access** to a much **larger number** of **varieties**
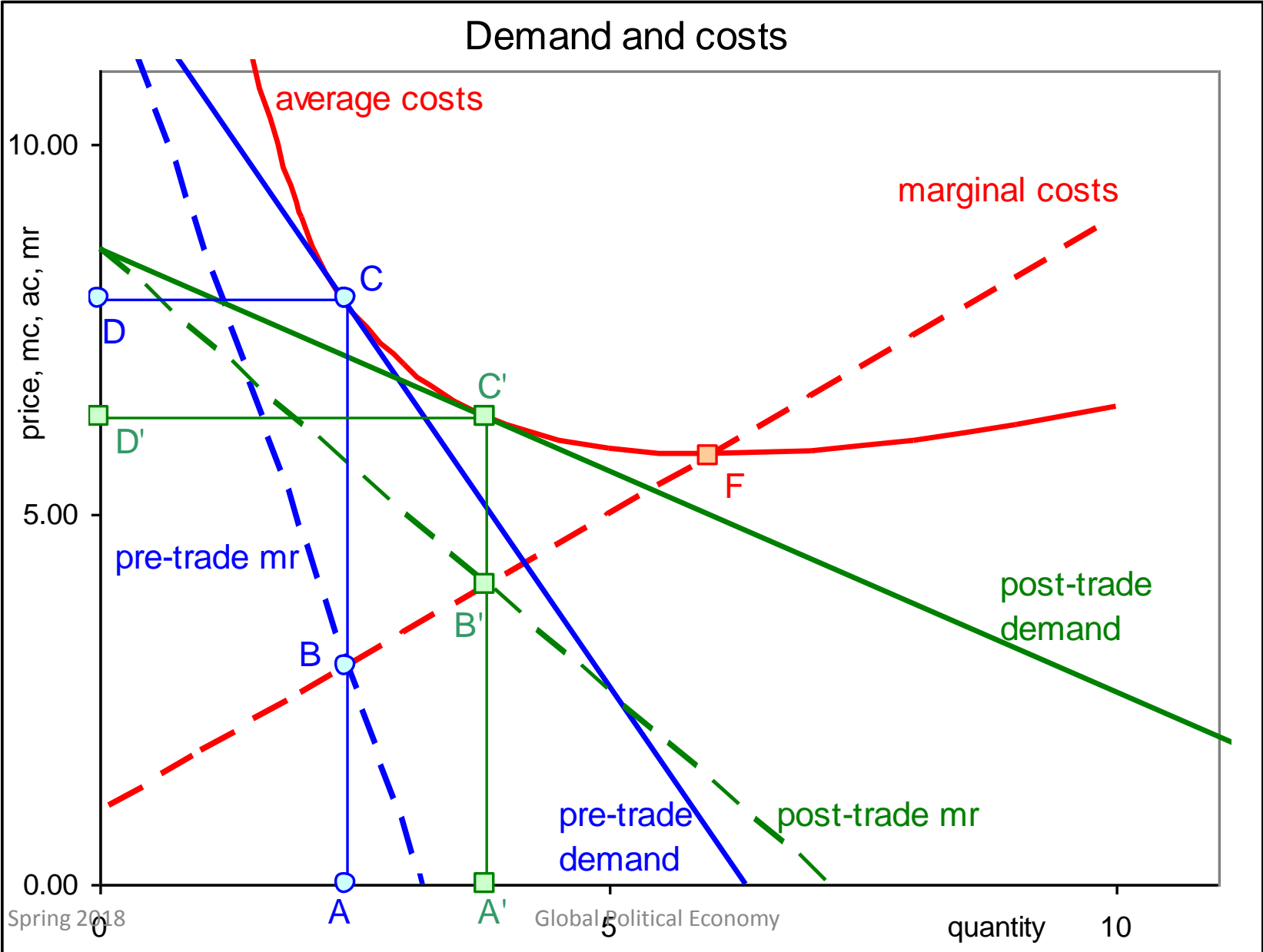
Figure 4.5 The varieties approach of monopolistic competition
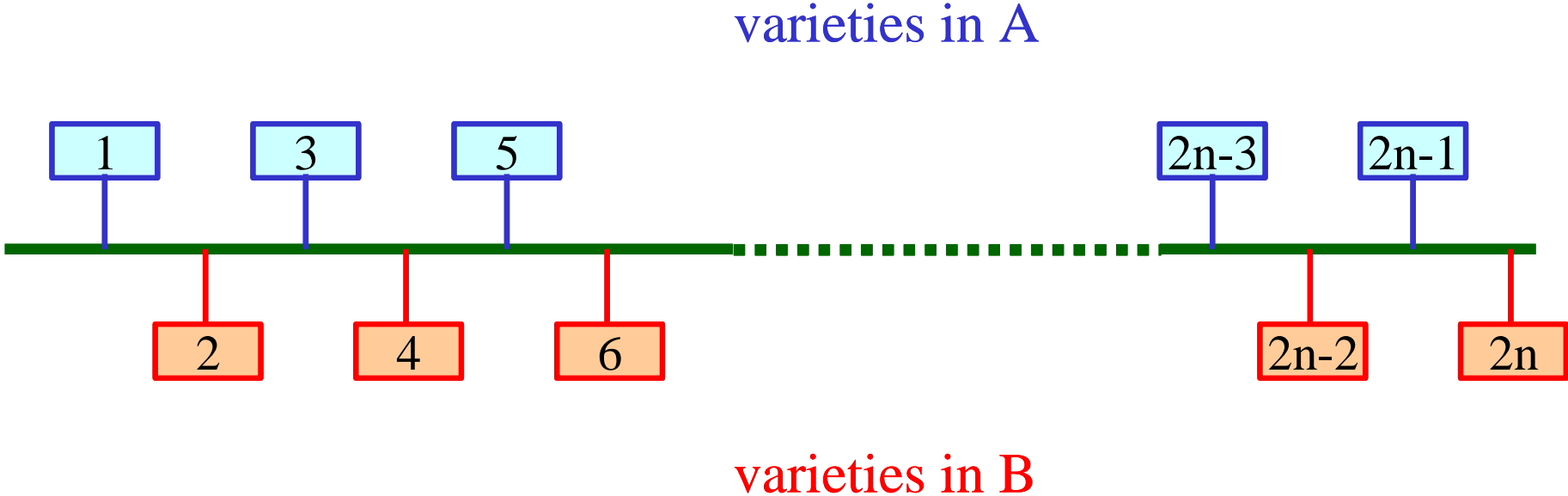
Trade with monopolistic competition

- **Consumers** can now potentially **access 2*n varieties**
- Some consumer may **switch** to a **'more ideal' variety** than in autarchy
- **Firms potentially double** their **market size** but also **lose half** of their **domestic consumers**

- As the number of firms increases, also **competition increases**
  - The **demand curve** faced by **each** individual **firm** is now **'flatter'** (more **elastic**)
  - Some firm will **exit** the market as a more **elastic demand** leads to **negative profits** (profits were already **zero in autarchy**)
- Monopolistic competition leads to **two ways trade** in **similar commodities** ➔ <u>**intra-industry trade**</u>

Figure 4.7 Monopolistic competition and foreign trade pressure, demand and costs

Demand and costs

average costs

marginal costs

price, mc, ac, mr

10.00

C

D

C'

D'

F

5.00

pre-trade mr

B'

B

post-trade
demand

pre-trade
demand

post-trade mr

A

A'

0.00

Global Political Economy

quantity   10

0   5

Trade with monopolistic competition

- The number of **varieties** in **equilibrium** will be **larger** than **n** but **lower** than **2*n**

- The **competition effect**, by increasing the **elasticity** of demand for each variety, induces a **reduction** in market **prices**

- Each producer, to **obtain non-negative profits**, needs to produce a **larger quantity** ➔ better **exploitation** of **economies of scale** (than in autarchy)

Gains from trade

- Larger **market size** allows to **exploit** more efficiently the **economies of scale**

- With **free entry**, better exploitation of **economies of scale** induces a **reduction** in **prices**

- A **larger market** can **sustain** a larger number of **varieties**

Empirical support for intra-industry trade

- **Affluent countries** will be more likely to be engage in intra-industry trade

- Once **basic needs** are **fulfilled** by buying '**homogeneous' basic goods** (e.g. wheat, cheap clothes, energy, etc), **consumers** buy more **sophisticated** (and **differentiated**) **commodities**

Empirical support for intra-industry trade

- Countries with **different levels of development** will also have **different tastes**

- This implies that **varieties** produced in **one country** are **not suitable** for consumers in **another country**

Empirical support for intra-industry trade

- **Large countries** can produce a larger **number** of **varieties**

- A large number of 'domestic' variety will also result in a substantial **export of varieties**

Empirical support for intra-industry trade

- Intra-industry trade is also expected to be **high** if:
    - The degree of **product differentiation** is **high** for a specific **product** (wheat vs cars)
    - **Economies of scale** are substantial

Implications of the model for firms' dynamics

- The '**competition effect**' forces some variety (and firm) to **exit** the market
- In **equilibrium**, with trade, the **number** of **varieties** is **lower** than the **sum** of varieties in **autarchy**

- **Selection effect** ➔ **less efficient firms leave** the **market** as competition pushed their **profits below zero**

- In presence of **heterogeneous firms**, trade:
  - Induces **less efficient firms** to **leave** the market
  - Results in an **increase** of the **market share** of the most **efficient** and productive **firms**

- Overall, **trade improves productivity**

Case study - The North American Auto Pact of 1964

- **Before 1964**, there were very **high tariffs** for importing **cars** both in **Canada** and the **US** to **protect domestic producers** of cars

- Both the US and Canada were '**autarchic**' in the car market

- Producers in Canada were ultimately subsidiaries of US corporations (e.g. GM, Ford, etc)

- The **Canadian car market** was about **1/10** of the **US** car market

Case study - The North American Auto Pact of 1964

- **US production plants** were exploiting **economies of scale** in a better way than the Canadian ones
  - **US** production **plants** were '**dedicated**' to a single **model**
  - **Canadian** production **plants** had to produce a **portfolio of models** as the Canadian **market** was **not large enough** to sustain 'dedicated' plants
- **Labour productivity** in **Canadian** plants was about **30 percent lower** than the one of US plants

Case study - The North American Auto Pact of 1964

- US and Canada agreed in **1964** to establish a free **trade area** in automobiles ➔ **North American Auto Pact**

- **US multinationals reorganized** their production by establishing '**dedicated**' plants also in **Canada**
  - The number of '**varieties**' **produced in Canada** decreased sharply (but not total production of cars and the number of varieties available to Canadian consumers)
  - **Labour productivity** of the **Canadian** car industry increased substantially and **closed the gap** with the US car industry