International trade and imperfection competition:

Three main problems with theoretical model of Ricardo, HOS, Standard:

- Based on perfect competition: trade does not increase competition
- No economies of scale so market size does not matter
- Predict that trade will take place between countries which are different and trade different goods

- So do not explain very well trade between industrialized countries in part. intra-European trade

  France and Germany are each other’s main trade partner but are very similar:

  - in technologies
  - en relative endowments of factors of production (K/L)
  - income

Also for EU and US

Share of trade patterns for merchandise trade 2001

<table>
<thead>
<tr>
<th>origin</th>
<th>No. Am</th>
<th>Latin Am</th>
<th>Europe Western</th>
<th>Africa</th>
<th>Asia</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. Am</td>
<td>6,5</td>
<td>2,7</td>
<td>2,1</td>
<td>0,2</td>
<td>3,5</td>
</tr>
<tr>
<td>Latin Am.</td>
<td>3,5</td>
<td>1,0</td>
<td>0,7</td>
<td>0,1</td>
<td>0,4</td>
</tr>
<tr>
<td>Europe</td>
<td>4,3</td>
<td>1,0</td>
<td>28,0</td>
<td>1,1</td>
<td>3,3</td>
</tr>
<tr>
<td>Africa</td>
<td>0,4</td>
<td>0,1</td>
<td>1,2</td>
<td>0,2</td>
<td>0,4</td>
</tr>
<tr>
<td>Asia</td>
<td>6,3</td>
<td>0,7</td>
<td>4,2</td>
<td>0,4</td>
<td>12,1</td>
</tr>
</tbody>
</table>
Do not explain well a growing share of world trade: trade in similar goods:
- intra-industrial trade
- trade that goes both ways inside a sector or industry
- example: France exports and imports cars to and from Germany
- Decrease of the share of inter-industry

<table>
<thead>
<tr>
<th>intra-European trade</th>
<th>Share of trade</th>
<th>Share of trade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>intra-industrial</td>
<td>inter-industrial</td>
</tr>
<tr>
<td>France</td>
<td>68.1</td>
<td>31.9</td>
</tr>
<tr>
<td>Germany</td>
<td>65.6</td>
<td>34.4</td>
</tr>
<tr>
<td>GB</td>
<td>63.9</td>
<td>36.3</td>
</tr>
<tr>
<td>Spain</td>
<td>54.1</td>
<td>45.9</td>
</tr>
<tr>
<td>Italy</td>
<td>52.0</td>
<td>48.0</td>
</tr>
<tr>
<td>Greece</td>
<td>13.3</td>
<td>86.6</td>
</tr>
<tr>
<td>EE-15</td>
<td>59.1</td>
<td>40.9</td>
</tr>
</tbody>
</table>

Source: Eurostat-CEPII.

<table>
<thead>
<tr>
<th>extra-European trade</th>
<th>Share of trade</th>
<th>Share of trade</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>intra-industrial</td>
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</tr>
<tr>
<td>France</td>
<td>31.1</td>
<td>68.9</td>
</tr>
<tr>
<td>Germany</td>
<td>33.4</td>
<td>66.6</td>
</tr>
<tr>
<td>GB</td>
<td>32.5</td>
<td>67.5</td>
</tr>
<tr>
<td>Spain</td>
<td>9.5</td>
<td>90.5</td>
</tr>
<tr>
<td>EU-15</td>
<td>26.6</td>
<td>73.4</td>
</tr>
</tbody>
</table>

Source: Eurostat-CEPII.
Theory
- « new » theories international trade; end of 1970s (Krugman, Helpman)
Apply to international trade imperfect competition models from industrial organization literature
- Imperfect competition, logical corollary of economies of scale
- New types of gains from international trade; rationalisation (mergers and acquisition), variety effect
Also allows to analyse the impact of economic integration on the location (delocation) of economic activities (« new » economic geography)

Economies of scale and market structure
In the presence of a fixed costs (R&D, training, advertising, marketing,...) is a natural source of economies of scale:
\[ C = F + c Q \]
C: total cost
F: fixed cost
c: marginal cost (salary for example)
Q: production
Average cost decreases with Q:
\[ AC = \frac{F}{Q} + c \]

Profit of a firm
\[ \Pi = pQ - C = (p - c)Q - F = (p - AC)Q \]

Income = \( p \) \( Q \)

marginal revenue = \( MR = \frac{\partial R}{\partial Q} = \frac{\partial p}{\partial Q} + p \)

\[ \frac{\partial Q}{\partial p} \frac{\partial Q}{\partial Q} = -\epsilon \]

where \( -\epsilon \) is the price elasticity of demand

\[ RM = p \left(1 - \frac{1}{\epsilon}\right) < p \]

If free entry of firms in long terms (competition element)
- firms enter on market if profits > 0
- firms exit market if profits < 0

long term equilibrium such that \( p = AC \)
determines number of firms on market and their size
Monopolistic competition model
International trade and monopolistic competition
- 2 strictly identical countries (France, Germany): in classical model implies no trade
- Price elasticity is not infinite (competition is not perfect) because each firm can differentiate its variety from its competitors’ (taste for variety of consumers, advertising etc)
- No strategic behaviour of firms (many small firms that take competitors prices as given)
- Free entry of firms: zero pure profits (operational profits = F)

Varieties are differentiated
Each firm has a monopoly on its variety
- Ford, Peugeot, VW … - Gap, H&M, Benetton …
Demand for its variety i:
\[ Q_i = S \left( \frac{1}{n} - b(p_i - \bar{p}) \right) \]
where \( Q_i \): production of the firm (variety) \( i \)
\( S \): total market size (given), \( n \): number of firms
\( p_i \): price of variety \( i \), \( \bar{p} \): average price on market
\( b \): measure of degree of substitution between varieties

Intuition:
- if \( p_i = \bar{p} \Rightarrow Q_i = S / n \)
- if \( p_i > \bar{p} \Rightarrow Q < S / n \)
Looses market share but not all its market (\( b \) is not infinity)
4 variables interest us:
- \( n; Q_i, p \) and AC
All firms are symmetric (same costs, same demand, same objectives) so have in equilibrium the same price strategy:

\[ Q_i = Q = S/n \quad \text{and} \quad p_i = p \]

So average cost:

\[ AC = \frac{F}{Q} + c = \frac{(F/n)}{S} + c \]

CC curve: 1st equilibrium relation between AC and n
positive relation between the number of firms on a market and the average cost of each firm: economies of scale effect

Second equilibrium relation: between \( p \) and \( n \)

How are prices determined?

Maximisation of profits of firm \( i \):

\[ \frac{\partial \Pi}{\partial Q_i} = p_i + \frac{\partial p_i}{\partial Q_i} Q_i - c = 0 \]

and \( p_i \) given by inverse demand function:

\[ p_i = \frac{1}{bn} - \frac{Q_i}{bs} + p \quad \text{is considered fixed} \]

so

\[ p_i - \frac{Q_i}{bs} - c = 0 \]

All firms have this same strategy, choose the same price and same production: \( Q = S/n \)

\[ p - \frac{S}{bSn} - c = 0 \quad \text{or} \quad p = c + \frac{1}{bn} \]

PP curve: negative relation between \( n \) and \( p \)

Competition effect: if \( n \) high then firm \( i \) looses more when it increases its price

All will choose lower price when \( n \) is high
What happens if two identical countries (France and Germany) form a free-trade zone (EU is more: 1992 Single Market)

Size of Market doubles: \( S \rightarrow S' = 2S \)

Firms number doubles: \( n \rightarrow 2n \)

So 2 effects on graph:

CC shifts to the right

Firms number on the (single larger) market goes (temporarily) to \( 2n \)
- Prices fall as AC of production decreases and the number of goods available on each market increases
- Scale economies effect (market size increase) as each firm becomes larger (production rationalisation):
  \[ Q = \frac{S}{n} \]  
  goes to \[ Q' = \frac{2S}{n'} > \frac{S}{n} \]
- Competition effect: more firms on each market compete (but less firms in each country remain):
  \[ n \rightarrow 2n > n'' > n \]
- Variety effect: number of varieties has increased

What happens in medium term? A price war and wave mergers and acquisitions (M&A): the EU case

- The case of European air transport:
  At beginning of liberalisation:
  - Harsh competition (2)
  - Price war (3)
  - Pressure to merge (M&A wave)
  - Prices increase again (but not their original level before liberalization) and increase of the number and variety (low cost) of companies that serve a country (4)

What happens in the meantime?
- Banking industry in Europe was a bit different
- Had more time to anticipate the effects of scale and competition due to enlarged and opening of market
- Wave of mergers happens early on (before complete liberalization) and no real price war
- note: restructuring in all cases and can be painful when labor markets do not work very well

Digression, if not competition policy: profits increase with trade integration

The link between competition policy and integration in Europe
- what if competition policy is weak at the time of integration?
- for example, if firms can easily merge but difficult to enter the market (artificial entry costs) (n is fixed)
- Then gains from integration go entirely into higher profits and no gains to consumers in the form of lower prices and higher diversity of goods
- Who exports what on the integrated market?
- The two countries specialize in different varieties of the same good: intra-industrial trade
- But nothing determines the location of firms

- Two possible ways forward:
  - reintroduce comparative advantages
  - introduce transport costs between the two countries that make the question of location interesting

Economies of scale and comparative advantage

Two countries: Germany-France

Two factors of production: capital and labour

Germany is relatively abundant in capital

two industries: automobile and textile

automobile intensive in capital

textile intensive in labour

automobile industry is not perfectly monopolistic

competition: concurrence

Without economies of scale, we get standard HOS result

<table>
<thead>
<tr>
<th></th>
<th>Car</th>
<th>textile</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(abundant en K)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>France</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(abundant en L)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Germany exports cars and imports textile:

inter-industrial trade only
If automobile industry produces differentiated goods in monopolistic competition
- Germany has a comparative advantage in automobile sector and will be net exporter in this sector
- but will still import some varieties produced by France
- France has a comparative advantage in textile and will export textile

Two types of trade:
- intra-industrial (car against cars): the more so the more similar countries are
  inter-industrial (cars against textile): reflects comparative advantages

- Estimation of intra-industrial trade:
  Grubel-Lloyd index: for each sector

  \[ I_{\text{intra}} = 1 - \frac{\text{exports} - \text{imports}}{\text{exports} + \text{imports}} \]

  - important for high technology sectors (high fixed costs)
  - Higher for more similar countries with high income
  - Well verified empirically for European and OECD countries
intra-industry trade

TABLE 4.3

<table>
<thead>
<tr>
<th>Economic Group/Country (Number of Countries)</th>
<th>Average Intradustry Trade Index</th>
<th>Change in Average Intradustry Trade Index from 1970 to 2000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Developed Economies (12)</td>
<td>95.1</td>
<td>62.8</td>
</tr>
<tr>
<td>Six Major Exporters</td>
<td>41.1</td>
<td>61.7</td>
</tr>
<tr>
<td>Japan</td>
<td>51.0</td>
<td>76.7</td>
</tr>
<tr>
<td>Germany</td>
<td>51.0</td>
<td>76.7</td>
</tr>
<tr>
<td>Italy</td>
<td>44.5</td>
<td>58.5</td>
</tr>
<tr>
<td>United Kingdoms</td>
<td>43.5</td>
<td>75.4</td>
</tr>
<tr>
<td>United States</td>
<td>36.0</td>
<td>59.6</td>
</tr>
</tbody>
</table>

The closer a country is to a summit, the more the corresponding trade type is important.
Source: Fontagné and Freudenberg (2000)

Vertically differentiated goods: differentiation by quality as measured by differences in prices (15%)

Share of trade for selected group of countries 2002

Source: Fontagné and Freudenberg (1998)
One-way trade
Two-way trade in similar products
Two-way trade in vertically differentiated products

Source: Fontagné and Freudenberg (2000)

Table 2 - The worldwide top ten bilateral HFT shares (TWT-I-TWT-V), %, 2000

<table>
<thead>
<tr>
<th>Country</th>
<th>Trade partner</th>
<th>Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Germany</td>
<td>France</td>
<td>68.70</td>
</tr>
<tr>
<td>Malaysia</td>
<td>Singapore</td>
<td>85.89</td>
</tr>
<tr>
<td>France</td>
<td>Belgium and Luxembourg</td>
<td>83.47</td>
</tr>
<tr>
<td>Netherlands</td>
<td>Belgium and Luxembourg</td>
<td>91.73</td>
</tr>
<tr>
<td>Germany</td>
<td>United Kingdom</td>
<td>90.60</td>
</tr>
<tr>
<td>Germany</td>
<td>Austria</td>
<td>79.78</td>
</tr>
<tr>
<td>France</td>
<td>Spain</td>
<td>77.62</td>
</tr>
<tr>
<td>United States</td>
<td>Canada</td>
<td>77.55</td>
</tr>
<tr>
<td>Taiwan</td>
<td>Singapore</td>
<td>77.59</td>
</tr>
</tbody>
</table>

Source: Fontagne et al. 2005

Recent increase of one way trade due to increase in share of trade by emerging countries

Source: Fontagne et al 2005
Déterminants type of trade Potential effects on specialisation distribution

- differences in productivity
- differences in factors of production
- comparative advantage (wages of skilled/ unskilled)

- possible divergence between countries
- no or little distribution effects except geography

- Another question on relation between trade and imperfect competition in Europe
  - market segmentation: the same good is not sold at the same price on all markets
  - Example: VW was fined for this segmentation practice
    An illegal practice (in theory):
    - VW forbade its Italian resale dealers to sell to German consumers (so as to make arbitrage difficult)
    - in general, prices are higher on domestic market than on international market (even though transport costs should say inverse)

- Another way to segment markets:
  Take advantage of different regulations:
  Before 1992 different rules in Germany and Fr. On packaging of pasta (in G: rule on the max. space between top and pasta); in Fr.: rule on the ratio of volume of product/volume of package)
  Allowed producers to stop arbitrage and segment markets (since 1992, mutual recognition of regulations and harmonisation)
  Why are goods prices higher on domestic market than on foreign markets if thes type of segmentation is possible?
In Europe, markets are still segmented. Price differentials persist
% price difference between highest/lowest price in Eurozone

<table>
<thead>
<tr>
<th>Segment</th>
<th>1/1/2011</th>
<th>7/1/2012</th>
<th>1/1/2013</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small segment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Opel</td>
<td>10.4%</td>
<td>13.3%</td>
<td>19.4%</td>
</tr>
<tr>
<td>Ford</td>
<td>14.7%</td>
<td>25.4%</td>
<td>25.4%</td>
</tr>
<tr>
<td>French</td>
<td>14.9%</td>
<td>11.3%</td>
<td>12.8%</td>
</tr>
<tr>
<td>Foreign EU</td>
<td>29.8%</td>
<td>26.8%</td>
<td>11.8%</td>
</tr>
<tr>
<td>VW</td>
<td>1.7%</td>
<td>13.6%</td>
<td>26.1%</td>
</tr>
<tr>
<td>VW Golf</td>
<td>15.5%</td>
<td>13.2%</td>
<td>11.5%</td>
</tr>
<tr>
<td>VW Pass</td>
<td>14.2%</td>
<td>13.5%</td>
<td>12.8%</td>
</tr>
<tr>
<td>Ford Focus</td>
<td>20.4%</td>
<td>23.8%</td>
<td>13.7%</td>
</tr>
<tr>
<td>French Bigger</td>
<td>13.2%</td>
<td>13.5%</td>
<td>13.5%</td>
</tr>
<tr>
<td>Foreign EU</td>
<td>18.3%</td>
<td>20.1%</td>
<td>15.8%</td>
</tr>
<tr>
<td>Large segment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMW 318</td>
<td>1.5%</td>
<td>13.6%</td>
<td>11.8%</td>
</tr>
<tr>
<td>Audi A4</td>
<td>16.4%</td>
<td>13.1%</td>
<td>12.6%</td>
</tr>
<tr>
<td>Ford Mondeo</td>
<td>23.6%</td>
<td>20.7%</td>
<td>28.9%</td>
</tr>
<tr>
<td>Opel Vectra</td>
<td>14.4%</td>
<td>27.7%</td>
<td>22.6%</td>
</tr>
<tr>
<td>VW Pass</td>
<td>14.4%</td>
<td>26.8%</td>
<td>21.1%</td>
</tr>
</tbody>
</table>

Note: Différence de prix en pourcentage entre le prix le plus élevé et le plus bas pour la modéle et l'année chosen - Diapos commissaire européen

- Dumping:
  Extreme example: domestic firm has monopoly on domestic market and is in perfect competition on foreign markets; perfect segmentation between markets (no arbitrage)

More generally producers have an advantage on domestic markets (biased preferences, retail networks, influence national regulations via lobbying etc...)
Optimal strategy of a firm:
- equate marginal cost and marginal income on both markets:
  \[ MR^* = P^* = MC \]
determines total production
MR^*= MR (dom)
Otherwise would increase production on domestic (if MR^*< MR (dom)) or foreign market (if MR^*> MR (dom)) : dumping
Decreasing arbitrage constraints helps against the domestic monopoly power

Reciprocal Dumping: 2 countries each with domestic monopoly; transport costs between markets
- each monopoly has an interest to sell a little on the other market (at a lower price than on its own market)
- Trade in both directions of identical goods and with transport costs: strange!
Ambiguous effect of trade on welfare :
- negative: inefficient to trade identical goods and use resources for transport
- positive: decreases monopoly power on each market

Reciprocal Dumping: Brander and Spencer
- 2 countries (H and F) and 2 (monopoly) symmetric firms produce identical good (only one price on each market)
- International transport cost \( \tau \)
- Firms choose quantities (Cournot)
- Cost function of firm i: \( C_i = c Q_i \)
- Inverse demand function: \( p = a - b \times Q \quad Q = Q_1 + Q_2 \)
- Max profits on each market: On foreign market
  - \( \Pi_1 = p Q_2 - c Q_1 - \tau Q_1 \) (profit on firm 1 on F Market)
  - \( \Pi_2 = p Q_2 - c Q_1 \) (profit on firm 2 on F Market)
These are the reaction functions of the firms

\[ \begin{align*}
\text{Max} & \quad \pi_1 = [a - b(Q_1 + Q_2)]Q_1 - (cQ_1 + \tau Q_1) \\
\Rightarrow & \quad a - 2bQ_1 - bQ_2 - c - \tau = 0 \quad \Rightarrow \quad Q_1 = \frac{a - bQ_2 - c - \tau}{2b} \\
\text{Idem firm} 2 & : Q_2 = \frac{a - bQ_1 - c}{2b}
\end{align*} \]

These are the reaction functions of the firms

The equilibrium is the intersection of firms reaction functions

What firm 1 sells on \( F \):

\[ Q_1 = \frac{a - c - 2\tau}{3b} \]

What firm 2 sells on \( F \):

\[ Q_2 = \frac{a - c + \tau}{3b} \]

Higher transport costs \( \tau \) mean the domestic firm has higher market share. If \( \tau > (a-c)/2 \) then \( Q_1 = 0 \)

Equilibrium price (on both markets) is:

\[ p = a - bQ = \frac{a + 2c + \tau}{3} \]

Higher transport cost mean higher price
Some implications:
• National firm sells on foreign market even with cost disadvantage
• Symmetrically, foreign firms sells on domestic market: trade is entirely intra-industry
• To sell on foreign market, firms lower their mark-up (reciprocal dumping different from dumping)
• Trade integration (lower $\tau$) imply lower prices, larger quantities ($Q_1 + Q_2$ increases): consumers gain: Pro-competitive effect
• Firms loose: profits can be shown to decrease as $\tau$ decreases (rents decrease; unions have less to fight/bargain over)

Final point on imperfect competition and international trade
• New studies show that firms that export are different from non exporters:
• Few firms export: less than 20%
• Exporters are larger (around 6 times larger)
• Exporters are more productive: labor productivity is 33% higher for exporters than non exporters
• Best explanation: presence of fixed costs to export (on top of fixed cost to produce)
• The most productive (lower prices, larger sales, larger operating profits) can pay this fixed cost; not the smaller less productive ones
• Consistent with models of imperfect competition with economies of scale

| SIC  | Industry               | Number of Plants | Percentage US firms | Percentage Exported | Percentage Exported US
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>Food, etc.</td>
<td>16657</td>
<td>11.1</td>
<td>19.0</td>
<td>19.0</td>
</tr>
<tr>
<td>21</td>
<td>textiles, etc.</td>
<td>18492</td>
<td>11.3</td>
<td>18.0</td>
<td>18.0</td>
</tr>
<tr>
<td>22</td>
<td>Apparel, etc.</td>
<td>18196</td>
<td>12.2</td>
<td>17.7</td>
<td>17.7</td>
</tr>
<tr>
<td>24</td>
<td>lumber, etc.</td>
<td>1757</td>
<td>10.7</td>
<td>16.0</td>
<td>16.0</td>
</tr>
<tr>
<td>26</td>
<td>Printing, etc.</td>
<td>16679</td>
<td>10.5</td>
<td>2.9</td>
<td>4.3</td>
</tr>
<tr>
<td>28</td>
<td>Chemicals, etc.</td>
<td>18601</td>
<td>11.4</td>
<td>17.3</td>
<td>12.9</td>
</tr>
<tr>
<td>30</td>
<td>Plastics, etc.</td>
<td>4722</td>
<td>4.3</td>
<td>22.2</td>
<td>4.3</td>
</tr>
<tr>
<td>31</td>
<td>Leather, etc.</td>
<td>4491</td>
<td>2.6</td>
<td>17.0</td>
<td>11.6</td>
</tr>
<tr>
<td>32</td>
<td>Stone, etc.</td>
<td>18652</td>
<td>12.3</td>
<td>16.7</td>
<td>12.0</td>
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<td>33</td>
<td>primary Metals, etc.</td>
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<td>5.0</td>
</tr>
<tr>
<td>34</td>
<td>fabricated Metals</td>
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<td>16.5</td>
<td>13.2</td>
<td>7.5</td>
</tr>
<tr>
<td>35</td>
<td>machinery, etc.</td>
<td>17144</td>
<td>26.8</td>
<td>16.6</td>
<td>13.9</td>
</tr>
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Note: Source = Calom, Kortum & Krayzer. US figures are for 1987; French figures are for 1985.