There are two technologies for producing automobiles in America. One is to manufacture them in Detroit, and the other is to grow them in Iowa. Everybody knows about the first technology; let me tell you about the second. First you plant seeds which are the raw materials from which automobiles are constructed. You wait a few months until wheat appears. Then you harvest the wheat, load it onto ships, and sail the ships westwards into the Pacific Ocean. After a few months, the ships reappear with Toyotas on them.

S. Landsburg (The Armchair Economist)
David Ricardo (1772 – 1823)

- Born in London in a Jewish family (disinherited)
- Amassed a fortune as stock trader and loan contractor
- Famous for the theory of comparative advantage
„Ricardian economy“ assumptions

- CRS (technological assumption)
- Perfect competition (behavioral assumption)
- „Linearity“ of the world
- Implications:
  a) cost of production equals price in equilibrium
  b) zero profits
  c) PPF is a straight line
Constant returns to scale

• CRS = knowing a min. cost of producing one unit gives us all information to determine min. costs of producing any number of goods (regardless number of factors of production)
• In our case: costs of producing $x$ units of a good $i$ $cx$
Perfect competition

• The firm takes costs and prices as given
• Unit costs depend only on available technology (production function)
  • \( \pi = px - cx = (p-c)x \)
  • If \( p < c \) = > \( x = 0 \)
  • If \( p = c \) = > any level of production maximizes profit! Equilibrium level is given by total demand and supply
  • If \( p > c \) = > \( x = \infty \), cannot be equilibrium
Technology table I

• A simple analytical tool
• Summarizing the state of technology in both countries
• With one input (labor) and CRS – table specifies how much labor is required to produce a unit of good in a specific country
Technology table II – example (2 x 2 x 1 model)

- 2 goods, 2 countries, 1 factor of production

<table>
<thead>
<tr>
<th></th>
<th>General specification</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Food</td>
<td>Chemicals</td>
</tr>
<tr>
<td>EU</td>
<td>$d_F^{EU}$</td>
<td>$d_C^{EU}$</td>
</tr>
<tr>
<td>Kenya</td>
<td>$d_F^K$</td>
<td>$d_C^K$</td>
</tr>
</tbody>
</table>

- Autarky price ratio (terms of trade) is completely determined by the technology (8/2 in the EU, 24/4 in Kenya)
Production possibility frontier (PPF) I

• Definition: all possible combinations of efficient production points given the available factors of production and the state of the technology
• PPF is Technological specification: does not depend on any type of market competition
• PPF depends on the available factors of production
• PPF depends on the state of technology
• Terms of trade (TT) is the tangency to the PPF
Production possibility frontier (PPF) II

Table 3.2 Total labour available and maximum production levels

<table>
<thead>
<tr>
<th></th>
<th>Total labour available</th>
<th>Maximum production</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Food</td>
</tr>
<tr>
<td>EU</td>
<td>200</td>
<td>100</td>
</tr>
<tr>
<td>Kenya</td>
<td>120</td>
<td>30</td>
</tr>
</tbody>
</table>

Figure 3.2 Ricardian production possibility frontiers for the EU and Kenya
Comparative advantage I

• With IT we cannot determine exact TT w/o other information, but we can determine boundaries

• Gains from trade:
  i) TT are between 4 and 6
  ii) TT are 4 (only Kenya will gain)
  iii) TT are 6 (only EU will gain)
Comparative advantage II

Figure 3.3 The terms of trade is 4.8 units of food per unit of chemicals
Comparative advantage III

Figure 3.4 The terms of trade is 4 units of food per unit of chemicals
Comparative advantage and wages – an example

• In Ricardian framework assume that the EU fully specializes in the production of chemicals and Kenya fully specializes in the production of food. Exchange rate is 1. Wage rate in Kenya is taken as numéraire. Assume perfectly competitive economies with CRS. Productivity table is given below:

<table>
<thead>
<tr>
<th></th>
<th>Food</th>
<th>Chemicals</th>
</tr>
</thead>
<tbody>
<tr>
<td>EU</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>Kenya</td>
<td>4</td>
<td>24</td>
</tr>
</tbody>
</table>
Questions

• What is the price of food?
• Let $w_{EU}$ be the EU wage. What is the price of chemicals in terms of $w_{EU}$?
• Note, that the EU can, in principle, also produce food. What would be the price of the food produced in the EU in terms of $w_{EU}$, if it were to do so?
• Since the EU does not produce food the price from c) must be higher than the actual food price – put down this inequality.
• Note also, that Kenya can, in principle, produce chemicals. What would be the price of the chemicals produced in Kenya in terms of Kenya wage (numéraire), if it were to do so?
• Since Kenya does not produce chemicals the price from e) must be higher than the actual price of chemicals – put down this inequality.
• Using derived information above prove that the EU wage is at least twice as high as the Kenyan wage and at most three times as high.
Anwsers

• What is the price of food?
Anwsers

• What is the price of food?  
  4

• Let $w_{EU}$ be the EU wage. What is the price of chemicals in terms of $w_{EU}$?
Anwsers

- What is the price of food?
  4
- Let $w_{EU}$ be the EU wage. What is the price of chemicals in terms of $w_{EU}$?
  $8 w_{EU}$
Anwsers

• What is the price of food?
  4

• Let $w_{EU}$ be the EU wage. What is the price of chemicals in terms of $w_{EU}$?
  $8 w_{EU}$
Anwsers

• Note, that the EU can, in principle, also produce food. What would be the price of the food produced in the EU in terms of $w_{EU}$, if it were to do so?
Anwsers

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\[ 2 w_{EU} \]
Anwsers

• Since the EU does not produce food the price from c) must be higher than the actual food price – put down this inequality.
Anwsers

• Since the EU does not produce food the price from c) must be higher than the actual food price – put down this inequality.

\[ 2 \, w_{EU} > 4 \quad => \quad w_{EU} > 2 \]
Anwsers

• Note also, that Kenya can, in principle, produce chemicals. What would be the price of the chemicals produced in Kenya in terms of Kenya wage (numéraire), if it were to do so?
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Anwsers

• Since Kenya does not produce chemicals the price from e) must be higher than the actual price of chemicals – put down this inequality.
Anwsers

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\[ 8 w_{EU} < 24 \implies w_{EU} < 3 \]
Anwsers

• Using derived information above prove that the EU wage is at least twice as high as the Kenyan wage and at most three times as high.

\[ 2 < w_{EU} < 3 \]
PPF of the world

Figure 3.6 Four countries and world PPF
Revealed comparative advantage (RCA) / Balassa index (BI)

- Introduced by Liesner (1958) and Béla Balassa (1965, 1989)
- \( BI^A_j = \frac{\text{share of industry } j \text{ in } A's \text{ exports}}{\text{share of industry } j \text{ in reference country's exports}} \)

Alternatively: \( RCA = \frac{(E_{ij} / E_{it})}{(E_{nj} / E_{nt})} \)

- If \( BI^A_j > 1 \), country \( A \) is said to have a revealed comparative advantage in industry \( j \), since this industry is more important for country \( A \)'s exports than for the exports of the reference countries
- If \( BI^A_j < 1 \), the country is said to have a comparative disadvantage in the commodity or industry
BI of selected countries

Figure 3.7 Highest Balassa index, selected countries: (a) USA, (b) Japan, (c) Finland, (d) Italy
Comparative advantage and the organisation of the firm

• Underlying principles of the comp. advantage hold at the firm level

• A company should steer workers to activities they perform most efficiently

• Wage rate depends on absolute costs
Comparative advantage: British trade after the industrial revolution

Britain known as a "Workshop of the world"

- c. 1860, Britain was the leading exporter of manufactured goods, and the most industrialized country in the world
- Britain was dominant in the "new industries" of the Industrial Revolution, i.e. cotton, engineering, iron and steel
- Britain exported manufactured goods to both developed and low-income markets
- Britain was also the leading importer from an expanding global economy

Britain had the second highest income per capita in the world (...because Australia was in the middle of a gold boom)

Imports made up a large and rising fraction of national income.

- So, can this trade be explained by a Ricardian model?
Figure 7.3 Exports as proportion of national income, 1700–1913
Britain's policy of free trade

Figure 7.4 Tariff revenues as percentage of value of retained imports
The industrial revolution and Ricardian trade

- Technological advance was what drove trade growth
- Technology and competition drove down prices in a specific range of "new" products – textiles, iron and engineering
- These lower prices stimulated exports
- Britain specialized, becoming more industrialized
- The gains from British exports were mainly felt by foreign consumers!
Specialization means Britain was bad at agriculture, right? NO!

Figure 4.1 Output per worker in agriculture, 1300–1800
British monopoly on manufacturing production?

<table>
<thead>
<tr>
<th></th>
<th>1860</th>
<th>1880</th>
<th>1900</th>
<th>1913</th>
<th>1928</th>
</tr>
</thead>
<tbody>
<tr>
<td>UK</td>
<td>19.9</td>
<td>22.9</td>
<td>18.5</td>
<td>13.6</td>
<td>9.9</td>
</tr>
<tr>
<td>France</td>
<td>7.9</td>
<td>7.8</td>
<td>6.8</td>
<td>6.1</td>
<td>6.0</td>
</tr>
<tr>
<td>Germany</td>
<td>4.9</td>
<td>8.5</td>
<td>13.2</td>
<td>14.8</td>
<td>11.6</td>
</tr>
<tr>
<td>Italy</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
<td>2.4</td>
<td>2.7</td>
</tr>
<tr>
<td>Japan</td>
<td>2.6</td>
<td>2.4</td>
<td>2.4</td>
<td>2.7</td>
<td>3.3</td>
</tr>
<tr>
<td>USA</td>
<td>7.2</td>
<td>14.7</td>
<td>23.6</td>
<td>32.0</td>
<td>39.3</td>
</tr>
</tbody>
</table>
British monopoly on exports of manufacturing production?

<table>
<thead>
<tr>
<th>Year</th>
<th>UK</th>
<th>USA</th>
<th>Germany</th>
<th>Japan</th>
</tr>
</thead>
<tbody>
<tr>
<td>1881/5</td>
<td>43.0</td>
<td>6.0</td>
<td>16.0</td>
<td>0.0</td>
</tr>
<tr>
<td>1899</td>
<td>34.5</td>
<td>12.1</td>
<td>16.6</td>
<td>1.6</td>
</tr>
<tr>
<td>1913</td>
<td>31.8</td>
<td>13.7</td>
<td>19.9</td>
<td>2.5</td>
</tr>
<tr>
<td>1929</td>
<td>23.8</td>
<td>21.7</td>
<td>15.5</td>
<td>4.1</td>
</tr>
</tbody>
</table>

Effects of British advances

Didn't Britain have a monopoly on advanced goods? Shouldn't the gains have gone to manufacturers?
• This is a misleading description: No one British firm had a monopoly
• Within Britain, pricing was competitive, so firms could not earn rents
• Relative to other countries in the late nineteenth century, British manufacturing firms were small, or “atomistic" and faced tough domestic competition

Gains to consumers
• Domestic consumers benefit from lower prices, as do foreigners, ... though textile producers in India and China didn't do so well...
Britain’s terms of trade