

Comparative Advantage

Vantaggi comparati, tecnologia e sviluppi recenti

Luca De Benedictis¹

¹University of Macerata

Lezione 2

The Ricardian model

Main characteristics and insights:

- ▶ Countries are different because of **technology** [tastes and endowments are identical across nations]
- ▶ Technology is linear [one factor of production, L , marginal productivity is constant]
- ▶ Markets are perfectly competitive
- ▶ Under autarky $\frac{p_x^A}{p_y^A} = \frac{a_x \cdot w_x}{a_y \cdot w_y} = \frac{a_x}{a_y}$
- ▶ **Absolute advantage (a.a.)**

$$a_x < a_x^*$$

Country H has an a.a. in the production of good x

- ▶ **Comparative advantage (c.a.)**

$$\frac{a_x}{a_y} < \frac{a_x^*}{a_y^*}$$

Country H has an c.a. in the production of good x

The Ricardian model (cont.)

Comparative advantage and trade flows prediction

Country H exports good x if $\frac{a_x}{a_y} < \frac{a_x^*}{a_y^*}$

Proof

$$\text{If } \frac{a_x}{a_y} < \frac{a_x^*}{a_y^*} \iff \frac{p_x^A}{p_y^A} < \frac{p_x^{*A}}{p_y^{*A}}.$$

This implies that $M_x < 0$ and $M_y > 0$. Country H exports good x and imports good y . Country F does the opposite.

The Ricardian model with a continuum of goods

- ▶ Ricardo's insight can be extended to a world with many goods. Dornbusch, Fischer and Samuelson, (*AER*, 1977) provide a tractable version (let's call it the DFS model).
- ▶ **Environment and Endowments:** There are two countries (H and F , the latter indicated with a $*$) and n goods ($j \in [1, n]$) produced with labor. Denote the endowments of labor by L and L^* . All markets are perfectly competitive.
- ▶ **Technology:** Unit labor requirements for good j in country H are given by $a_j \equiv \frac{L_j}{X_j}$, while in country F , $a_j^* \equiv \frac{L_j^*}{X_j^*}$. Without loss of generality we can index goods such that

$$\frac{a_1}{a_1^*} > \dots > \frac{a_j}{a_j^*} > \dots > \frac{a_n}{a_n^*}.$$

- ▶ **Preferences:** Preferences are Cobb-Douglas ($\sum_{j=1}^n b_j = 1$) and identical in both countries, with a share $b_j = b_j^*$ of income going to good j .
- ▶ **Continuum of goods:** Goods are described in a continuum (move from a discrete space to a continuous space): $j \in [1, n] \Rightarrow z \in [0, 1]$.

$$A(z) \equiv \frac{a^*(z)}{a(z)}.$$

Where $A'(z) < 0$: is a decreasing function of z .

The Ricardian model with a continuum of goods (2)

- ▶ The cost of producing good z in country H is given by $w \cdot a(z)$. Perfect competition ensures that good z is produced in H if and only if $a(z) \cdot w \leq a^*(z) \cdot w^*$, or if and only if $z < \tilde{z}$, where $\tilde{z}$ is such that

$$\omega = \frac{w}{w^*} = A(z). \quad (1)$$

- ▶ Let's use the **balanced trade** equation. Since there are no profits in equilibrium, defining $\theta(\tilde{z}) = \int_0^{\tilde{z}} b(z) dz > 0$ the fraction of world income spent in goods produced in country H , and $1 - \theta(\tilde{z}) = \int_{\tilde{z}}^1 b(z) dz > 0$ the fraction of world income spent in goods produced in country F .
 $0 < \theta(\tilde{z}) < 1$.

- ▶ H GDP is (income=value of production)

$$w \cdot L = \theta(\tilde{z})(w \cdot L + w^* \cdot L^*)$$

dividing by $w^* \cdot L$, we obtain

$$\omega = \frac{w}{w^*} = \theta(\tilde{z})\left(\omega + \frac{L^*}{L}\right) \longrightarrow \omega(1 - \theta(\tilde{z})) = \theta(\tilde{z}) \cdot \frac{L^*}{L}$$

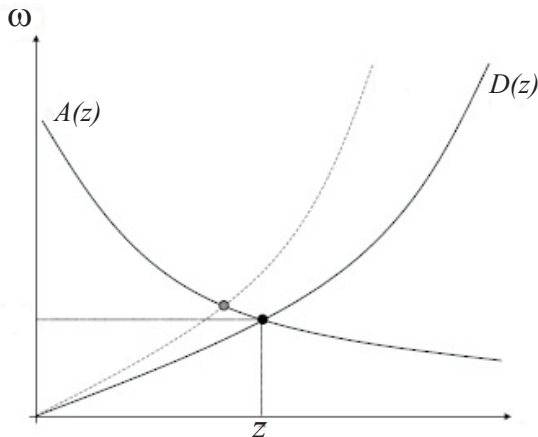
- ▶ so, finally we obtain

$$\omega = \frac{w}{w^*} = \frac{\theta(\tilde{z})}{1 - \theta(\tilde{z})} \cdot \frac{L^*}{L} = D(\tilde{z}, \frac{L^*}{L}). \quad (2)$$

- ▶ (1) and (2) define a system of two equations in two unknowns, $\tilde{z}$ and ω .

The Ricardian model with a continuum of goods (3)

- The figure below illustrates the equilibrium. Remember that the curve $A(z)$ is monotonically decreasing in z . On the other hand, $D(\tilde{z}, \frac{L^*}{L}) > 0$ is monotonically increasing in z . But note also that $D(0) = 0$ and $\lim_{z \rightarrow 1} = +\infty$. Hence, an equilibrium exists and is unique.



DFS Model: comparative statics

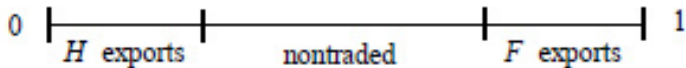
- ▶ Suppose that **population in F increases**. From the point of view of H , you can interpret this as trade integration with a larger country.
- ▶ As illustrated in the Figure above, this leads to a fall in the set of goods produced in H (H loses industries), but to an increase in the relative wage in H .
- ▶ It is easy to see that H is better off. Real income in terms of goods produced in H before and after the rise in L^* is unaffected, while it rises for all other goods.
- ▶ Workers in F lose, because their real wage in terms of goods produced in F before and after trade does not change, but it declines in terms of all other goods.
- ▶ Note that with technology being fixed, there is a one-to-one mapping between changes in the terms-of-trade and changes in welfare.

DFS Model: comparative statics

- ▶ Suppose that **technology in F increases**.
- ▶ This leads to a fall in the set of goods produced in H (H loses industries), and to a decrease in the relative wage in H .
- ▶ It is easy to see that H is worst off. Real income in terms of goods produced in H before and after the rise in L^* is reduced.

DFS Model: comparative statics

- ▶ Let's now introduce **trade costs**.
- ▶ If melting iceberg transport costs are present. In this event the specialization pattern is as follows:



DFS Model and the gravity equation

- The trade volume is

$$2w^*L^*\theta(\tilde{z}) = \frac{(2w^*L^*)(wL)}{(w^*L^*) + (wL)} = 2\frac{YY^*}{Y^w}, \quad (3)$$

where Y denotes GDP.

- Hence, the DFS model predicts a simplified version (with no trade frictions) of the so-called **gravity equation**.
- It can easily be shown that any model with complete specialization, homothetic preferences, and no trade barriers delivers this prediction.