International Trade Theory and Policy

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The Ricardian Model of Comparative Advantage and the Gains from Trade

David Ricardo, 1772-1823

Outline

1. Ricardian model of an economy in autarky
    - Production possibilities, relative prices, optimal output bundle
    - Measuring GDP using the beer theory of value
2. Gains from trade
    - Comparative advantage
    - Gains from exchange and from specialization
3. The terms of trade—how the gains are divided
    - Determinants and sources of change in the TOT
4. Relative wages and productivity—Krugman's myths
5. Comparative advantage in a model with many goods
6. Topics for discussion

The Ricardian Production Possibility Frontier

A model of an economy with two goods, cloth (C) and beer (B), and one factor of production, labor (L). Technology is represented by the labor requirement per unit output (a_{LC} and a_{LB}).

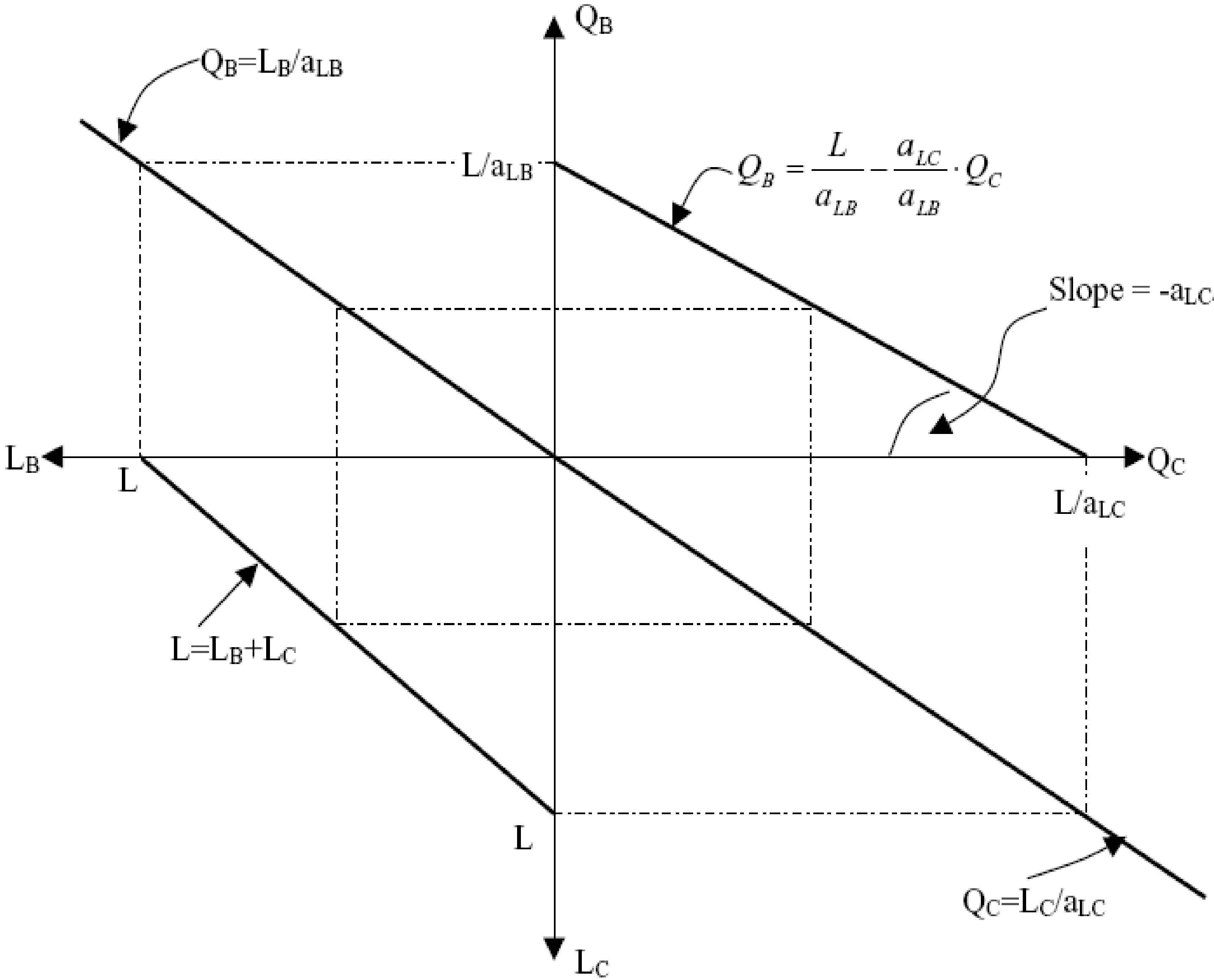
(1) $$Q_C = Q_C(L_C) = \frac{L_C}{a_{LC}}$$ Production function for cloth

(2)) $$Q_B = Q_B(L_B) = \frac{L_B}{a_{LB}}$$ Production function for beer

(3) $$L = L_C + L_B = Q_C \cdot a_{LC} + Q_B \cdot a_{LB}$$ Endowment constraint

(4) $$Q_B = \frac{L}{a_{LB}} - \frac{a_{LC}}{a_{LB}} \cdot Q_C$$ Production possibility frontier

Diagrammatic illustration of the Ricardian PPF



Relative prices in autarky

Autarky Equilibrium

The classical labor theory of value holds that relative prices of goods reflect the relative amounts of labor required to produce the goods. It is easy to see the logic of this proposition in the context of the Ricardian model. In competitive markets where there is no excess profit, price equals the unit cost of production. In this model:

(5) $$P_C = a_{LC} \cdot w_C$$ (6) $$P_B = a_{LB} \cdot w_B$$

where w_C and w_B are the wage rates in the cloth and beer sectors. If the labor market is perfectly competitive, then wages will be the same in both sectors ($w_B = w_C$), from which it follows that:

(7) $$\frac{P_C}{P_B} = \frac{a_{LC}}{a_{LB}}$$

Finding the optimal production bundle

So far we have determined production possibilities and relative prices, but we still do know which of all the production possibilities is the optimal one. Which of all the production possibilities maximizes social welfare? To answer this question we have to define consumer preferences, using the social welfare function and its graphical analogue, the community indifference curve. The consumers maximize their utility function subject to their budget constraint:

$$(8) \qquad \max \; U = U(Q_C, Q_B) \qquad (9) \qquad subject \;\; to \;\; Q = P_C \cdot Q_C + P_B \cdot Q_B$$

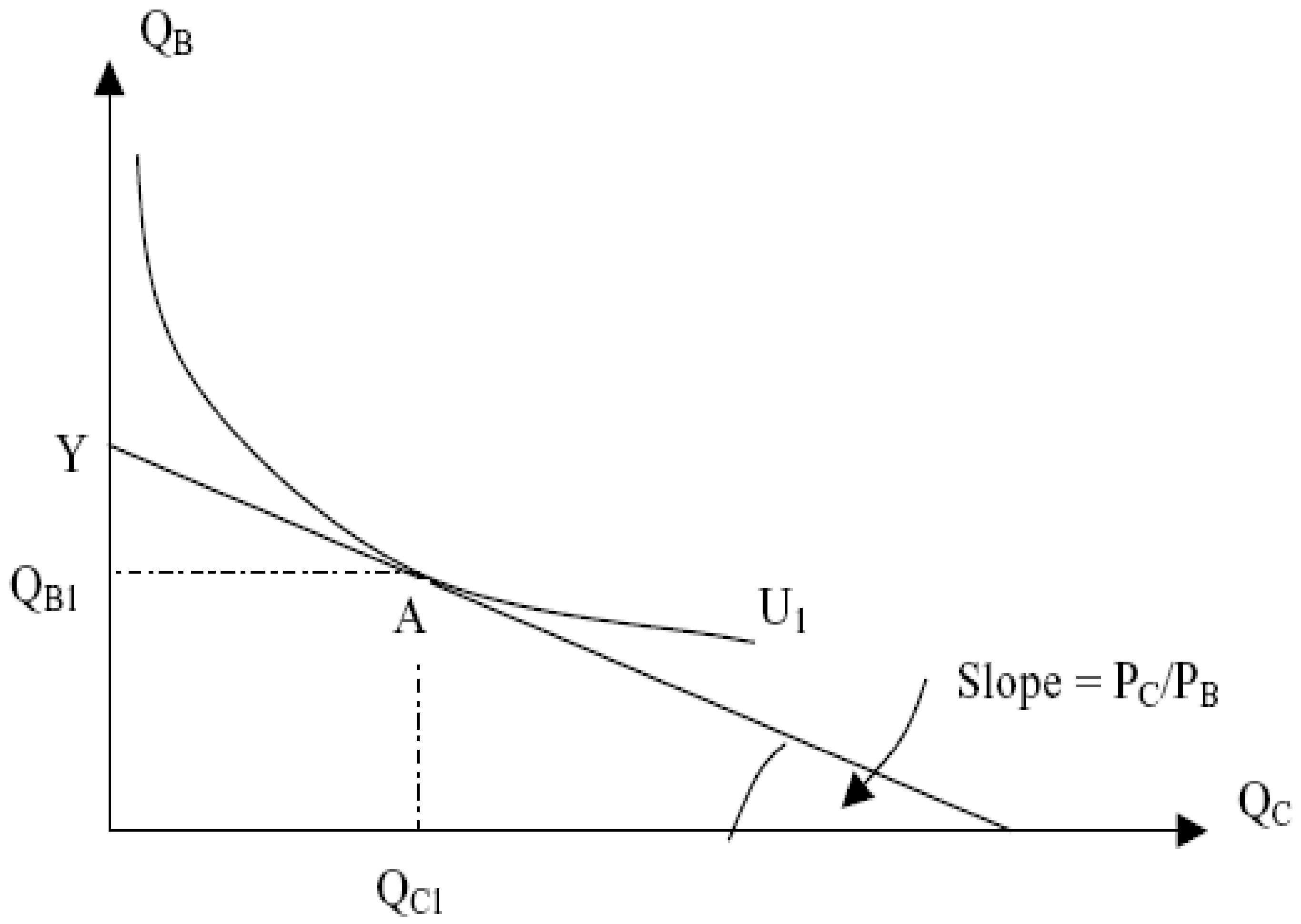
Consumption is constrained in a closed economy by what the country can produce, aggregate value of which is GDP (Q). The first-order condition for a maximum is:

$$(10) \qquad \frac{\delta U}{\delta Q_C} = P_C \qquad and \qquad \frac{\delta U}{\delta Q_B} = P$$

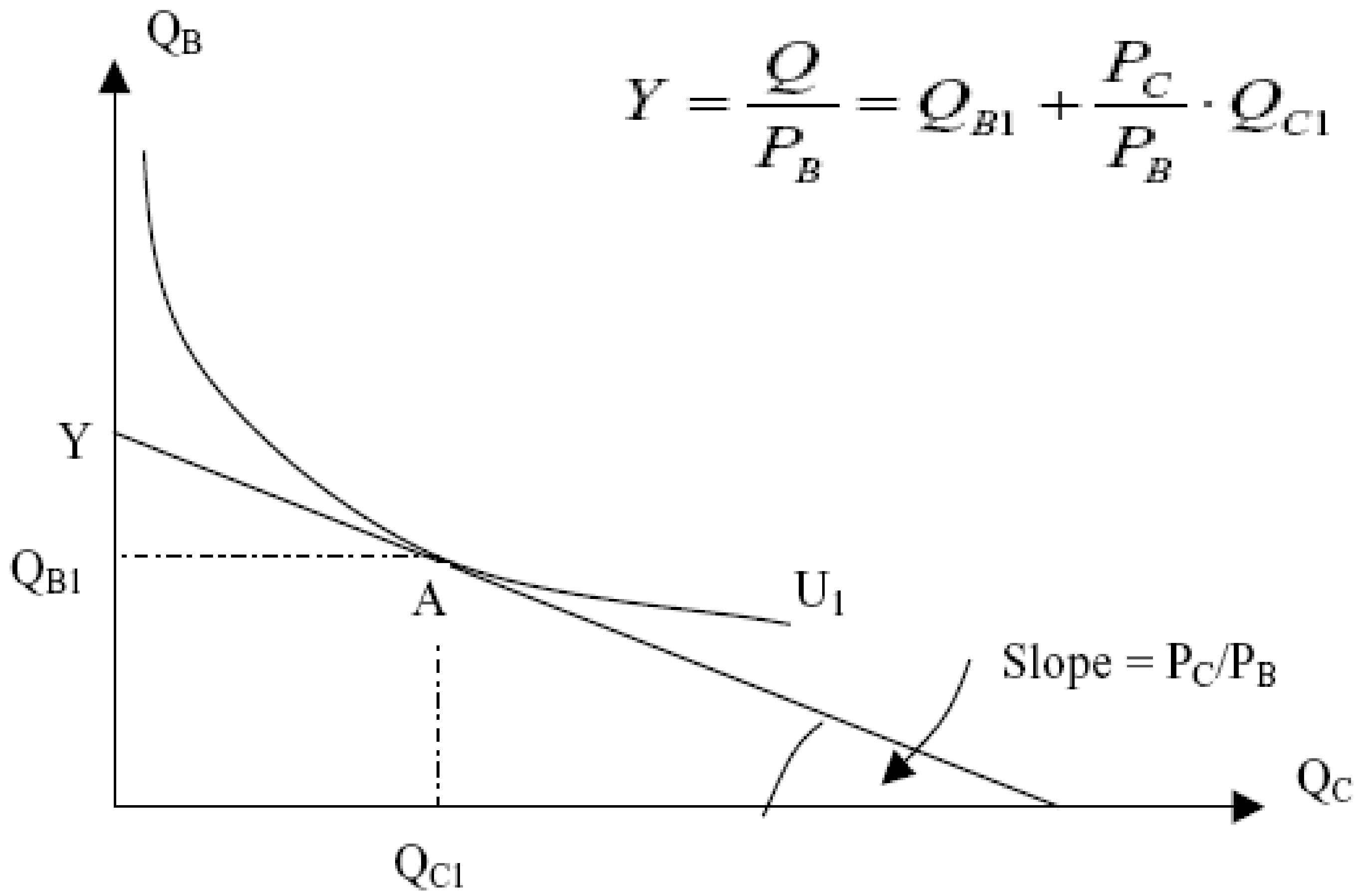
This implies that the marginal rate of substitution (MRS), illustrated by the slope of the indifference curve, is equal to relative prices, which in turn are equal to the ratio of technical coefficients:

$$(11) \qquad MRS = \frac{\partial Q_B}{\partial Q_C} = \frac{\partial U / \partial Q_C}{\partial U / \partial Q_B} = \frac{MU_C}{MU_B} = \frac{P_C}{P_B} = \frac{a_{LC}}{a_{LB}}$$

Illustration of the optimal output bundle in autarky

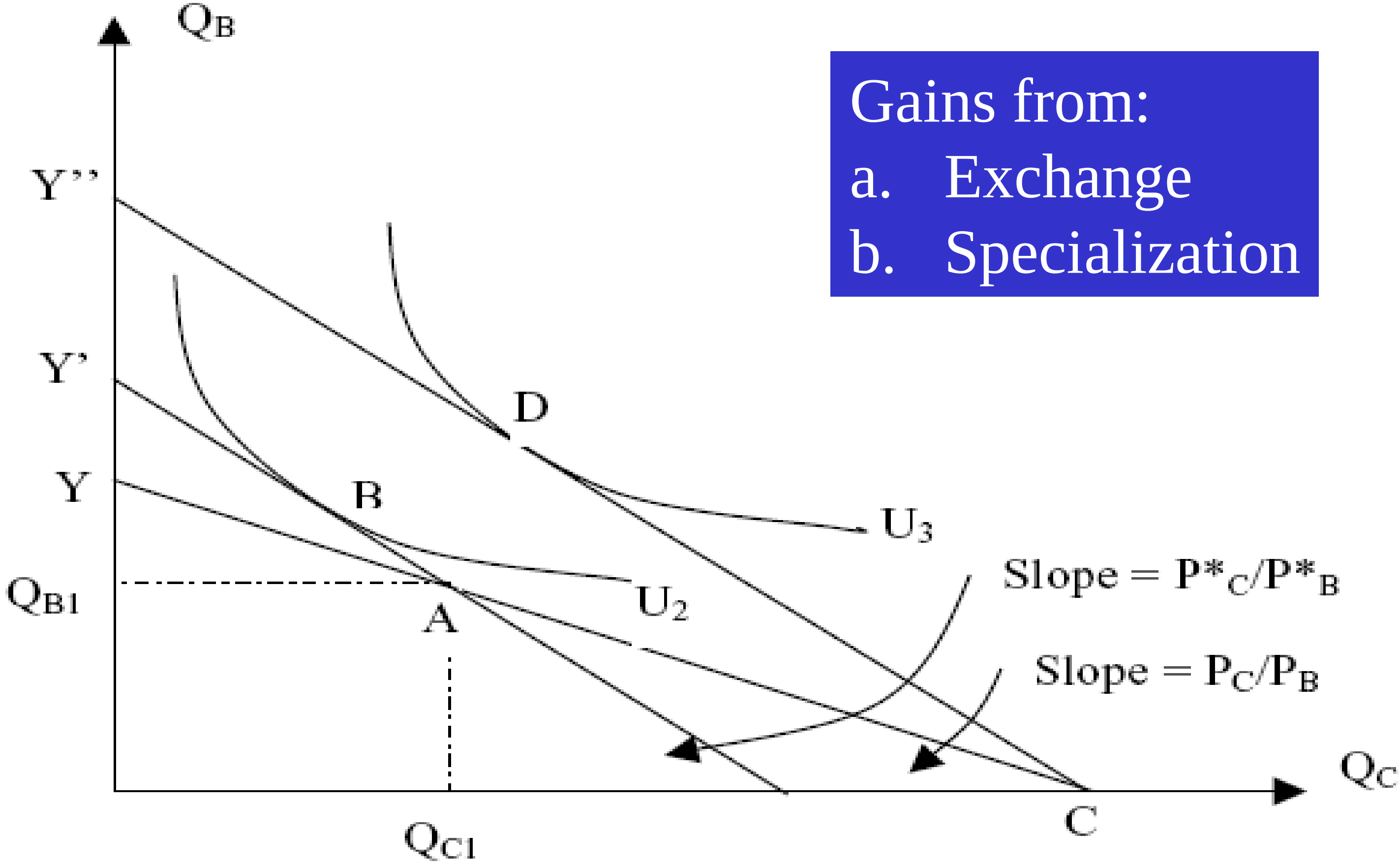


Measuring GDP in autarky



Gains from trade

$$\text{If} \quad \frac{P_C^*}{P_B^*} > \frac{P_C}{P_B} \quad \text{then} \quad \frac{a_{LC}^*}{a_{LB}^*} > \frac{a_{LC}}{a_{LB}} \quad \text{or} \quad \frac{a_{LC}^*}{a_{LC}} > \frac{a_{LB}^*}{a_{LB}}$$



Gains from:

a. Exchange
b. Specialization

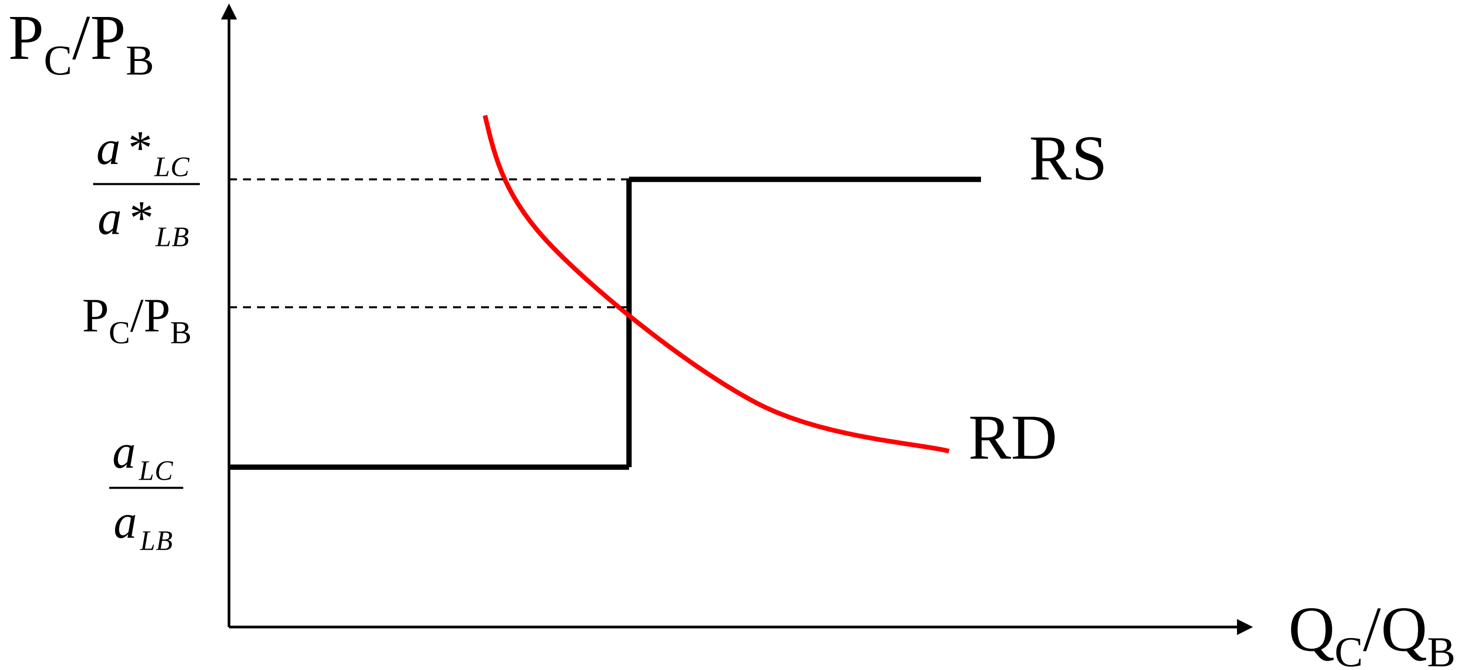
The gains from specialization

$$Y' = \frac{L_{B1}}{a_{LB}} + p^* \cdot \frac{L - L_{B1}}{a_{LC}} \qquad where \quad p^* = \frac{P_C^*}{P_B^*} = \frac{a_{LC}^*}{a_{LB}^*}$$

$$Y'' = p^* (\frac{L}{a_{LC}})$$

$$Y'' - Y' = p^* (\frac{L}{a_{LC}}) - \frac{L_{B1}}{a_{LB}} - p^* (\frac{L - L_{B1}}{a_{LC}}) = (p^* - p) \frac{L_{B1}}{a_{LC}} \qquad where \quad p = \frac{P_C}{P_B} = \frac{a_{LC}}{a_{LB}}$$

Determining the TOT using Relative Supply and Demand

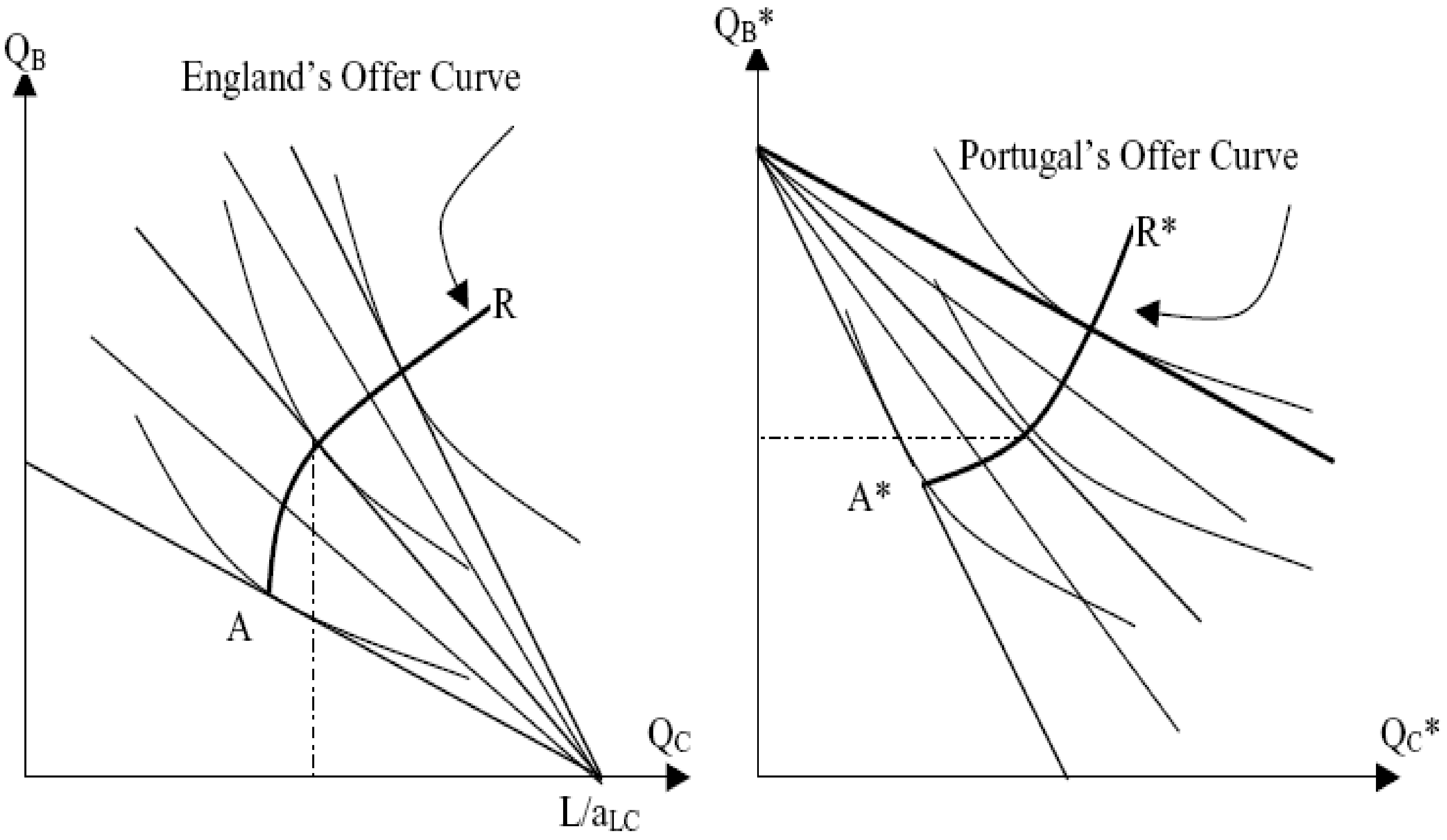


$$If\ \frac{P_C}{P_B} < \frac{a_{LC}}{a_{LB}}\ then\ Q_C = 0$$

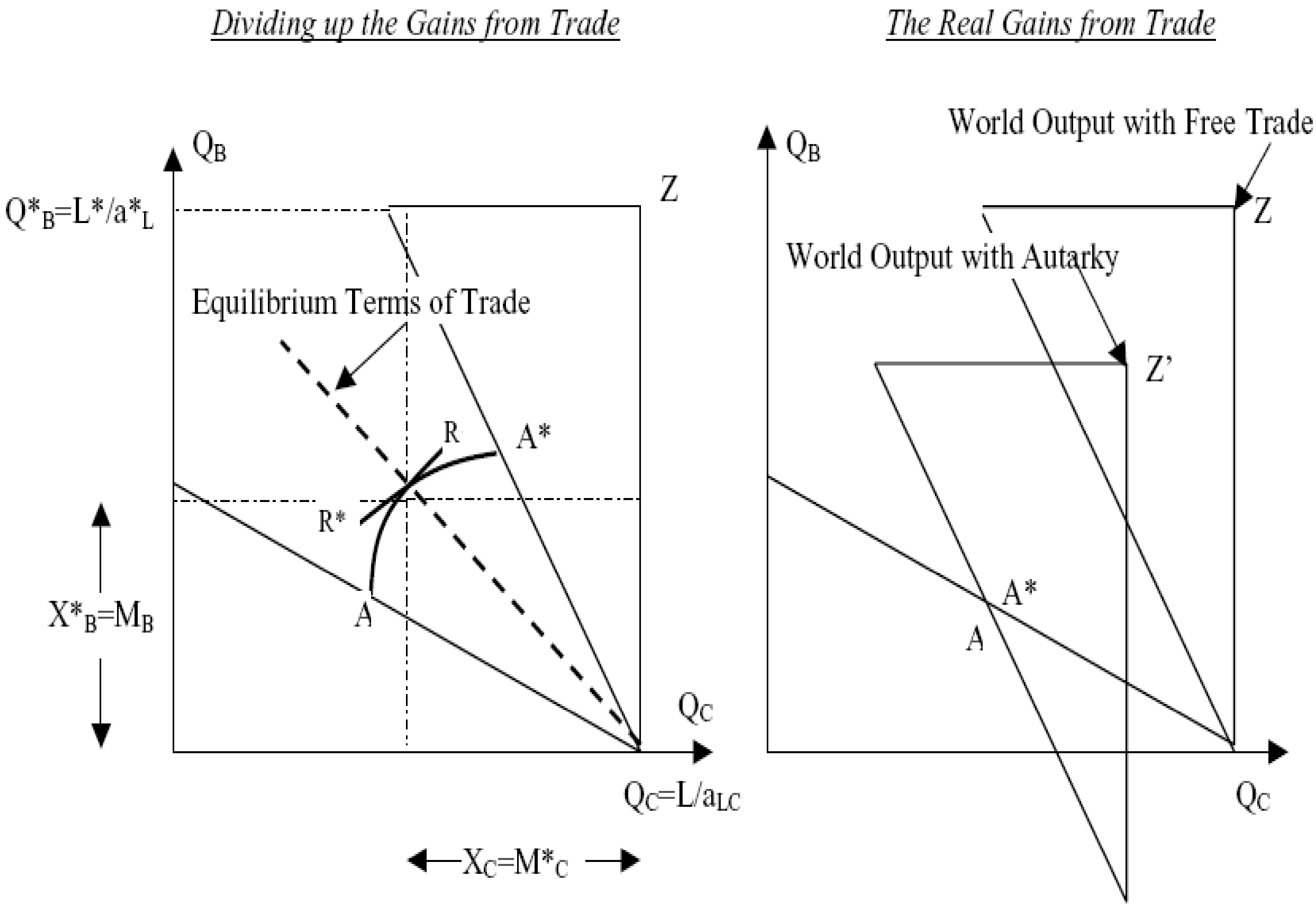
$$If\ \frac{P_C}{P_B} > \frac{a^*_{LC}}{a^*_{LB}}\ then\ Q_B = 0$$

$$If\ \frac{a_{LC}}{a_{LB}} < \frac{P_C}{P_B} < \frac{a^*_{LC}}{a^*_{LB}}\ then\ Q_C = \frac{L}{a_{LC}},\ \ Q_B = \frac{L^*}{a^*_{LB}}$$

Determining the TOT using Offer Curves: Step One



Determining the TOT using Offer Curves: Step Two



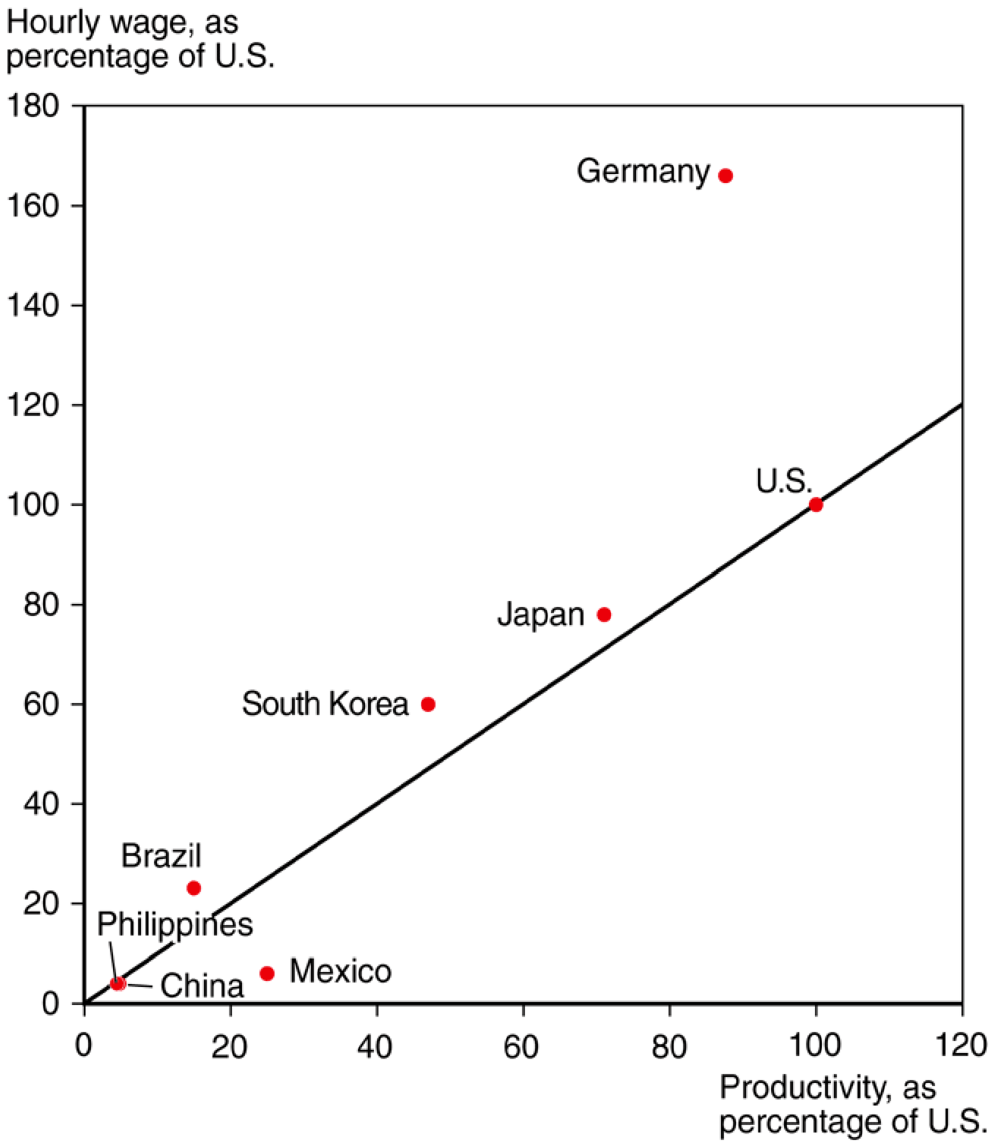
Productivity and Wages

Relative wages depend on relative labor productivity in the industry in which the countries are specialized

$$w = \frac{Y_B}{L} = \frac{P_C}{P_B} \cdot \frac{Q_C}{L} = \frac{P_C}{P_B} \cdot \frac{1}{a_{LC}}$$

$$w^* = \frac{Y_B^*}{L^*} = \frac{Q_B^*}{L^*} = \frac{1}{a_{LB}^*}$$

$$\frac{w}{w^*} = \frac{P_C}{P_B} \cdot \frac{a_{LB}^*}{a_{LC}}$$

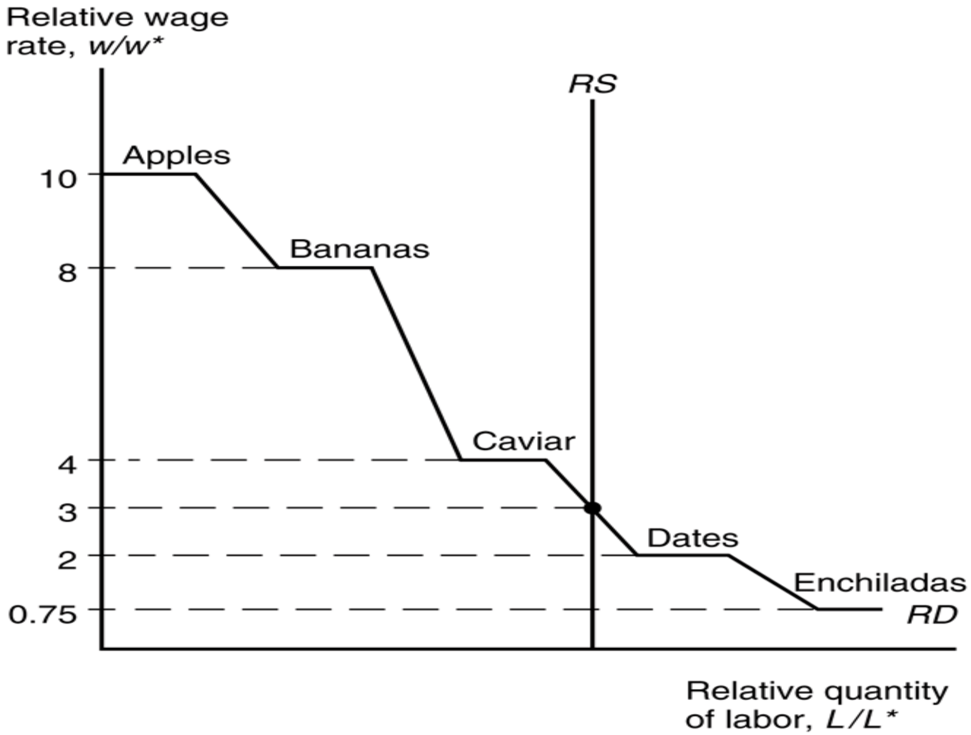


Source: International Monetary Fund, Bureau of Labor Statistics, and The Conference Board

Comparative advantage in a model with many goods

TABLE 3-2 Home and Foreign Unit Labor Requirements

Good	Home Unit Labor Requirement a_{Li}	Foreign Unit Labor Requirement (a^*_{Li})	Relative Home Productivity Advantage (a^*_{Li}/a_{Li})
Apples	1	10	10
Bananas	5	40	8
Caviar	3	12	4
Dates	6	12	2
Enchiladas	12	9	0.75



Topics for Discussion

1. Country's gain by following comparative advantage. Is the same true for corporations? Will they succeed if they have a comparative advantage? Or, do they need an absolute advantage? How about in tennis?

2. Why is comparative advantage a "dangerous idea" according to many people?

3. Is it fair that U.S. workers have to compete with Chinese workers whose wages are one-fifth the level of U.S. workers?

4. Is it fair that fair that the average Chinese worker has to work five times longer than the average U.S. worker to produce products that exchange for the same value?