RICARDIAN MODEL

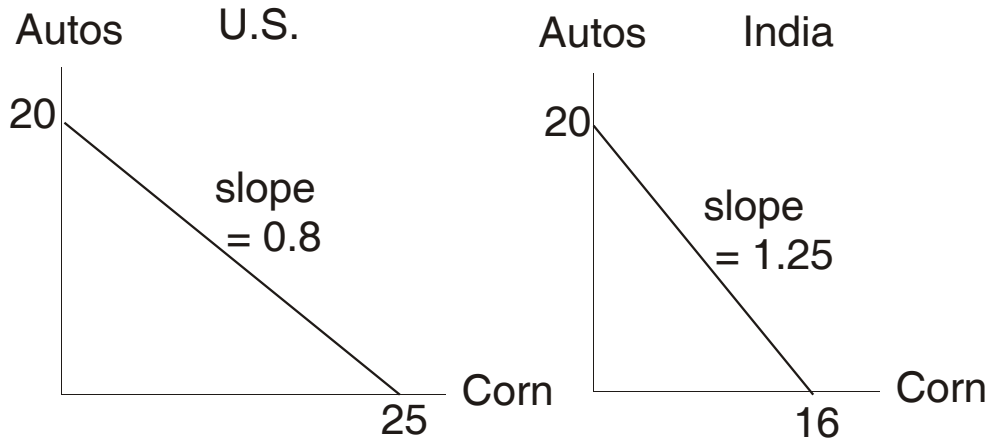
Simplest and earliest (1817) complete model of production and trade
Source of comparative advantage and trade:
differences in production technologies across countries
Note: these are differences in production functions,
not differences in labor productivities due to different endowments of capital
That type of model (Heckscher-Ohlin) will be taken up later

Simple version for exposition: Two countries, two goods.
Labor only factor of production. Endowments given, confined to country but intersectorally mobile within each country.
Constant returns to labor. Perfectly competitive markets.
Numerical example:

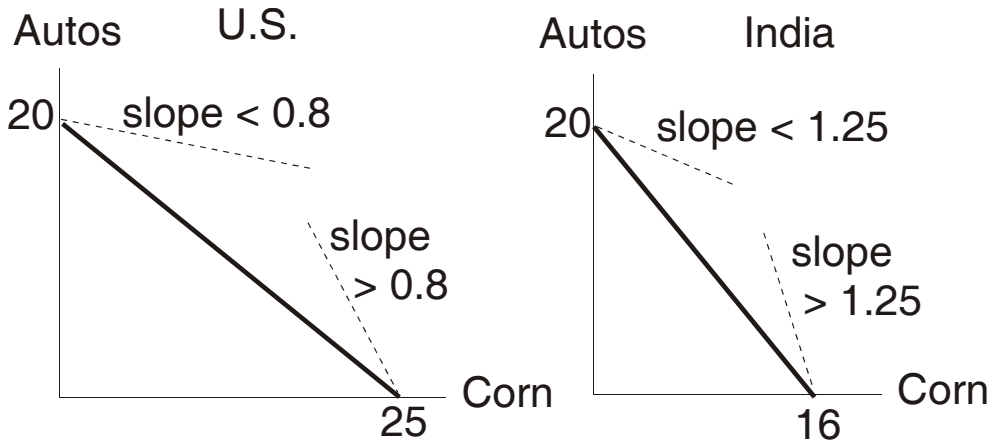
	US	India
Labor force	200	800
Labor per unit corn	8	50
Labor per unit auto	10	40

PRODUCTION POSSIBILITY FRONTIERS

PPFs in the two countries:



Supply in the two countries:



Notation: $P = P_C / P_A$, relative price of corn, $R = Q_C / Q_A$, relative quantity of corn

Production and supply:

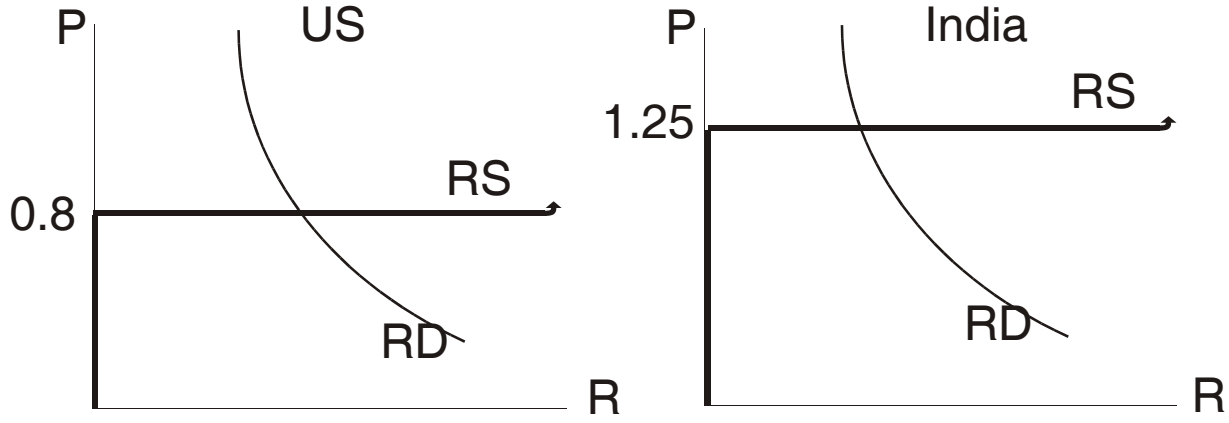
US: If $P < 0.8$, $Q_C = 0$, $Q_A = 20$, $R = Q_C / Q_A = 0$.

If $P = 0.8$, Q_C , Q_A can be anywhere on PPF, $0 < Q_C / Q_A < \infty$.

If $P > 0.8$, $Q_C = 25$, $Q_A = 0$, $R = Q_C / Q_A = \infty$.

India similar, with crucial value of $P = 1.25$.

Autarkic equilibria in two countries:



Relative price of corn is lower in the US, relative quantity consumed is higher.

TRADE

Relative supply:

When P < 0.8, both countries produce only autos, world ratio R = 0

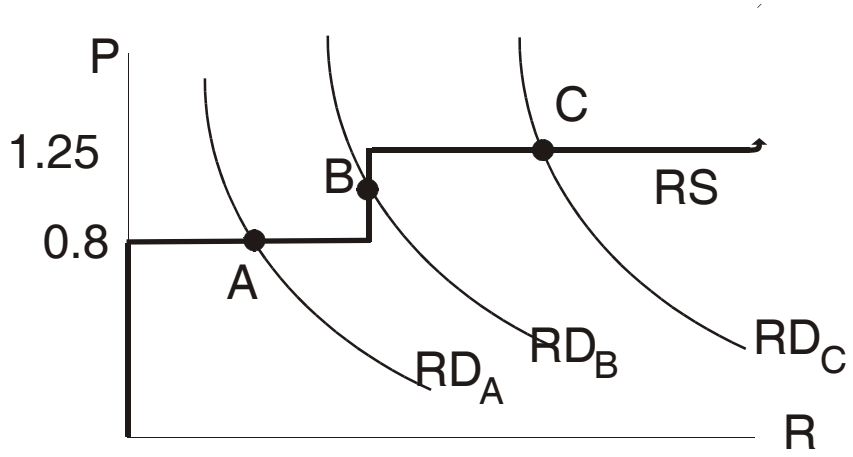
When 0.8 < P < 1.25, US produces 25 corn, India produces 20 autos, R = 1.25

When P > 1.25, both countries produce only corn, R = ∞.

When P = 0.8, India produces 20 autos. US varies between 20 autos, no corn (world R = 0), and 0 autos, 25 corn (world R = 1.25)

When P = 1.25, similarly world R can be anywhere between 1.25 and ∞.

Depending on position of relative demand, the trading equilibrium can be one of three types: complete specialization (B) or incomplete (A, C).

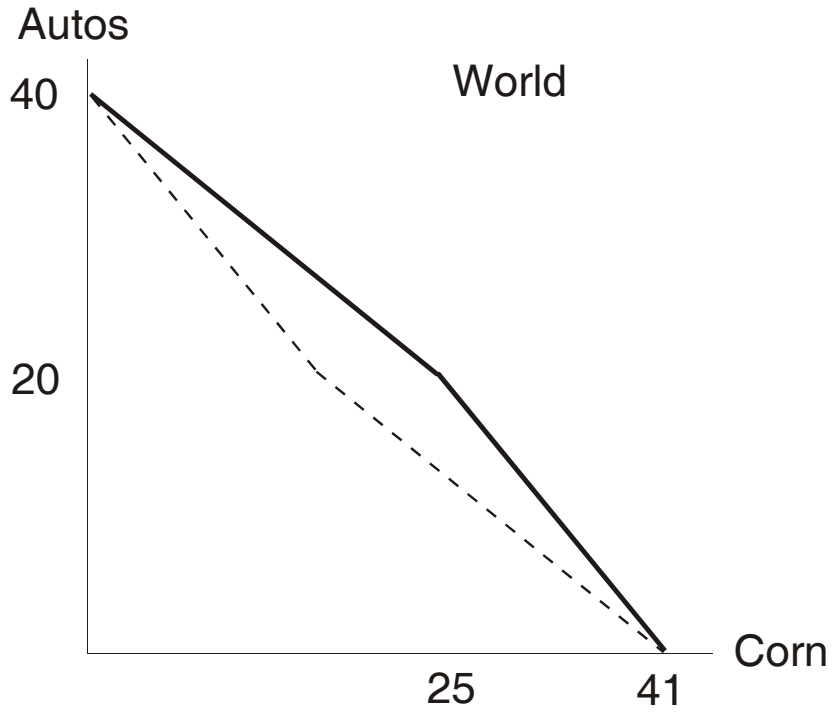


A: P = 0.8. US produces both goods, India autos

B: 0.8 < P < 1.25, US produces only corn, India only autos

C: P = 1.25. US produces only corn, India produces both goods.

EFFICIENT PRODUCTON AND WORLD PPF



Suppose initially all labor produces autos in both (40 in all). If any corn is to be produced, it is better to do so by switching some labor in the US: each auto not produced releases 10 labor which can then produce 10/8 = 1.25 corn. In India each less auto yields only 40/50 = 0.8 more corn. Only when all US labor has been diverted to producing corn should any Indian labor be switched.

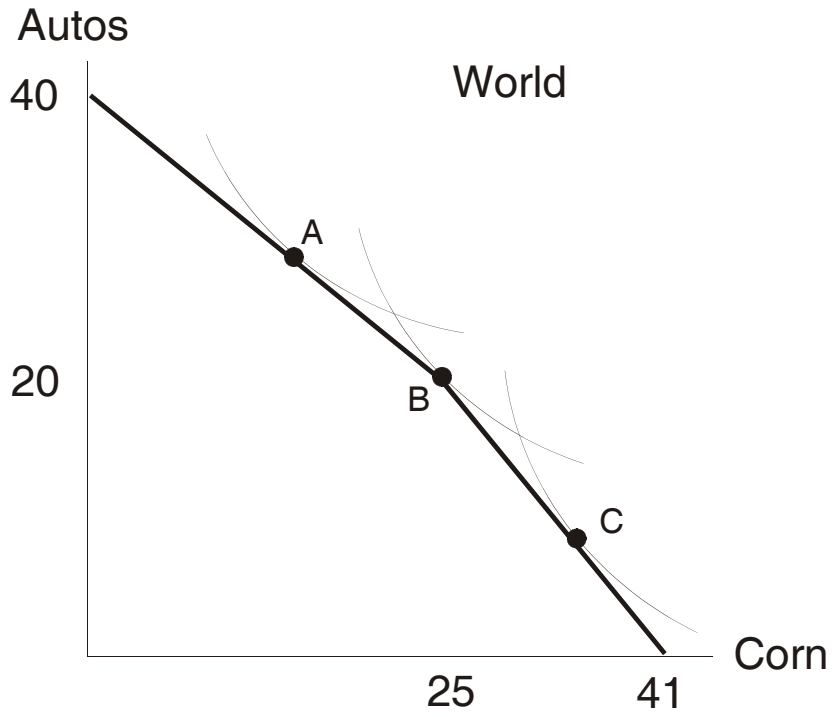
Conversely, starting with all corn (41 units), to produce any autos, Indian labor should be switched.

This despite the US producing autos more efficiently than India: only 10 units of labor against 40. The reason: the US produces corn *even more* efficiently: only 8 units of labor against 50. What matters is the ratio: 10/8 > 40/50, or 10/40 > 8/50.

World PPF: juxtapose the country PPFs as the outer (thicker) lines.
"Wrong" assignment of production would yield the less efficient inner (dashed) lines.

If preferences are identical and homothetic everywhere,
we can draw world indifference curves.
Depending on their shape, three types of outcomes:

A: US produces both goods
India produces only autos
B: US produces only corn
India produces only autos
C: US produces only corn
India produces both goods



Relative price of corn = slope of PPF
0.8 in A, 1.25 in C
between 0.8 and 1.25 in B

To sum up: Equilibrium/efficient
pattern of production determined
by *comparative*, not *absolute* advantage.

Absolute advantage: Lower labor requirement per unit of output

Comparative advantage: Country R has comparative advantage over country B in good X as against good Y if the ratio of unit labor requirement for X to that for Y is smaller in country R than in country B.

WAGES

Under constant returns to scale,
P = MC = AC for each good produced, < if not produced.

Autarky: US produces both goods: $P^{U,A}_C = 8\ W^{U,A}$, $P^{U,A}_A = 10\ W^{U,A}$
Each US worker can buy $W^{U,A}/\ P^{U,A}_C = 1/8$ corn, or $W^{U,A}/\ P^{U,A}_A = 1/10$ auto
India produces both goods: $P^{I,A}_C = 50\ W^{I,A}$, $P^{I,A}_A = 40\ W^{I,A}$
Each Indian worker can buy $W^{I,A}/\ P^{I,A}_C = 1/50$ corn, or $W^{I,A}/\ P^{I,A}_A = 1/40$ auto

Free trade: Consider type B equilibrium. For definiteness, let $P^T_C / P^T_A = 1$ $P^T_C = P^T_A$
Important: No country label here; world market for goods, same price
US produces only corn: $P^T_C = 8\ W^{U,T}$, $P^T_A < 10\ W^{U,T}$
Each US worker can buy $W^{U,T}/\ P^T_C = 1/8$ corn, or $W^{U,T}/\ P^T_A > 1/10$ auto
India produces only autos: $P^T_C < 50\ W^{I,T}$, $P^T_A = 40\ W^{I,T}$
Each Indian worker can buy $W^{I,T}/\ P^T_C > 1/50$ corn, or $W^{I,T}/\ P^T_A = 1/40$ auto

Labor in both countries is better off in trade than in autarky: can buy more of the good *no longer produced*. Benefit of trade: ability to buy cheaper imports!

In A, C types, the country producing both goods has no gain, but no loss either.

Main findings:

[1] Rival claims: US: We can't compete with low-wage Indian labor
India: We can't compete with highly productive US labor
are both wrong: Wages adjust; US continues to compete in corn, India in autos.

[2] This model has only one factor in each country, and mobile across sectors:
therefore no distributive conflict over trade.
Reminder: different models have different uses. This one is useful
for clarifying the idea of comparative advantage in the simplest way.

[3] Absolute advantage does matter: it affects the standard of living.
Here each US worker can buy much more than each Indian worker,
whether we compare the two in autarky, or compare them with trade.
But it does not matter for determining which goods to produce where,
and therefore for the pattern of trade, nor for existence of gains from trade.
Distinct comparisons: (a) Is US richer than India? Absolute advantage is relevant.
(b) Does US gain from trade with India? Comparative advantage is relevant.

[4] Different types A, B, C of equilibria also can arise for supply side reasons:
(one country much larger or much more productive than the other).

GENERAL ALGEBRAIC RESTATEMENT

Notation: Countries Home and Foreign; foreign variables denoted by asterisks.
Trading prices etc. denoted by superscript T.

Labor endowments L, L* . Wages W, W*
Two goods X and Y. Prices P_X , P_Y
Unit labor inputs A_X , A_Y in home, A^*_X , A^*_Y in Foreign.
(Conversely, $1/A_X$ etc. are labor productivity parameters.)
Choose labels so that $A_X / A_Y < A^*_X / A^*_Y$ (equivalently $A_X / A^*_X < A_Y / A^*_Y$)
This is the definition here of home having comparative advantage in X
Relative price of X: $P = P_X/P_Y$, Relative quantity ratio $R = X/Y$.

Home PPF: $A_X X + A_Y Y = L$, slope A_X / A_Y
Foreign PPF: $A^*_X X^* + A^*_Y Y^* = L^*$, slope A^*_X/A^*_Y

Relative demands identical, $X/Y = f(P_X/P_Y)$.

AUTARKY:

Home: $P_X = W\,A_X$, $P_Y = W\,A_Y$; $W/P_X = 1/A_X$, $W/P_Y = 1/A_Y$; $P = A_X / A_Y$

Foreign:

$P^*_X = W^*\,A^*_X$, $P^*_Y = W^*\,A^*_Y$; $W^*/P^*_X = 1/A^*_X$, $W^*/P^*_Y = 1/A^*_Y$; $P^* = A^*_X/A^*_Y$

So Home has lower relative price of X in autarky than does Foreign:
comparative advantage concept again.

TRADE: Common price $P^T = P^T_X / P^T_Y$

(Note: each country may use different currencies / units of account
so both prices in one may be equiproportionately higher than in the other.)

Home produces X, may or may not produce Y.
Foreign produces Y, may or may not produce X.

Home: $P^T \geq A_X / A_Y$; $P^T_X = W^T\,A_X$, $P^T_Y \leq W^T\,A_Y$; $W^T/P^T_X = 1/A_X$, $W^T/P^T_Y \geq 1/A_Y$

Foreign:

$P^T \leq A^*_X / A^*_Y$; $P^T_X \leq W^{*T}\,A^*_X$, $P^T_Y = W^{*T}\,A^*_Y$; $W^{*T}/\,P^T_X \geq 1 / A^*_X$, $W^{*T}/\,P^T_Y = 1 / A^*_Y$

Exercise: Reconfirm the findings of the numerical example
in this more general algebraic formulation.