

MODELS OF INTERNATIONAL TRADE

Each model examines one particular issue in greater detail and depth.
No one model captures the whole picture and should not be judged as such.
Each should be used for the insight or intuition it conveys on its focus issue.
A grand all-encompassing model can be built (& solved on computer for applying),
but it would be too complex to understand and learn from.

Next few weeks: traditional models. Their restrictions:

[1] Primary factors produce final goods directly; no “disintegration of production”.

[2] Factors are not internationally mobile; no migration or capital flows.

This is distinct from mobility of factors across sectors within a country.

Will explore degree of that mobility and implications for distributive conflict.

[3] Goods internationally tradeable, with restrictive policies, but no transport costs.

[4] Perfectly competitive markets: international for goods, domestic for factors.

This requires constant or diminishing returns to scale in production.

Country may be large player in trade but individual producers are small.

Many of the omitted or ignored features will be taken up later in the term.

THE GRAVITY MODEL

Simplest view of how much country i imports from country j:

$$\begin{aligned} M_{ij} &= \text{Expenditure of country } i * \text{ Fraction spent on goods of country } j \\ &= k Y_i * Y_j / Y_{\text{world}} \end{aligned}$$

Correct this to reflect impediments to trade, e.g. transport costs, and we have

Trade between i and j proportional to

Product of their GDPs / Function of “distance” between them

Gravity model!

This holds up well empirically, in fact as well as many models that specify the structure of production in much greater detail. But structural specification is important for interpreting the effects of trade and deriving policy implications.

Weak points of the Gravity Model:

- [1] does not determine endogenously which country produces which goods,
- [2] does not tell us how trade will affect factor incomes,
- [3] requires various ad hoc adjustments for fitting to data.

For empirical estimation, the concept of “distance” must be interpreted not just in the physical sense but an economic sense. Distance within a country matters much less than distance across borders, having a common border or not makes a difference, preferential trade agreements and common currencies matter, etc.

One of the best estimated equation is (Baier and Bergstrand, J Int Econ 2001):

$$\begin{aligned} \Delta \ln X_{ij} = & \frac{0.05}{(0.09)} + \frac{2.37}{(6.29)} \Delta \ln(Y_i + Y_j) + \frac{0.60}{(1.74)} \Delta \ln(s_i s_j) \\ & - \frac{3.19}{(-2.71)} \Delta \ln(1 + a_{ij}) - \frac{4.49}{(-4.48)} \Delta \ln(1 + t_{ij}) \\ & - \frac{0.68}{(-2.83)} \Delta \ln(Y_j) - \frac{0.25}{(-2.69)} \Delta \ln(P_i^F / P_j^C) - \frac{0.08}{(-2.62)} \ln(P X_{ij}) \end{aligned}$$

with N = 240 and adjusted R² = 0.388. The notation is:

X_{ij} = export volume from i to j, Y_i, Y_j GDPs, $s_i = Y_i / (Y_i + Y_j)$

a_{ij} transport costs, t_{ij} tariff rates, P_i^F, P_j^C prod'n, cons'n price indexes

THE EXCHANGE MODEL

This assumes that each country has fixed endowment of finished goods.
Ignores production, specialization induced by trade;

focuses on trade to get preferred consumption mix.

But can be interpreted as a production model where *all* factors are specific to their uses; short-run (year or less) view of production.

Method of analysis: Edgeworth Box diagram of intermediate microeconomics, replacing the two individuals of that model by two countries!

When is it valid to treat a country as one consumer? Need exact aggregation:
demands independent of income distribution.

Commonly used sufficient condition:

all consumers in the country have identical homothetic preferences.

Indifference curves are radial replicas;

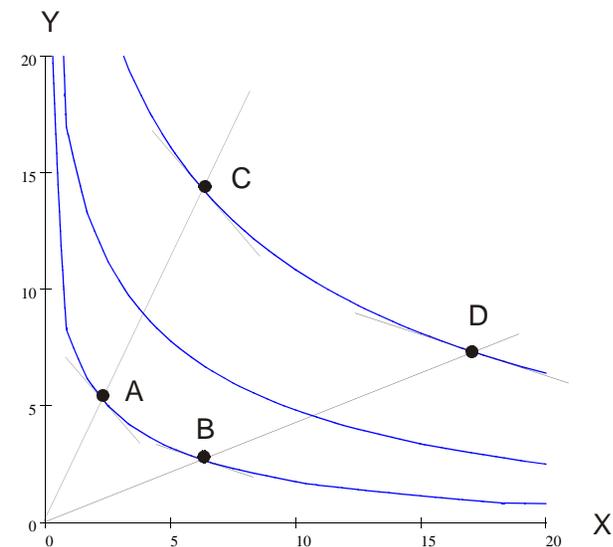
MRS constant along a radial line.

Individual demands $X_i = D_X(P_X, P_Y) I_i$

Incomes I_i differ, function D_X same for all.

Total demand $X = D_X(P_X, P_Y) \times \text{Total } I$

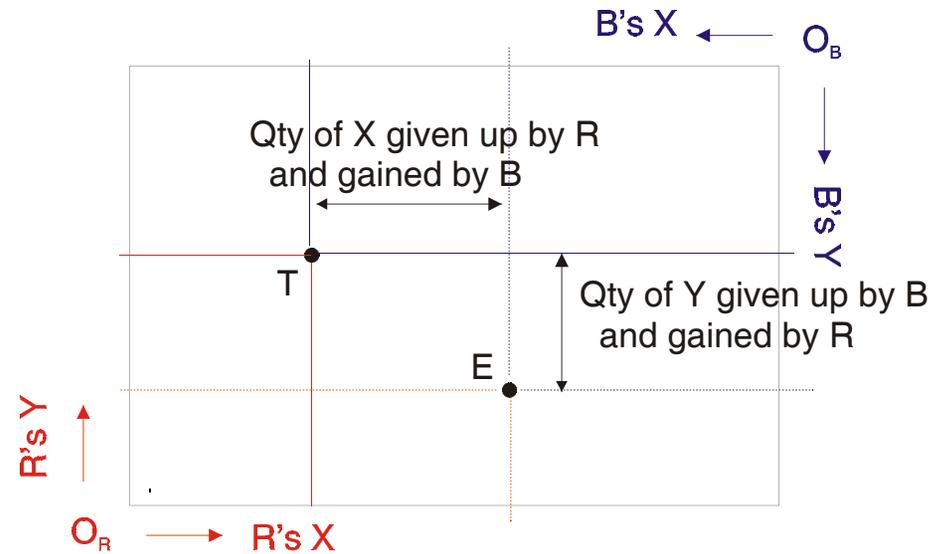
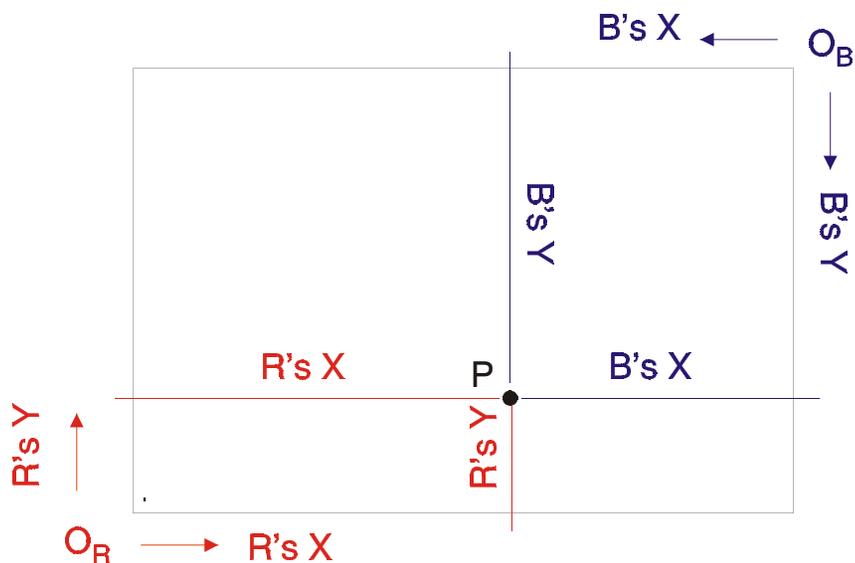
(Welfare judgments still need separate I_i .)



For ease of exposition only, assume 2 countries Red and Blue, 2 goods X and Y
 Rectangular box, lengths of sides X, Y equal to
 the total world fixed quantities of the two goods
 R's quantities read from origin O_R ; B's from origin O_B in the reverse direction

Each point P in the box shows an allocation of the two goods between the two countries (4 quantities)

Each move, as from E to T, is a reallocation or exchange or trade



In international trade context, “giving up” becomes “export”, “gaining” is “import”
 (But people's perception of the desirability of these is very different!)

MUTUALLY BENEFICIAL AND EFFICIENT TRADES

E is initial allocation (endowment, ownership)

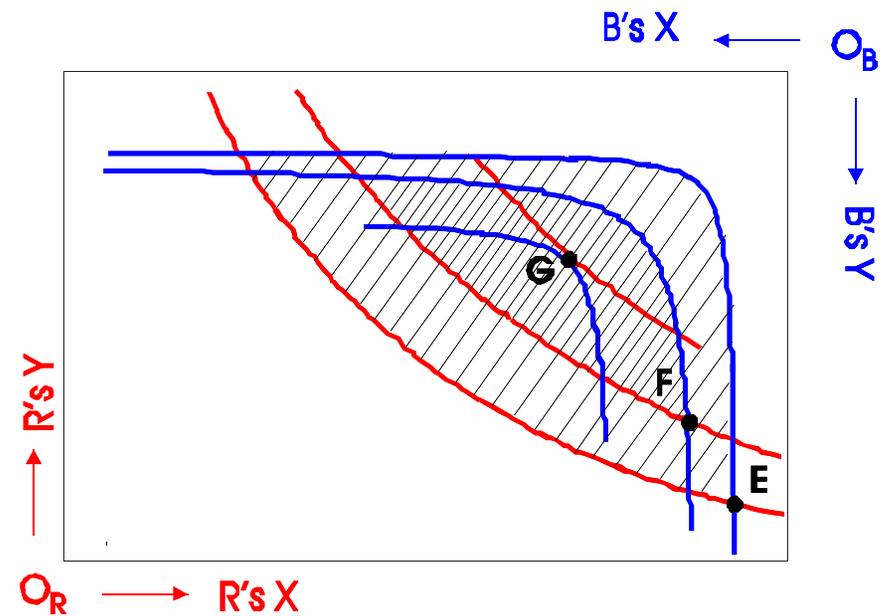
Move to F is mutually beneficial -

lies above the indifference curve through E for both R and B

(Remember B's quantities are measured from O_B in reverse direction, so B's utility increases toward the south-west and B's indifference curves are rotated 180°)

Trade from E to any point in shaded area is also mutually beneficial

Move to F still leaves open the possibility of further mutually beneficial trades in similar smaller double-shaded area



Now consider G. If a further trade from F to G (or a direct trade from E to G) is made, then there remains no possibility for further mutual benefit

Any further reallocation that R prefers makes B worse off, and vice versa

This is just the definition of Pareto efficiency, so G is Pareto efficient

Key test of the possibility or otherwise of trade: inequality or equality of MRS

At F, the MRS for the two countries are unequal

Therefore there exists scope for mutually beneficial trade

Country with the lower MRS of X to Y

values X relatively less than does B

So gives up (exports) some X

in return for relatively more valued Y

Numerical example: At F,

MRS = $\frac{1}{2}$ for R, 3 for B.

R exports 1 of X and imports 1.5 of Y

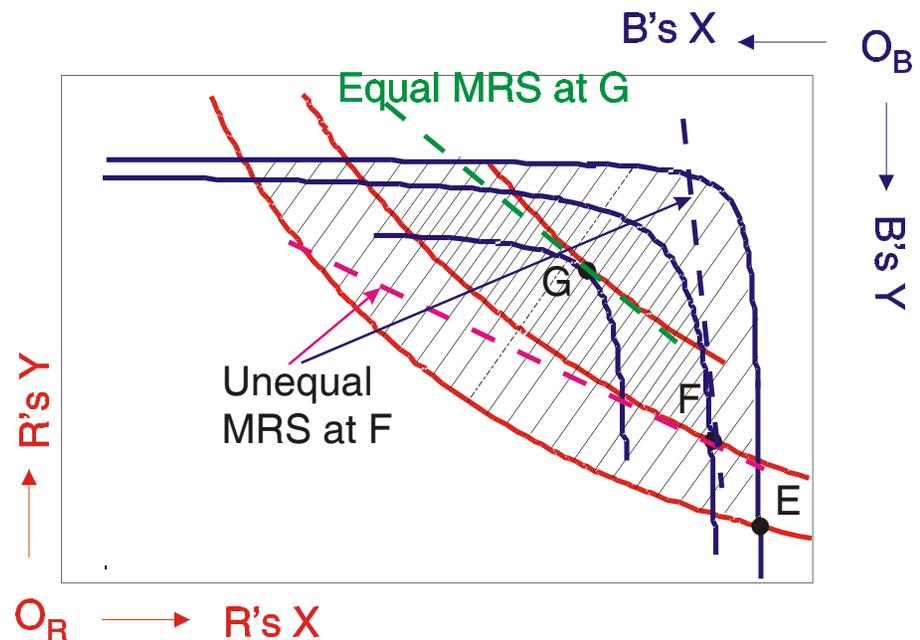
R would be happy with

$1 * \frac{1}{2} = 0.5$ of Y;

B willing to give up 1.5 of Y in

exchange for only $\frac{1.5}{3} = 0.5$ of X

Both do better than that.



At G, MRS between X and Y equal for R and B: no more mutually beneficial trades

Can say that at F, R has **COMPARATIVE ADVANTAGE** in X

Basis of this: lower MRS, or lower relative price of X, at F

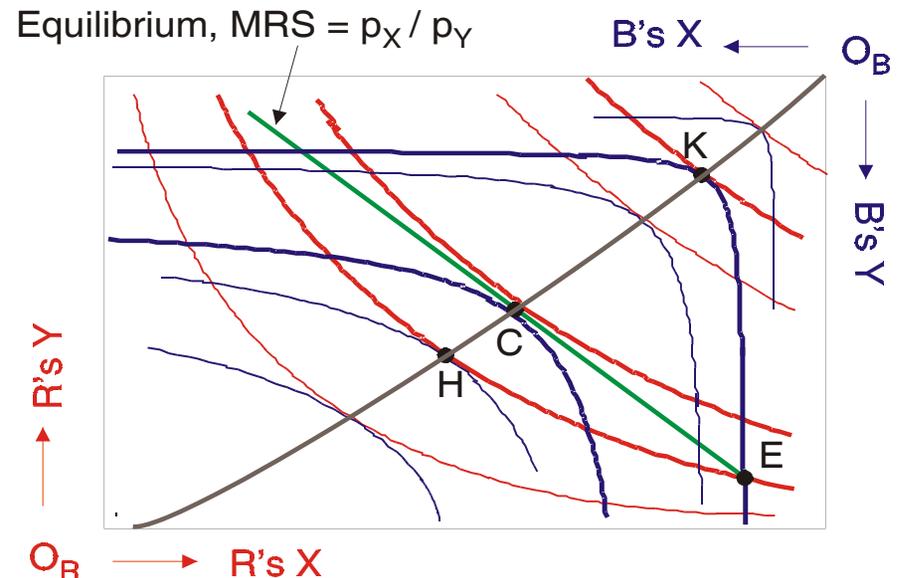
More importantly, this will later arise because lower marginal cost of production.

CONTRACT CURVE: All Pareto efficient allocations in the exchange Edgeworth box ignoring initial ownership / endowment , as if the government can seize and redistribute goods among people
 Contract curve extends from O_R to O_B

CORE: Respect initial ownership.
 E-Indifference curves of R, B intersect the contract curve at H, K, respectively
 So only portion HK becomes relevant
 Core of the exchange:
 trades that are voluntary and efficient

In the core, there must be at least one point C such that the line of R and B's common MRS between X and Y at C passes through E
 This gives a way of achieving the allocation C as a competitive market equilibrium
 Set the relative price of X in terms of Y equal to the slope of this line.
 Line passes through the point E showing the endowments of both countries
 It becomes the common budget line for the two; optimum choice C for both

E = initial endowment, $O_R H C K O_B$ = contract curve
 HK = core, C = equilibrium

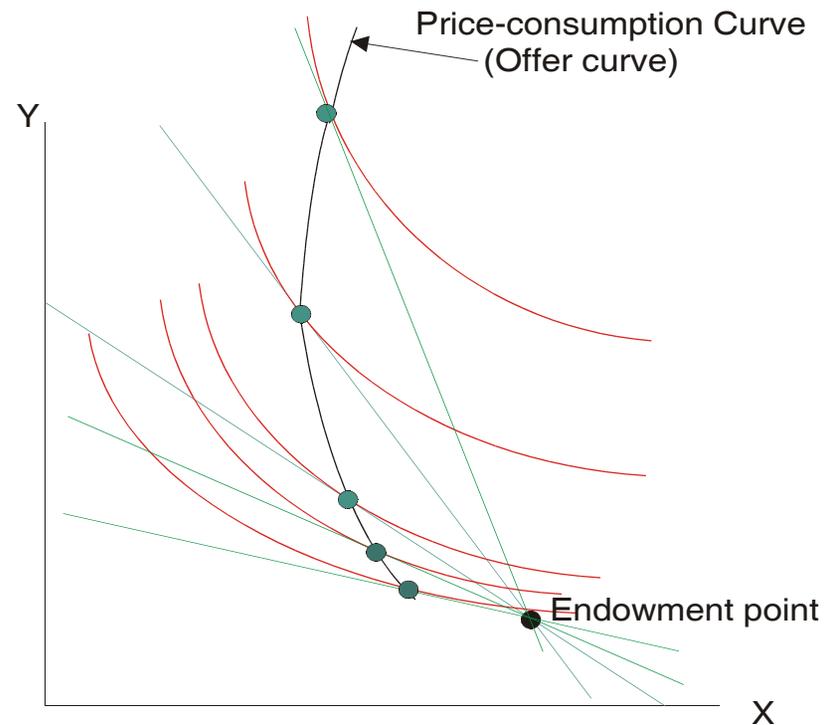


OFFER CURVES (Price-Consumption curves): general equilibrium analogs of supply/demand curves to construct equilibrium

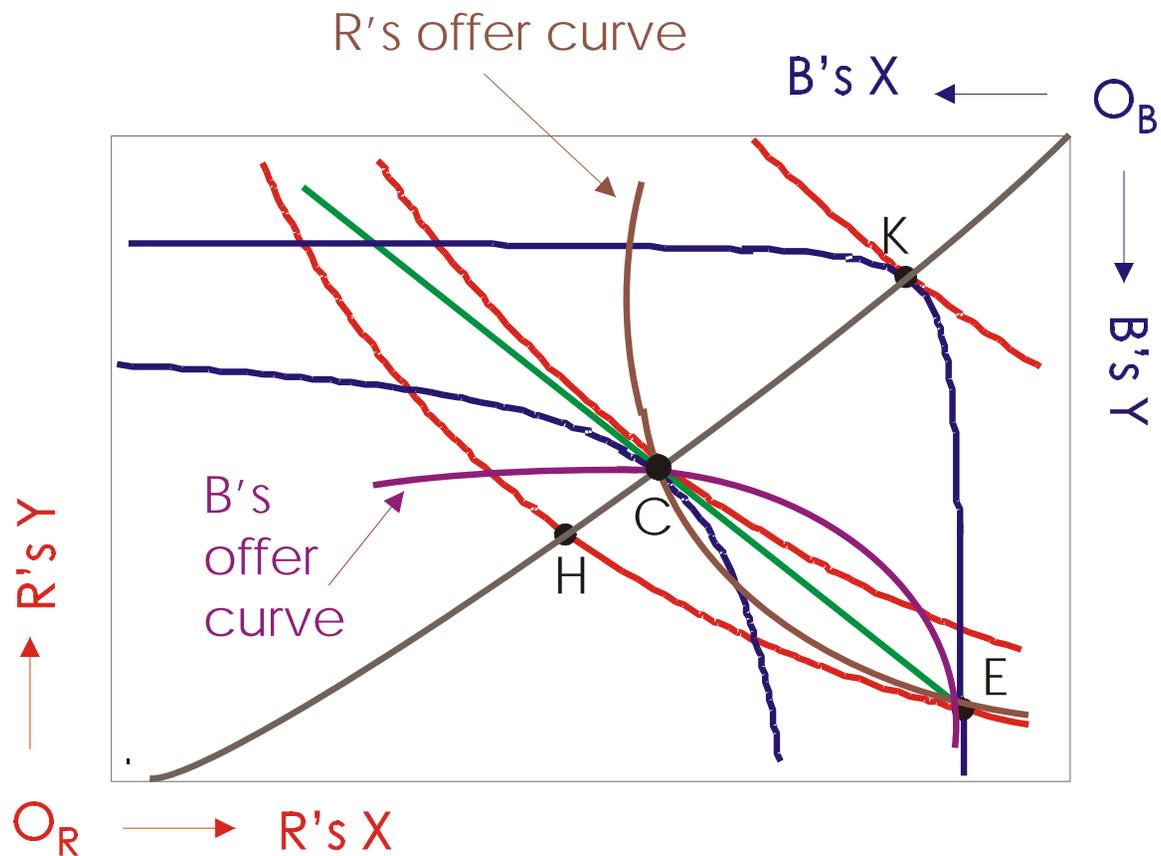
Consider just one consumer/country
Take budget lines of different slopes
all through endowment point E
Connect up all their tangencies
with indifference curves
This is the locus of all trades
that are optimal when facing
all possible different relative prices

Normal case: steeper budget line
(higher relative price of X) causes
the consumer / country to keep
less X (export more).
This is substitution effect

But offer curve can “bend back”
due to income effects: when P_X/P_Y very high, can get a lot of Y by giving up
very little X, and so consume more of both X and Y than at a lower price



Now put the two countries' offer curves together in the exchange Edgeworth box
 Where they intersect is equilibrium
 Must be on contract curve, because the two countries' indifference curves are tangent to the same budget line



Will develop these ideas differently, and will “unpack” country into individuals.