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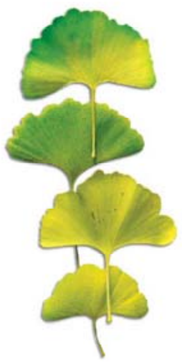

Chapter 17

General Equilibrium and Market Efficiency

Chapter Outline

- A Simple Exchange Economy
- The Invisible Hand Theorem
- Efficiency In Production
- Efficiency In Product Mix
- Gains From International Trade
- Taxes In General Equilibrium
- Other Sources Of Inefficiency

A Simple Exchange Economy

- ***General equilibrium analysis:*** the study of how conditions in each market in a set of related markets affect equilibrium outcomes in other markets in that set.

A Simple Exchange Economy

(2 - PERSON
2 - good
2 - Factor input)

- Consider a simple economy in which there are only two consumers—Ann and Bill— and two goods, food and clothing.
  - *Allocation:* an assignment of these total amounts between Ann and Bill.
  - *Initial endowments:* the amounts of the two goods with which Ann and Bill begin each time period.

$$\boxed{\begin{aligned} Q^F &= (L^F, K^F) \\ Q^c &= (L^c, K^c) \\ L^{TOTAL} &= L^F + L^c \\ K^{TOTAL} &= K^F + K^c \end{aligned}}$$

ON PRODUCTION SIDE

$$\boxed{\begin{aligned} U_{ANN} &= U(F_A, C_A) \\ U_{BILL} &= U(F_B, C_B) \end{aligned}}$$

ON CONSUMPTION SIDE

$$\boxed{P^F \quad P^c}$$

$$\boxed{\begin{aligned} w &= \text{price of } L \\ r &= \text{price of } K \end{aligned}}$$

Edgeworth Exchange Box

- ***Edgeworth exchange box:*** a diagram used to analyze the general equilibrium of an exchange economy.

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Figure 17.1: An Edgeworth Exchange Box

R = initial endowment

$$Q_C^{TOTAL} = Q_C^{ANN} + Q_C^{BILL}$$
(200) (70) (130)

 6

THE WIDTH = TOTAL AMOUNT OF CLOTHING (200)
THE HEIGHT = TOTAL AMOUNT OF FOOD (100)

$$Q_F^{TOTAL} = Q_F^{ANN} + Q_F^{BILL}$$
100 (75) (25)

Figure 17.2: Gains from Exchange

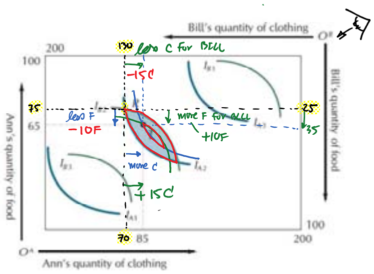

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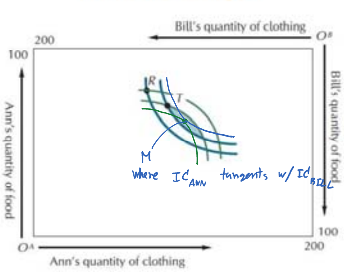
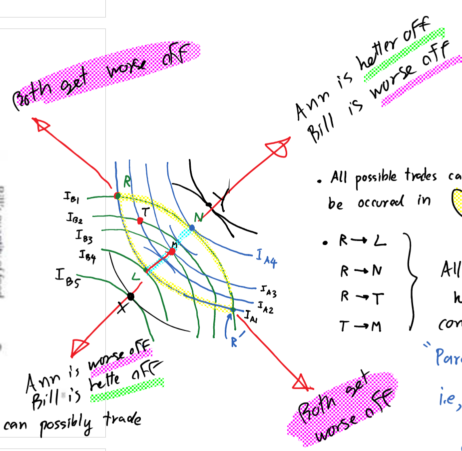
Figure 17.3: Further Gains from Exchange





- All possible trades can be occured in

- R → L
  R → N
  R → T
  T → M

All movements here are considered as "Pareto improvements", i.e, it makes at least one person better off and does not hurt anyone else.

① If R is the initial endowment, Both can possibly trade until they arrive at M.

LN is so called "the Core": a collection of all Pareto Efficient allocations. (or Pareto Optimal allocations)

NO

NO

M is an example of

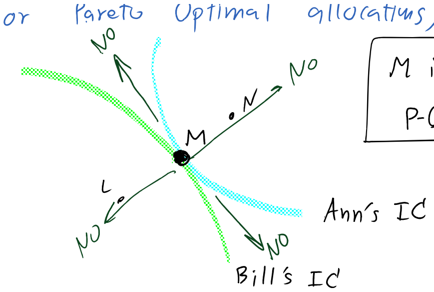
Pareto Allocations

- ***Pareto superior allocation***: an allocation that at least one individual prefers and others like at least as well.
- ***Pareto optimal allocation***: used to describe situations in which it is impossible to make

at least one individual prefers and others like at least as well.

- ***Pareto optimal allocation***: used to describe situations in which it is impossible to make one person better off without making at least some others worse off.

(or Pareto Optimal allocations)

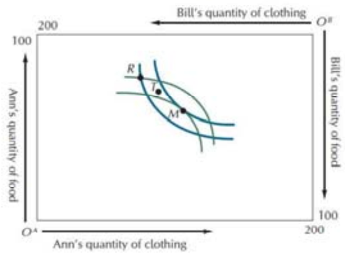


$\boxed{\text{M is an example of P-O allocations.}}$

P-O allocation refers t
a situation that
it is IMPOSSIBLE TO DO
ANYTHING TO MAKE ON
PERSON BETTER OFF W/O
HURTING/HARMING AN

(A, B)
(50, 50) → (49, 51)

Figure 17.4: A Pareto-Optimal Allocation

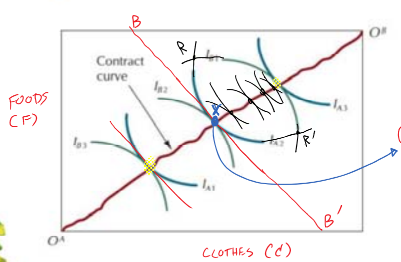


The Contract Curve

- ***Contract curve:*** a curve along which all final, voluntary contracts must lie.
  - Identifies all the efficient ways of dividing the two goods between the two consumers.

Figure 17.5: The Contract Curve: all Pareto-Optimal allocations

a collection of



① at x allocation which is Pareto optimal

$MRS^A_{CF} = MRS^B_{CF}$

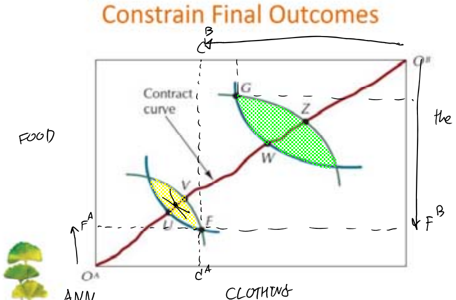
② Line BB' is the budget constraint for both agents:

its slope $= -\frac{P_C}{P_F}$

So at x: $\boxed{MRS^A_{CF} = MRS^B_{CF} = \frac{P_C}{P_F}}$

Pareto Optimal Condition for consumption

Figure 17.6: Initial Endowments Constrain Final Outcomes



Start at F, possible outcomes will be on the yellow len

start at G, possible outcome will be on the green len.

L6

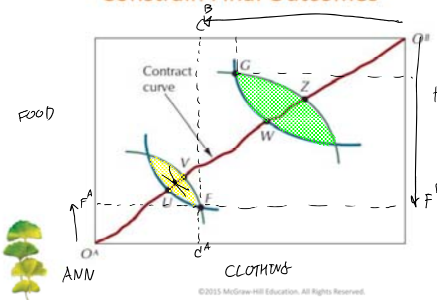
E

OTHER .

So at X: $\boxed{MRS_{CF} = MRS_{CF} = \frac{P_C}{P_F}}$

Pareto Optimal Condition for consumption

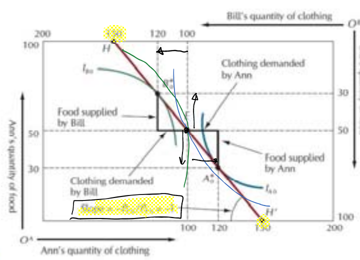
Figure 17.6: Initial Endowments Constrain Final Outcomes



Start at E, possible outcomes will be on the yellow len

start at G, possible outcome will be on the green len.

Figure 17.7: A Disequilibrium Relative Price Ratio



- Start at E

For Ann: (100, 50) — C, F

For Bill: (100, 50)

→ Total endowment for C = 100 + 100 = 200 units

→ Total endowment for F: 50 + 50 = 100 units

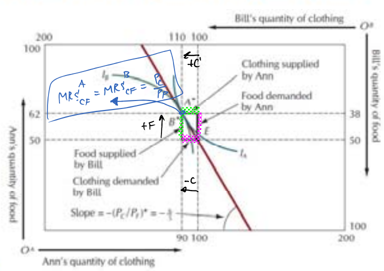
w/ the current price ration ($\frac{P_C}{P_F} = 1$)

① excess demand for C occurs

② excess supply for F occurs

$P_C \uparrow$, $P_F \downarrow$ → $\left(\frac{P_C}{P_F}\right)$ must go up to clear the excess demand & the excess supply

Figure 17.8: General Equilibrium



Now,

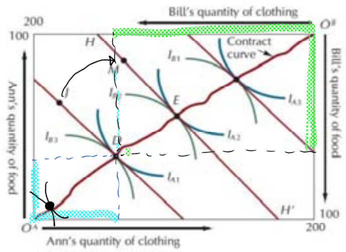
excess demand in clothes = 0

excess supply in foods = 0

The Invisible Hand Theorem

- *Theorem of the invisible hand:* an equilibrium produced by competitive markets will exhaust all possible gains from exchange.
  - *Equilibrium in competitive markets is Pareto optimal.*

Figure 17.9: Sustaining Efficient Allocations



Efficiency

Equity

- First Theorem of welfare economics; (FTWE): Free market will lead to an Pareto-Efficient outcome.

Efficiency

- Second Theorem of welfare economics: (STWE): A desirable final outcome can be obtained if we reallocate initial endowment to a suitable one and then let them trade in competitive market environment.

Equity (or fairness)

Second Welfare Theorem

- The *second theorem of welfare economics says* that, under relatively unrestrictive conditions:
  - *Any* allocation on the contract curve can be sustained as a competitive equilibrium.
- *The significance of the second welfare theorem is that the issue of equity in distribution is logically separable from the issue of efficiency in allocation.*

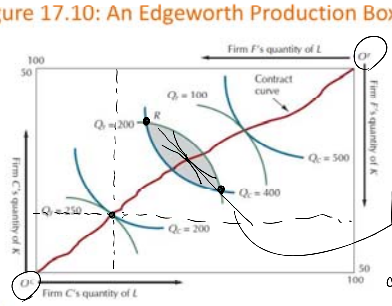
Efficiency In Production

- Suppose we now add a productive sector to our exchange economy, one with two firms, each of which employs two inputs—capital (K) and labor (L)—to produce either of two products, food (F) or clothing (C).
  - Suppose firm C produces clothing and firm F produces food.
  - The marginal rates of technical substitution for the two firms will be equal in competitive equilibrium.

$P_L = w$

$P_K = r$

Figure 17.10: An Edgeworth Production Box



$$\boxed{MRTS^C_{LK} = MRTS^F_{LK} = \frac{w}{r}}$$

or

$$\boxed{\frac{MP^C_L}{MP^C_K} = \frac{MP^C_L}{MP_K} = \frac{w}{r}}$$

IN CLOTHING PRODUCTION

$$\frac{MP^C_L}{MP^C_K} = \frac{w}{r}$$

OR

$$\boxed{\frac{MP^C_L}{w} = \frac{MP^C_K}{r}}$$

IN FOOD PRODUCTION

$$\frac{MP^F_L}{MP^F_K} = \frac{w}{r}$$

$$\boxed{\frac{MP^F_L}{w} = \frac{MP^F_L}{r}}$$

Efficiency In Production

- Competitive general equilibrium is efficient not only in the allocation of a given endowment of consumption goods, but also in the allocation of the factors used to produce those goods.
- Firms will trade inputs until they reach the contract

(1) $MRS^A_{CF} = MRS^B_{CF} = \frac{P_C}{P_F}$ (Efficiency in consumption)

only in the allocation of a given endowment of consumption goods, but also in the allocation of the factors used to produce those goods.

- Firms will trade inputs until they reach the contract curve where the marginal rates of technical substitution are the same for all firms

① $MRS^{A}_{CF} = MRS^{B}_{CF} = \frac{P_C}{P_F}$ (Efficiency in consumption)

② $MRTS^{C}_{LK} = MRTS^{F}_{LK} = \frac{w}{r}$ (Efficiency in Production

③ $MRS^{A}_{CF} = MRS^{B}_{CF} = MRT$

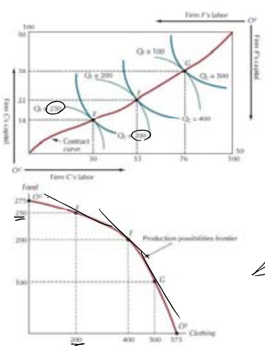
$\Downarrow$

Competitive General Equilibrium needs to have ① + ② + ③.

Efficiency In Product Mix

- ***Production possibilities frontier:*** the set of all possible output combinations that can be produced with a given endowment of factor inputs.
- ***Marginal rate of transformation (MRT):*** the rate at which one output can be exchanged for another at a point along the production possibilities frontier.

Figure 17.11: Generating the Production Possibilities Frontier



- $MRT = \frac{\Delta F}{\Delta C}$ = opportunity cost of clothing in term of food
- MRT = slope of PPF
- $MRT = \frac{MC_C \text{ (good x)}}{MC_F \text{ (good y)}}$

example $MC_C = 100$ \$/unit

$MC_F = 50$ \$/unit

then $MRT = \frac{MC_C}{MC_F} = \frac{100}{50} = 2$

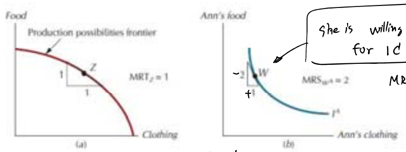
OR $MC_C = 2\,MC_F$

Efficiency in the Product Mix

- For an economy to be efficient in terms of its product mix, it is necessary that *the marginal rate of substitution for every consumer be equal to the marginal rate of transformation.*

Figure 17.12: An Inefficient Product Mix

Why MRT must be equal to MRS' to achieve the condition #3 ?

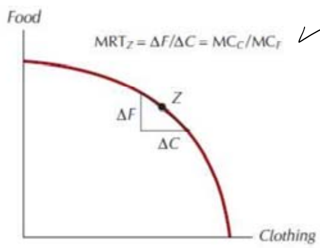


She is willing to give up 2F for 1C

$MRS = \frac{\Delta F}{\Delta C} = \frac{-2}{+1} = -2$

IF we reduce 2F, we will get 2C

Figure 17.13: MRT Equals the Ratio of Marginal Costs



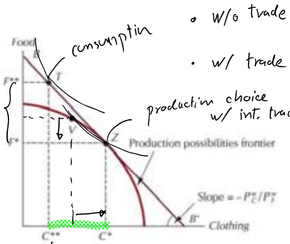
$\boxed{MRT = \frac{\Delta Y}{\Delta X} = \frac{MC_X}{MC_Y}}$

Gains From International Trade

- The fact that the international budget constraint contains the original competitive equilibrium point means that it is possible to make everyone better off than before.
  - But the impersonal workings of international trading markets provide no guarantee that every single person will in fact be made better off by trade.

Figure 17.14: Gains from International Trade

- w/o trade ⇒ V is the equilibrium (MRS = MRT) $= \frac{P_c}{P_F}$
  They consume amount they produce.
- w/ trade ⇒ Facing w/ $\frac{P_c^w}{P_F^w}$



consumption

imports

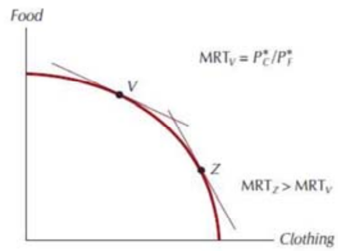
production choice w/ int. trade

exports

it should produce at Z where $MRT = \frac{P_c^w}{P_F^w}$

it should produce more C and less F compare to V.

Figure 17.15: Taxes Affect Product Mix



Taxes In General Equilibrium

- A tax on food does not alter the fact that consumers will all have a common value of MRS in equilibrium.
  - Nor does it alter the fact that producers will all have a common value of MRTS.
- The real problem created by the tax is that it causes producers to see a different price ratio from the one seen by consumers.

Other Sources Of Inefficiency

- Monopoly
- Externalities
- Public Goods
- All of the above alter prices from their efficient market levels. This leads to decisions by producers and consumers that distort the most efficient outcomes of perfect competition.