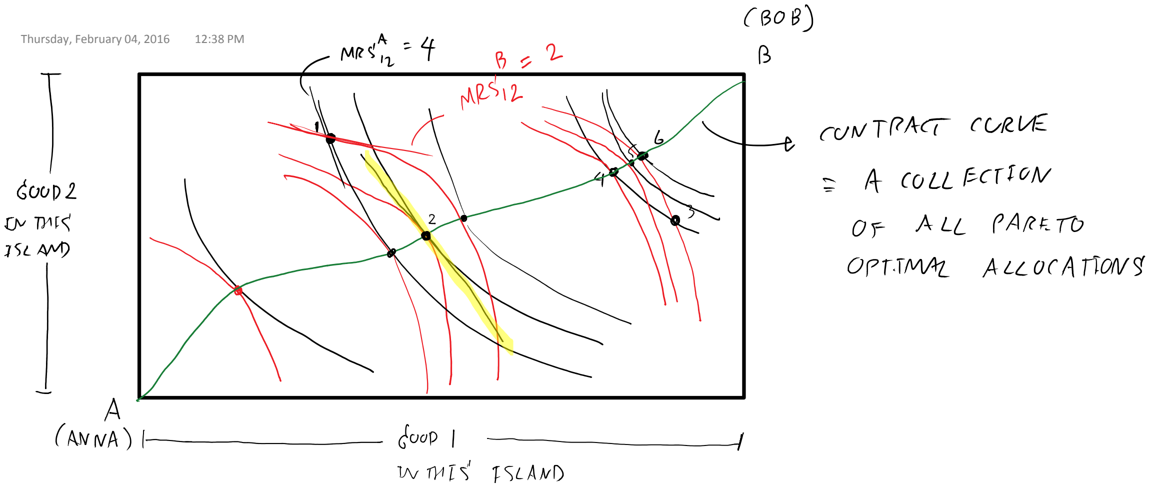


FACT #1 AT ALLOCATION (2), OBSERVE THAT SLOPES OF TWO INDIFFERENCE CURVE ARE EQUAL.

SLOPE OF ANNA'S IC = SLOPE OF BOB'S IC

$$MRS^A_{12} = MRS^B_{12}$$

NOTE: MARGINAL RATE OF SUBSTITUTION (MRS) IS THE RATE THAT A CONSUMER IS WILLING TO TRADE ONE GOOD FOR OTHER GOOD SO THAT HIS/HER UTILITY REMAINS UNCHANGED,

MRS^A_{12} = AMOUNT OF GOOD 2 ANNA IS WILLING TO GIVE UP IN EXCHANGE FOR 1 UNIT OF GOOD 1

MRS^B_{12} = AMOUNT OF GOOD 2 BOB IS WILLING TO GIVE UP IN EXCHANGE FOR 1 UNIT OF GOOD 1

SO, "EFFICIENCY IN EXCHANGE" REQUIRES THAT MRS_{12} OF ALL CONSUMERS MUST BE EQUAL.

IF $MRS^A_{12} \neq MRS^B_{12}$, THEN IT SIGNALS THAT THERE MUST BE AN OPPORTUNITY TO MAKE AT LEAST ONE PERSON HAPPIER W/O {HARMING / HURTING} THE OTHER PERSON.

IN OTHER WORDS, PARETO IMPROVEMENT IS POSSIBLE.

EX: AT (1), NOTICE THAT $MRS^A_{12} > MRS^B_{12}$
(4) (2)

- ANNA IS WILLING TO GIVE UP 4 UNITS OF GOOD 2 (COCONUTS) TO GET 1 UNIT OF GOOD 1 (FISH)
- BOB IS WILLING TO GIVE UP 2 UNITS OF GOODS (COCONUTS) TO GE 1 UNIT OF GOOD 1 (FISH)

NOW, SEE THAT TRADE OR EXCHANGE CAN IMPROVE UTILITY OF BOTH...

IF A CAN TRADE 3 OF GOOD 2 FOR 1 OF GOOD 1,
A WILL BE BETTER OFF!

IF B RECEIVES 3 OF GOOD 2 FOR 1 OF GOOD 1,
B WILL BE BETTER OFF TOO! (WHY?)
B/C BOB WOULD ACCEPT 2 UNITS OF GOOD 2 FOR ONE UNIT OF GOOD 1 BUT NOW HE GETS 3 OF GOOD 2!

SO, IF $MRS^{A}_{12} \neq MRS^{B}_{12}$, THERE IS GAIN FROM TRADE.

NOW, LET'S TURN TO PRODUCTION OF FISHES AND COCONUTS

GOOD 1: FISH INDUSTRY — L_1, K_1

GOOD 2: COCONUT INDUSTRY — L_2, K_2

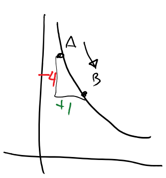
$L = L_1 + L_2$

$K = K_1 + K_2$

Q: HOW TO ALLOCATE L AND K BETWEEN FISH INDUSTRY AND COCONUT INDUSTRY IN ORDER TO RECEIVE THE MAXIMUM OF THE TWO GOODS, GIVEN AVAILABLE L AND K?

A: EFFICIENCY IN PRODUCTION OCCURS WHEN

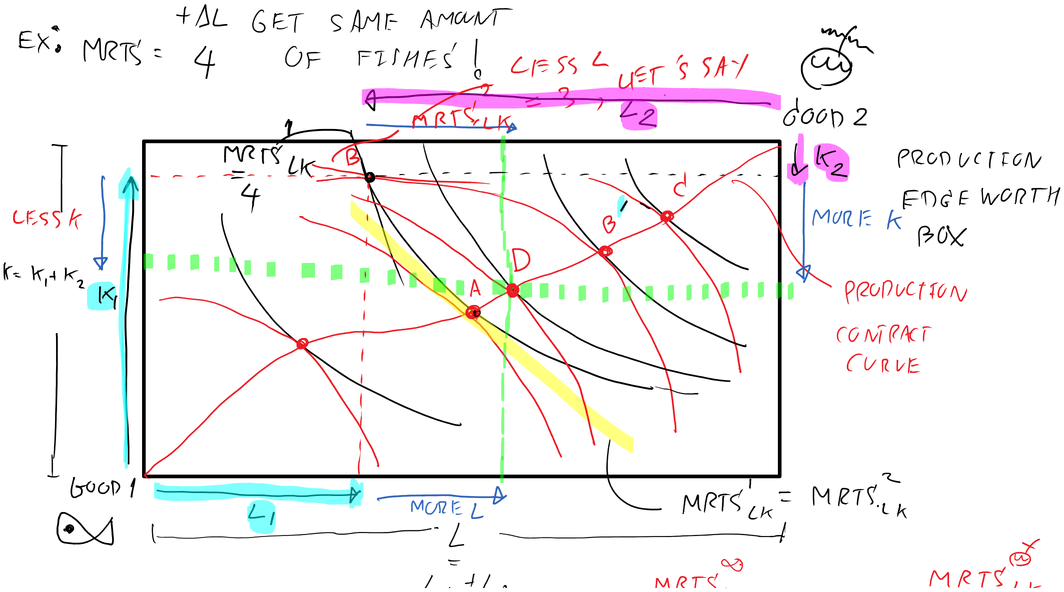
$$MRTS^{1}_{LK} = MRTS^{2}_{LK}$$

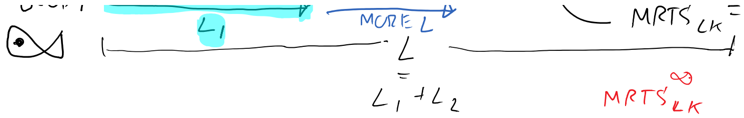


HOW MANY K CAN BE RELEASED IF YOU INSERT A WORKER INTO THE FISH INDUSTRY, AND YOU CAN STILL GET SAME AMOUNT OF FISHES!

$MRTS_{LK} = \frac{-\Delta K}{+\Delta L}$

EX: MRTS = 4





$MRTS_{LK} = MRTS_{LK}$

$MRTS^{fish}_{LK}$ $MRTS^{coconut}_{LK}$

AT POINT A WHERE SLOPE OF ISOQUANT FOR FISH PRODUCTION = SLOPE OF ISOQUANT FOR COCONUT PRODUCTION,

WE HAVE A PARETO OPTIMAL ALLOCATION OF L AND K BETWEEN TWO INDUSTRIES.

CONSIDER POINT B ... $MRTS^{fish}_{LK} = 4 > MRTS^{coconut}_{LK} = 3$

IT TELLS US THAT WE CAN REALLOCATE L AND K IN BETWEEN THE TWO INDUSTRIES SO THAT WE CAN GET

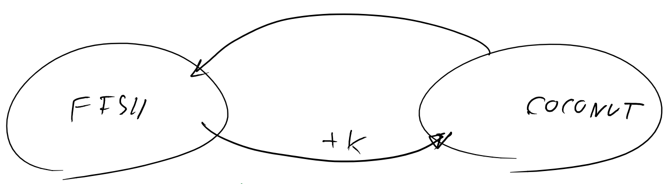
- MORE FISHES (GOOD 1) W/O LOSING COCONUTS (GOOD 2) — ①

OR • MORE COCONUTS W/O LOSING FISHES — ②

OR • MORE OF FISHES AND MORE OF COCONUTS — ③

MOVING FROM B ⟶ D, WE CAN GET MORE [fish] AND [coconut].

TO DO SO



MUST USE MORE L AND LESS K — MUST USE LESS L AND MORE K

ALGEBRICALLY, $MRTS^{fish}_{LK} = 4 > MRTS^{coconut}_{LK} = 3$ (AT B)

IT MEANS THAT

[fish] IN PRODUCTION OF FISHES, IF WE ADD ONE MORE UNIT OF L, WE CAN RELEASE 4 UNITS OF K, W/O CHANGING LEVEL OF OUTPUT.

[coconut] IN COCONUT PRODUCTION, IF WE ADD ONE MORE UNIT OF L, WE CAN RELEASE 3 UNITS OF K, W/O CHANGING LEVEL OF OUTPUT.

THAT'S WHY, LABOR SHOULD BE USED MORE IN PRODUCING FISH AND KAPITAL SHOULD BE USED MORE IN PRODUCING COCONUTS!

SUMMARY EFFICIENCY IN PRODUCTION REQUIRES THAT $MRTS^1_{LK} = MRTS^2_{LK}$.

SUMMARY: EFFICIENCY IN PRODUCTION REQUIRES THAT $MRTS^1_{LK} = MRTS^2_{LK}$.

SO FAR, PARETO EFFICIENCY:

- $MRS^A_{12} = MRS^B_{12}$ (EFFICIENCY IN EXCHANGE) ✓
- $MRTS^1_{LK} = MRTS^2_{LK}$ (EFFICIENCY IN PRODUCTION) ✓
- $MRS^A_{12} = MRS^B_{12} = MRT$ (EFFICIENCY IN OUTPUT MARKETS)

EFFICIENCY IN OUTPUT MARKETS

FOR OVERALL EFFICIENCY, ALL GOODS PRODUCED MUST SUIT WITH CONSUMERS' WANTS.

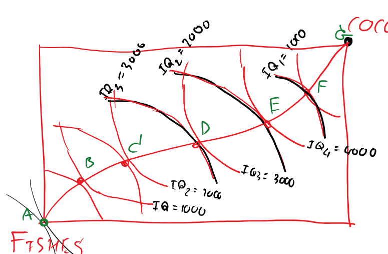
NOTE: IT WOULD BE UNFORTUNATE IF WE ARE SO EFFICIENT IN PRODUCING F & C BUT ANNA & BOB WANT TO HAVE A DIFFERENT COMBINATION OF F & C, NOT THE ONE THAT IS PRESENTED TO THEM. THAT'S WHY WE NEED TO MAKE SURE THAT ABOVE UNFORTUNATE SITUATION DOES NOT HAPPEN.

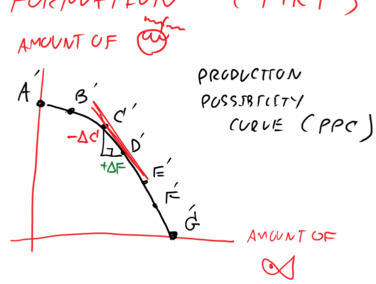
EFFICIENCY IN OUTPUT MARKETS REQUIRES THAT ...

$$MRS^A_{12} = MRS^B_{12} = MRT.$$

LET'S SEE...

MARGINAL RATE OF TRANFORMATION (MRT)





MRT_{12} TELLS US ABOUT HOW MANY COCONUT WE HAVE TO GIVE UP IN ORDER TO PRODUCE ONE MORE UNIT OF FISH

$$MRT = \frac{-\Delta C}{+\Delta F} \quad \begin{matrix} \leftarrow \text{LOSS} \\ \leftarrow \text{GAIN} \end{matrix}$$

ANOTHER VERSION OF MRT ⇒ $MRT = \dfrac{MC_F}{MC_C}$ OR $MRT = \dfrac{MC_1}{MC_2}$ → MC_1: ADDITIONAL COST OF PRODUCING 1 UNIT OF GOOD 1; → MC_2: ADDITIONAL COST OF PRODUCING 1 UNIT OF GOOD 2

EXAMPLE: SUPPOSE $MC_1 = 1$ €

$MC_2 = 2$ €

SO, $\dfrac{MC_1}{MC_2} = \dfrac{1}{2}$

- THE ECONOMY CAN PRODUCE 1 UNIT OF GOOD 1 BY SPENDING 1 €.
- THE ECONOMY CAN PRODUCE 1 UNIT OF GOOD 2 BY SPENDING 2 €
- IF WE HAVE 1 €, WE CAN EITHER GET 1 FISH (GOOD 1) OR GET $\frac{1}{2}$ COCONUT (GOOD 2)
- $MRT = \frac{MC_1}{MC_2} = \frac{1}{2}$ ⟹ TO GET 1 MORE UNIT OF FISH (GOOD 1) YOU MUST GIVE UP OR REDUCE THE COCONUT PRODUCT BY $\frac{1}{2}$ UNIT.

SO MARGINAL COST OF GETTING AN ADDITIONAL UNIT OF GOOD 1 IS EQUAL TO $\frac{1}{2}$ UNIT OF GOOD 2 FOR GONE!

NOW, SUPPOSE

$$MRS^A_{12} = MRS^B_{12} = 3$$
$$MRT_{12} = 2$$

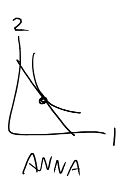
⇓

- ANNA AND BOB SAID "THEY ARE WILLING TO GIVE UP 3 COCONUTS (GOOD 2) TO EXCHANGE FOR 1 FISH (GOOD 1) [MRS = 3] } CONSUMERS
- IN PRODUCTION HOUSE, THE PRODUCTION MANAGER SAID "TO PRODUCE 1 MORE FISH, WE NEED TO GIVE UP 2 COCONUTS.

IT WOULD BENEFIT THE SOCIETY IF WE PRODUCE MORE FISH AND LESS COCONUTS.

SUMMING UP

2 CONSUMERS : ANNA (A) & BOB (B)
2 GOODS : FISH (GOOD 1) & COCONUT (GOOD 2)
2 INPUTS : LABOR (L) & CAPITAL (K)



$$MRS^A_{12} = \frac{P_1}{P_2} \longrightarrow \longleftarrow MRS^B_{12} = \frac{P_1}{P_2}$$

$$MRS^A_{12} = MRS^B_{12} = \frac{P_1}{P_2}$$

$$MRT_{12} = \frac{MC_1}{MC_2}$$

$$MRS^A = MRS^B = P_1 = MC_1 = MRT$$

$MRS^A_{12} = MRS^B_{12} = \frac{P_1}{P_2} = \frac{MC_1}{MC_2} = MRT$

- $P_1 = MC_1$
- $P_2 = MC_2$

} PERFECTLY COMPETITIVE MKT!

GRAND CONCLUSION

COMPETITIVE MARKET LEADS TO PARETO EFFICIENCY