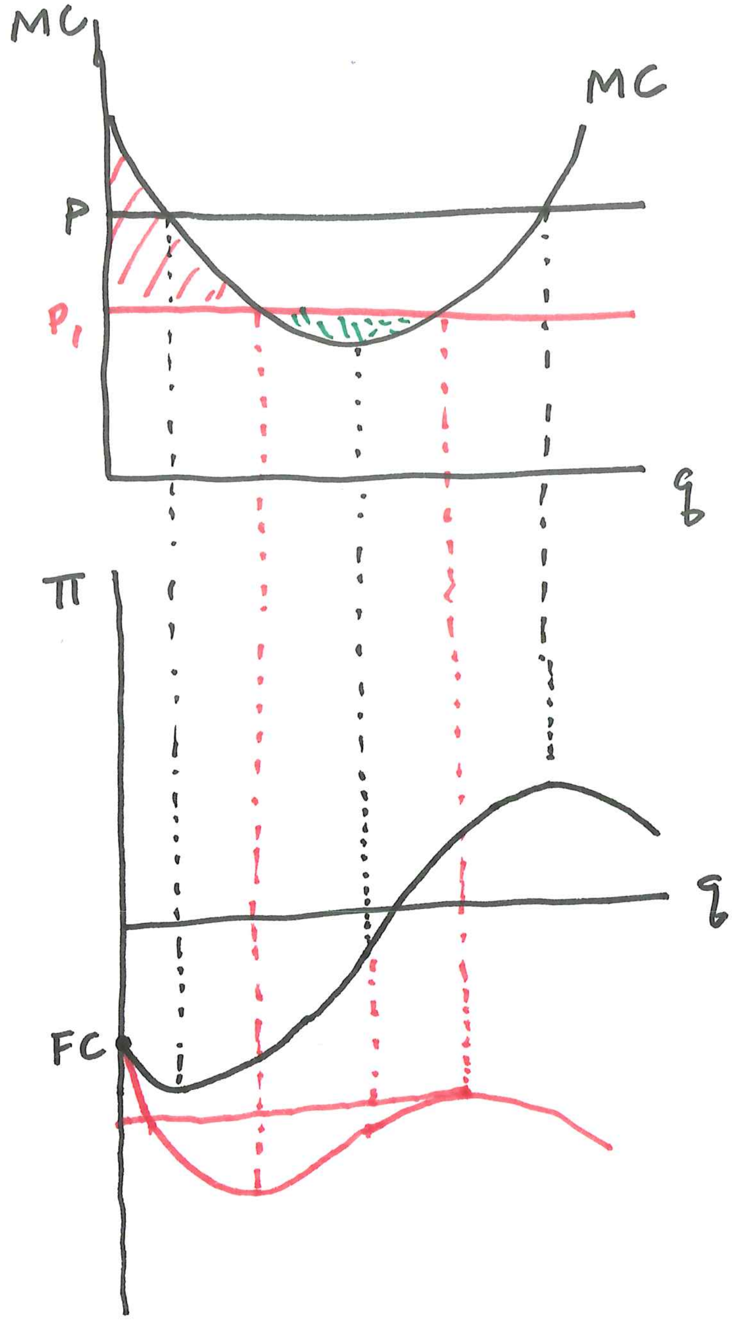
$$C_{LR} = \begin{cases} 0 & \text{for } q = 0 \\ C(q, w, r) & \text{for } q > 0 \end{cases}$$



Notation: Superscripts as identifiers

Subscripts as derivatives

$2 \times 2 \times 2$ model

2 individuals, A + B : $u^A = u^A(x^A, y^A)$

$u^B = u^B(x^B, y^B)$

2 goods, x + y : $x^A + x^B = X(K^x, L^x)$

$y^A + y^B = Y(K^y, L^y)$

2 factors, K + L : $K^x + K^y = \bar{K}$

$L^x + L^y = \bar{L}$

$$\text{Max} \quad U^A = U^A(x^A, y^A)$$

$$\text{s.t.} \quad u^B = U^B(x^B, y^B)$$

$$\mathcal{L} = u^A(x^A, y^A) + \lambda\left[U^B - u^B\Big(X(K^x, L^x) - x^A,\ Y(\bar{K} - K^x, \bar{L} - L^x) - y^A\Big)\right]$$

⋮

$$\frac{\partial \mathcal{L}}{\partial x^A} = u_x^A + \lambda\left[-u_x^B(-1)\right] = 0 \rightarrow \underline{u_x^A = -\lambda u_x^B}$$

$$\frac{\partial \mathcal{L}}{\partial y^A} = u_y^A + \lambda\left[-u_y^B(-1)\right] = 0 \rightarrow \underline{u_y^A = -\lambda u_y^B}$$

Efficiency in Consumption (1) $\frac{u_x^A}{u_y^A} = \frac{u_x^B}{u_y^B} \Rightarrow \cancel{\frac{u_x^A}{u_x^B} = \frac{u_y^A}{u_y^B}}$

$MRS^A = MRS^B$ ~~MRS^A~~

$$\frac{\partial \mathcal{L}}{\partial K^x} = \lambda\left[-u_x^B X_K - u_y^B Y_K(-1)\right] = 0$$

$$\frac{\partial \mathcal{L}}{\partial L^x} = \lambda\left[-u_x^B X_L - u_y^B Y_L(-1)\right] = 0$$

$$\left.\begin{aligned} \leftarrow u_x^B X_K &= u_y^B Y_K \\ \leftarrow u_x^B X_L &= u_y^B Y_L \end{aligned}\right\} \quad \frac{X_K}{X_L} = \frac{Y_K}{Y_L}$$

(2) $MRTS^x = MRTS^y$

Production Efficiency

$$\frac{u_x^B}{u_y^B} = \frac{Y_K}{X_K} = \frac{Y_L}{X_L}$$

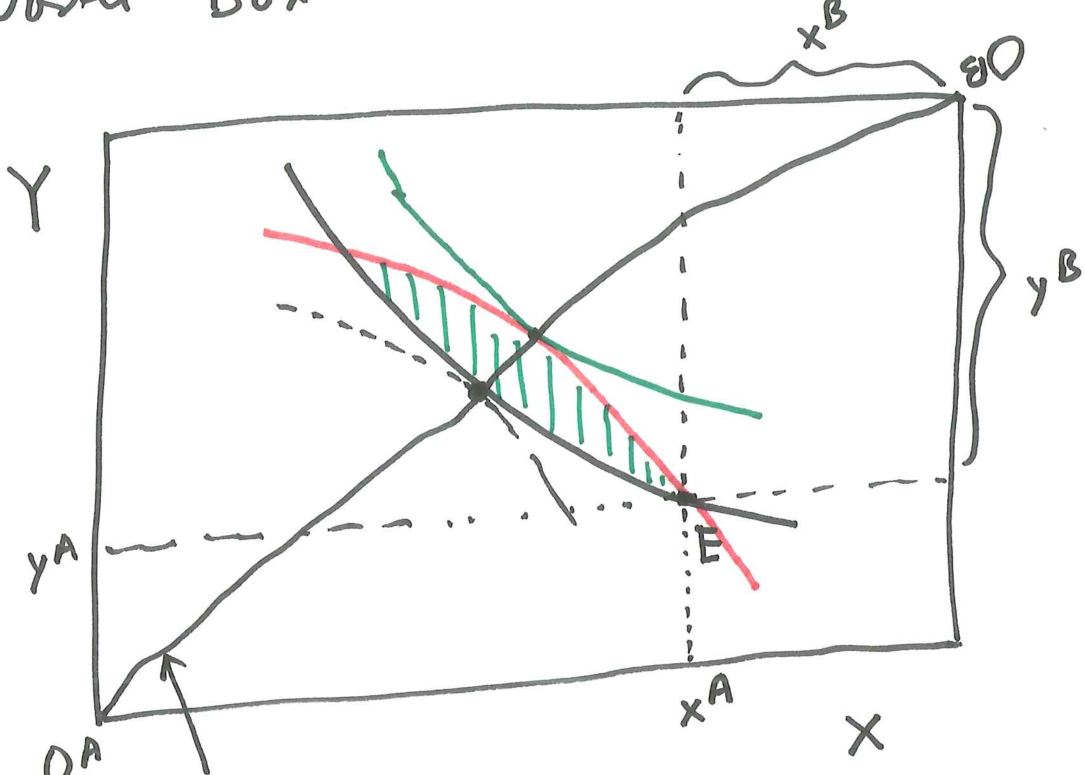
(3)

MRS = MRT

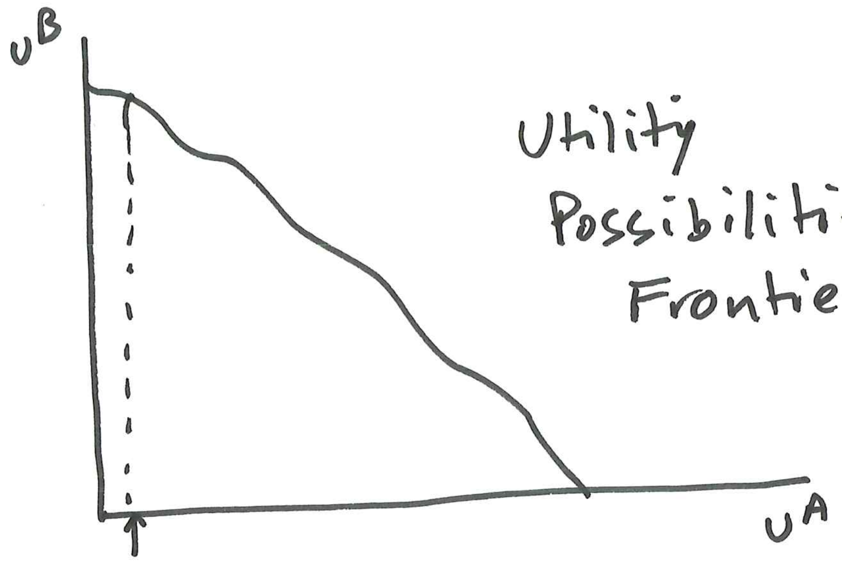
Marginal Rate of Transformation

Product Mix Efficiency

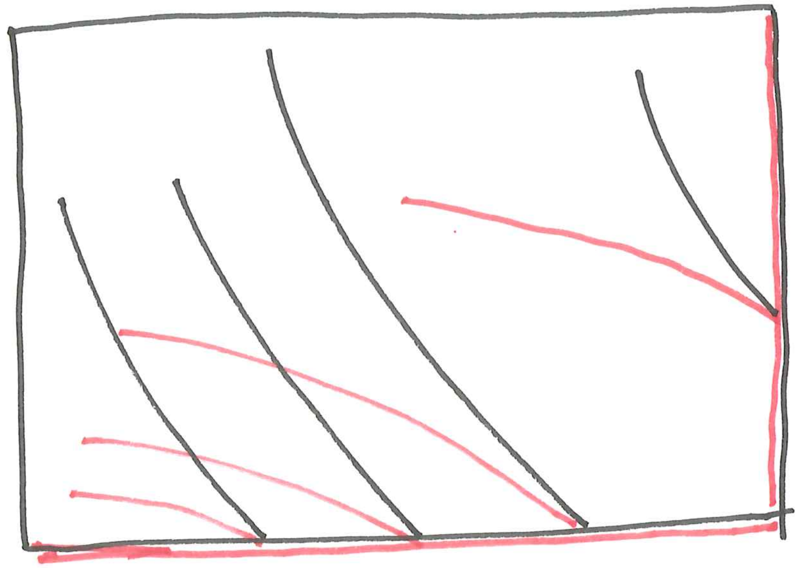
Edgeworth Box

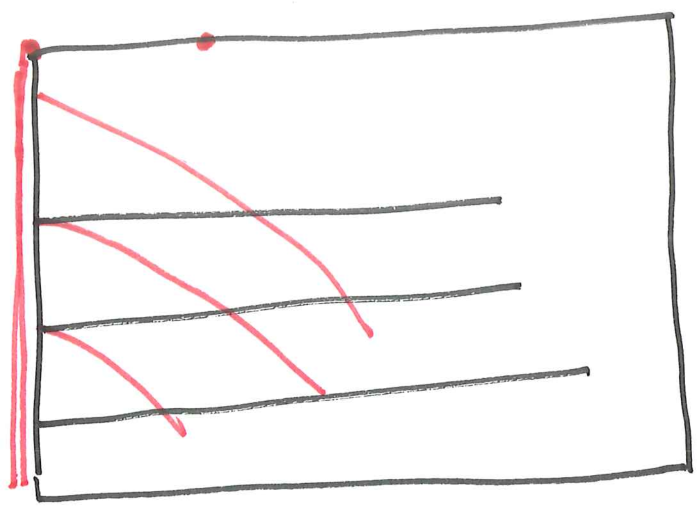


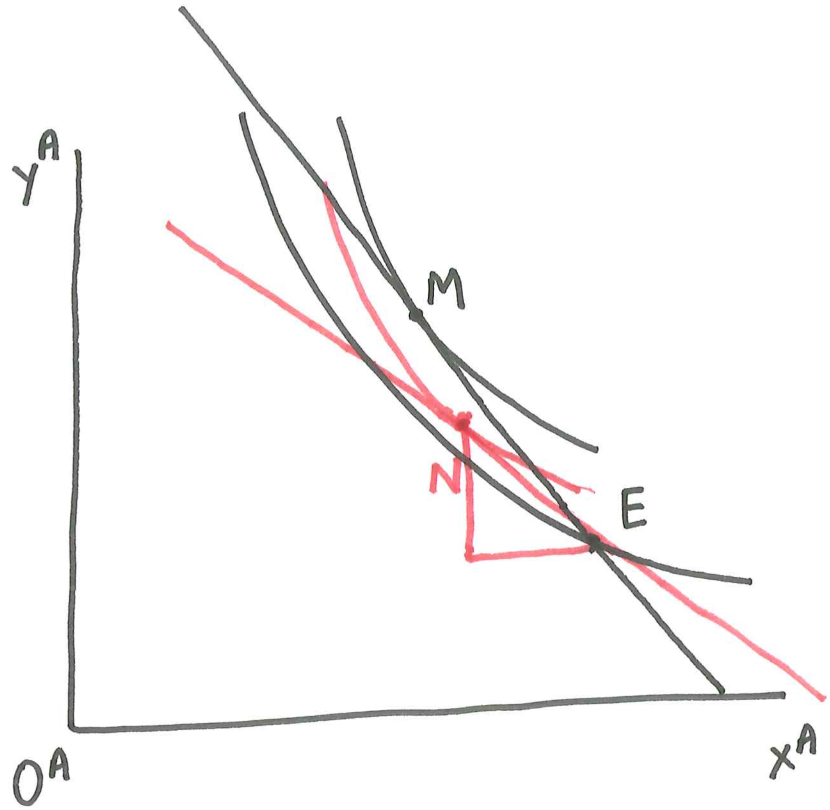
Consumers' Contract Curve

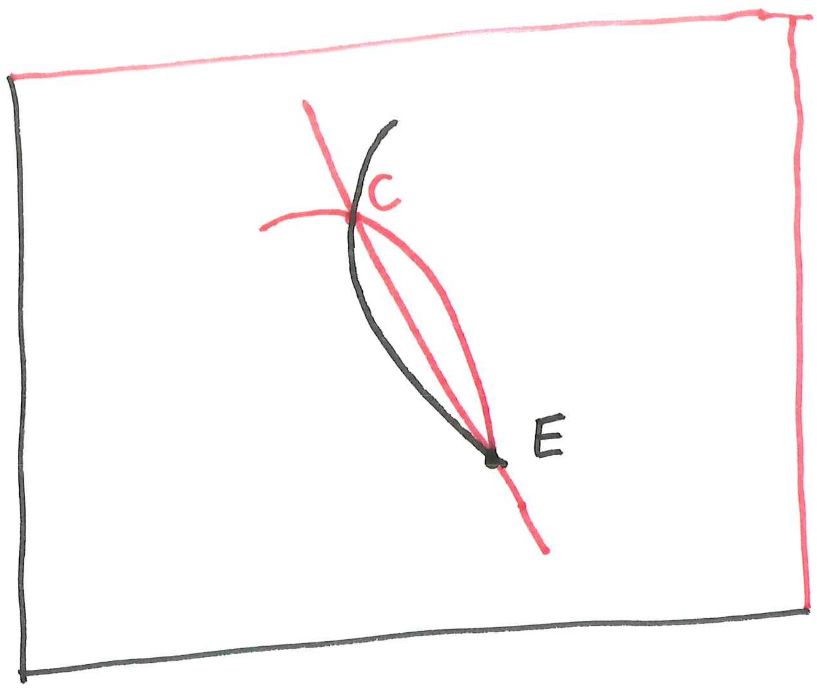


Utility Possibilities Frontier









Walrasian process of tâtonnement

Walras's Law: Value of Sum of Excess Demands is Zero

$$p^x \Delta x^A + p^y \Delta y^A = 0$$
$$p^x \Delta x^B + p^y \Delta y^B = 0$$
$$\overline{p^x(\Delta x^A + \Delta x^B) + p^y(\Delta y^A + \Delta y^B) = 0}$$