

$$MRTS_{LK}^X \equiv - \frac{\partial K_X^*}{\partial L_X^*}$$

We derived

$$\frac{\partial K_X^*}{\partial L_X^*} = - \frac{\partial g / \partial L_X}{\partial g / \partial K_X}$$

$$\Rightarrow MRTS_{LK}^X = \frac{\partial g / \partial L_X}{\partial g / \partial K_X} > 0$$

$$= \frac{MP_L^X}{MP_K^X}$$

Rule #1

We derived that a necessary condition for efficiency in production:

$$MRTS_{LK}^X = MRTS_{LK}^Y$$

If not, it should be possible to increase production in one industry without decreasing it in the other.

So, suppose:

$$MRTS_{LK}^X = 2 > 1 = MRTS_{LK}^Y$$

$$\frac{MP_L^X}{MP_K^X} = 2 > 1 = \frac{MP_L^Y}{MP_K^Y}$$

\Rightarrow at pt of Y doesn't change.
Output of X goes up, by 1.

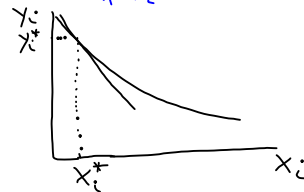
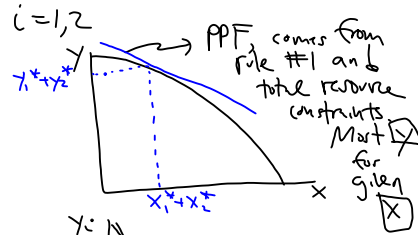
Rule #2 for efficient allocations

$$MRS_{xy}^1 = MRS_{xy}^2$$

$$\frac{MU_x^1}{MU_y^1} = \frac{MU_x^2}{MU_y^2}$$

Rule #3

$$MRS_{xy}^i = \text{slope of PPF} = MRT_{xy}$$



Suppose not, so: $\uparrow x$ by 1, $\downarrow y$ by 1

$$MRS_{xy}^i = 2 > 1 = MRT_{xy}$$

$$\frac{MU_x^i}{MU_y^i}$$

Raises utility by 2.
Reduce his consumption of y by 1, net gain in utility of 1.

give back 1 y, utility of other person unchanged

Economy we defined in the
"benchmark" economy.
Characterized efficient
allocations ("good feasible
things").

Now, say something about
equilibrium ("things that will
happen").

Add structure
⇒ "private ownership
benchmark economy"

① Price taking behavior:

People and firms take prices
as fixed and given.

Motivated by perfect competition,
or equivalently, no barriers to
entry in any market whatsoever.

If a firm tries to sell at
a price above what others are
charging, will have no customers.
They will buy from other
sellers.

Similarly, if customers try to
buy at a price below
what others are buying at.
They will find no sellers,
firms have plenty of other
customers.

["Free markets" as no human-made barriers to entry, like regulation or powerful incumbent firms that could make life difficult. Could still be natural barriers, and those could interfere with price taking "Natural monopoly." Perfect competition/price taking are stranger assumptions.]

② Profit maximization by firms.

[Identifying firms with "industry," but think of lots of firms in each industry.]

$$\pi_x = p_x \cdot g(L_x, k_x) - wL_x - v k_x$$

$$\pi_y = p_y \cdot f(L_y, k_y) - wL_y - v k_y$$

③ Distribution of income
(M^1, M^2)

⇒ budget constraints,

$$p_x \cdot x^i + p_y \cdot y^i = M^i, i=1,2.$$

④ Utility maximization

Private ownership benchmark economy:

Benchmark economy plus
①-④.

Note: tension between

profit max.

↑↑
"capitalism"
Private ownership of firms.
Owner's income is profits; want most income.

price taking

⇕
no barriers to entry whatsoever.

In general, an incumbent firm can increase profit by creating barriers, perhaps with the aid of govt.

Adam Smith: Capitalism and competition together work; warned about the tension. Compete by means other than innovation, producing what people want, managing costs, etc.

Equilibrium of the P.O.B.E.

An allocation and a list of prices (w, r, p_x, p_y) such that:

Equilibrium of the P.O.B.E.

An allocation, and a list of prices (w, r, p_x, p_y) such that:

- Given the prices, each person is maximizing utility at the given allocation.
- Given the prices, firms are maximizing profits.
- Markets clear: total goods (factors) demanded equals total goods (factors) supplied.

Show that any equilibrium allocation is an efficient allocation.

⇒ Show Rules #1-#3 hold.

Firms/Factors

$$\text{Profit max} \Rightarrow p_y \cdot \frac{\partial f}{\partial L_y} = w$$

$$p_y \cdot \frac{\partial f}{\partial K_y} = r$$

Same for industry X.

$$\Rightarrow \frac{\frac{\partial f}{\partial L_y}}{\frac{\partial f}{\partial K_y}} = \frac{w}{r} = \frac{\frac{\partial g}{\partial L_x}}{\frac{\partial g}{\partial K_x}}$$

MRTS_{LK}^Y = MRTS_{LK}^X

$$\begin{aligned} & \text{Max } U(x_1, x_2) \\ & x_1, x_2 \\ & \text{s.t. } p_x \cdot x_1 + p_y \cdot x_2 = M^i \end{aligned}$$

$$\Rightarrow \frac{\partial U / \partial x_1}{\partial U / \partial x_2} = \frac{p_x}{p_y} = \frac{\partial^2 U / \partial x_1^2}{\partial^2 U / \partial x_2^2}$$

$$\downarrow \qquad \qquad \downarrow$$

$$MRS_{xy}^1 = MRS_{xy}^2$$

Task #3

$$MRS_{xy}^c = \frac{p_x}{p_y} \stackrel{?}{=} MRT_{xy}$$

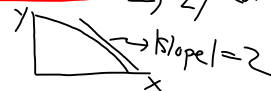
Perfect Competition,

$$\frac{p_x}{p_y} = \frac{MC_x}{MC_y} \stackrel{?}{=} MRT_{xy}$$

$$\left. \begin{aligned} MC_x &= \$100 \\ MC_y &= \$50 \end{aligned} \right\}$$

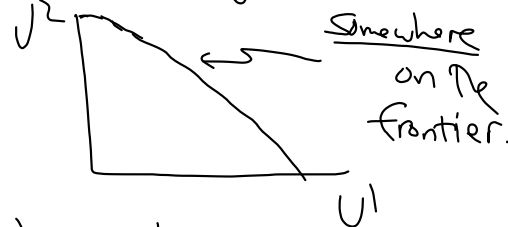
Produce 1 unit less of X,
save resources that could produce
two units of Y.

Dollar costs give a ratio that
reflects the technological
rate of transformation of
the **goods**. $\Rightarrow 2y$ for $1x$,



Conclusion:

Equilibrium of P.O.B.E.
is efficient



Where depends on
a lot of things, including
distribution of income



"First Fundamental
Theorem of Economics"
"Invisible Hand"