Individual and Social Production Possibilities and Indifference Curves

International Economics
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An individual’s production possibilities frontier shows the quantities of goods, X and Y, that can be produced within a given time period while efficiently using the resources at hand.

The slope of the production possibilities frontier shows the marginal rate of transformation between X and Y, $\text{MRT}_{x,y}$ (how much it costs in Y to produce an X).

- The slope is $30/15 = 2$.
- The marginal cost of $X = 2Y$.
- The marginal cost of $Y = \frac{1}{2} X$. 

An individual’s production possibilities frontier shows the quantities of goods, X and Y, that can be produced within a given time period while efficiently using the resources at hand.
Three Individual PPFs

Which individual is the best producer of X?
Which individual is the best producer of Y?

It depends upon what is meant by “best”!
Comparative and Absolute Advantage

- A person is said to have an **absolute advantage** in producing a good if he can produce more of the good than can another.

- A person is said to have a **comparative advantage** in producing a good if he can produce the good at a lower cost than another.
Three Individual PPFs

**Absolute Advantage**

Absolute Advantage: Good X
- Sam (150)
- Bill (120)
- Joe (30)

Absolute Advantage: Good Y
- Bill (180)
- Sam (100)
- Joe (30)
Three Individual PPFs

Comparative Advantage

Comparative Advantage: Good X
Sam: $2/3$ Y
Joe: $1$ Y
Bill: $3/2$ Y

Comparative Advantage: Good Y
Bill: $2/3$ X
Joe: $1$ X
Sam: $3/2$ X
Building the Social PPF

Comparative Advantage:
- Good X
  - Joe: 1 Y
  - Bill: 3/2 Y
  - Sam: 2/3 Y
The Social PPF is the “summation” of all the individual agents’ PPFs in the economy, constructed by applying the principle of comparative advantage.
Many Person Social PPF

Slope is flat at $A$. Low opportunity cost of $X$.

Slope is steep at $B$. High opportunity cost of $X$. 
Indifference Curves

Characteristics

1. Fixed preferences
2. Negatively-sloped
3. Convex
4. Non-intersecting
5. Slope = Marginal Rate of Substitution ($MRS_{xy}$)
6. Higher indifference curve represents greater utility
Indifference Curves

The Marginal Rate of Substitution represents a trade-off ratio; the marginal benefit from a unit of one good in terms of another.

If the individual is at point A, an additional unit of X is worth 2Y.

If the individual is at B, an additional X is worth 0.2 Y.
A budget constraint is negatively-sloped, reflecting the notion of opportunity cost - one must give up one good to get more of another.

The slope of a budget constraint measures the opportunity cost of one additional unit of a good in terms of the foregone units of the other good.
Budget Constraint

- In consumer choice, the budget constraint usually consists of an income constraint reflecting relative prices of the two goods.
- The budget constraint can also consist of the individual’s PPF, reflecting the individual’s MRT.
  - In either case, the slope of a budget constraint measures the opportunity cost of one additional unit of a good in terms of the foregone units of the other good.
What is the slope of the budget constraint?

Slope equals rise over run.

For an income constraint, slope equals \( \frac{I}{P_y} \) divided by \( \frac{I}{P_x} \). (where \( I \) is income and \( P_j \) is the price of good \( j \))

\[
\frac{\frac{I}{P_y}}{\frac{I}{P_x}} = \frac{P_x}{P_y}
\]

The slope of the budget constraint equals the price ratio \( \frac{P_x}{P_y} \).
What is the slope of the individual production possibility frontier?

Slope equals rise over run.

For an PPF, slope equals $Y$ divided by $X$, and is the Marginal Rate of Transformation, $\text{MRT}_{x,y}$.

The slope of the budget constraint equals $\text{MRT}_{x,y}$.
Choice: Combining Indifference Curves with Production Possibilities

Here, $\text{MRS}_{x,y} > \frac{P_x}{P_y}$ (or $\text{MRT}_{x,y}$). The individual can buy an additional $X$ for less than the additional unit is valued.

Here, $\text{MRS}_{x,y} < \frac{P_x}{P_y}$ (or $\text{MRT}_{x,y}$). The individual would have to pay more than the additional unit of $X$ is valued.
When the $\text{MRS}_{x,y} > \frac{P_x}{P_y}$ (or $\text{MRS}_{x,y} > \text{MRT}_{x,y}$), the individual can make himself better off by selling a unit of $Y$ to purchase additional units of $X$, since a unit of $X$ is valued more highly than a unit of $Y$ at the going prices.

So long as this remains true, the individual continues to move “down” his budget constraint.
When \( \text{MRS}_{x,y} = P_x/P_y \) (or \( \text{MRS}_{x,y} = \text{MRT}_{x,y} \)), the individual will have reached a point where he can make himself no better off by a rearrangement of resources in X and Y consumption. He will have maximized his utility!
Changes in the Budget Constraint

Starting from an original budget constraint...

Suppose that the price of $X$ falls...

The consumer can now buy more $X$ if all income is spent on $X$...

But can buy no more $Y$ if all income is spent on $Y$...

The budget constraint rotates outward “around” the original Y-intercept.
Starting from an original budget constraint...

Suppose that the price of X increases...

The consumer can now buy less X if all income is spent on X...

But can buy no more Y if all income is spent on Y...

The budget constraint rotates inward “around” the original Y-intercept.
Changes in the Budget Constraint

Starting from an original budget constraint...

Suppose that the price of Y falls...

The consumer can now buy more Y if all income is spent on Y...

But can buy no more X if all income is spent on X...

The budget constraint rotates outward "around" the original X-intercept
Changes in the Budget Constraint

Starting from an original budget constraint ...

Suppose that the price of Y increases...

The consumer can now buy less Y if all income is spent on Y...

But can buy no more X if all income is spent on X...

The budget constraint rotates inward “around” the original X-intercept
Changes in the Budget Constraint

Starting from an original budget constraint...

Suppose that money income I increases...

The consumer can now buy more Y if all income is spent on Y...

and can buy more X if all income is spent on X...

The budget constraint shifts outward.

Does the slope change? NO.
Changes in the Budget Constraint

Starting from an original budget constraint ...

Suppose that money income I decreases ...

The consumer can now buy less Y if all income is spent on Y ...

and can buy less X if all income is spent on X ...

The budget constraint shifts inward.

Does the slope change? NO.
Changes in Indifference Curves

Start from an original set of Indifference Curves (only one of which is shown).

If the individual is at point A, an additional unit of X is worth 2Y.

Suppose that the individual’s preferences change so that X is now valued more highly (he prefers X relatively more)...

Now the individual will value an additional unit of X at more than 2Y, say 5Y...

The set of indifference curves will become steeper...
Changes in Indifference Curves

Start from an original set of Indifference Curves (only one of which is shown).

If the individual is at point A, an additional unit of X is worth 2Y.

Suppose that the individual’s preferences change so that Y is now valued more highly (he prefers X relatively less)...

Now the individual will value an additional unit of X at less than 2Y, say 1Y...

The set of indifference curves will become flatter...
Changes in Behavior: Price

Beginning from equilibrium,

suppose that $P_x$ falls.

The budget constraint rotates outward around the $Y$-intercept...

The consumer chooses a new $X$, $Y$ combination: $X^{**}$, $Y^{**}$
Changes in Behavior: Price

Beginning from equilibrium,
suppose that \( P_x \) rises.

The budget constraint rotates outward around the Y-intercept...

The consumer chooses a new \( X, Y \) combination: \( X', Y' \)
Beginning from equilibrium, suppose that Income rises.

The budget constraint shifts outward and the slope doesn’t change (why?)

The consumer chooses a new $X, Y$ combination: $X^{**}, Y^{**}$
Changes in Behavior: Income

As this graph what kind of goods are X and Y?

Both are normal goods.
Suppose, that instead, money income had fallen. Again that means a new equilibrium, and a new equilibrium combination of $X'$ and $Y'$. 
Changes in Behavior: Preferences

Suppose preferences become more favorable to X...the IC steepen.

The individual now moves to a bundle favoring more X and less Y, at B.

Start from an original equilibrium, A.
Social Indifference Curves?

- Can we sum up the preferences of individuals into a social indifference curve?
  - We could if we could measure the intensity of preferences independent of income levels, or measure utility directly.
  - But we can’t.

- Further, *Arrow’s Impossibility Theorem* shows that there exists no rule that allows us to combine preferences without giving some one person in society totalitarian power over the resulting choice.
There ain’t no such thing as a Social Indifference Curve... (sometimes called a Social Welfare Function).

But **BE WARE**, textbooks and journal articles often present graphs that pretend that we can aggregate individual preferences into a Social Preference Ordering – a Social Indifference Curve.
For a two good world, we can employ the **fiction** that the indifference curve represents the preferences of the *marginal* or *representative* individual in society.

When we move to more than two goods, however, this fiction becomes untenable.
TANSTAAALIC

- Why use graphs that show Country PPFs and Country ICs? (that violate TANSTAAALIC!)
- As a short-hand for the more complicated process of actual price formation...that’s all.
- Don’t commit the fallacy of misplaced concreteness.