Econ. 1A. Chapter 3. **The Economic Problem. Production Possibility Frontier (PPF). Specialization and Trade**

The purpose of this chapter is to apply an economic model called PPF to explain and illustrate the concepts of scarcity, production efficiency, opportunity cost, tradeoff and economic growth. It further applies PPF to show that *free trade* + *CA* + *specialization is efficient.*

1. Economic Model:

1.1. Economics is based on the formulation of *models*. A model is a *theory*.

(a) An economic model is an *abstract* representation of reality.
(b) It is composed of a number of *assumptions* from which *conclusions* - predictions - are deduced.

1.2. Economic model can be described by
(i) verbal statements, (ii) graphs, and (iii) equations.

2. Example: An economic model of scarcity and opportunity cost

(a) Fact: The quantities of goods that can be produced are *limited* by
(i) limited available resources (factors of production), and (ii) given technology.

(b) **The production possibility frontier** (PPF)
PPF is the boundary between the combinations of goods and services that can be produced and the combinations that cannot be produced, given *the available factors of production and the state of technology* and the available resources are *fully* and *efficiently* used.

(c) PPF is an economic model

Assumptions:

(1) There are *two* goods: DVD (d) and Cell Phone (c).
(2) The amount of *factors of production (resources)* and *technology* available for the production of d and c are fixed.
(3) Factors of production (resources) are used *fully* and *efficiently*.

Conclusions:

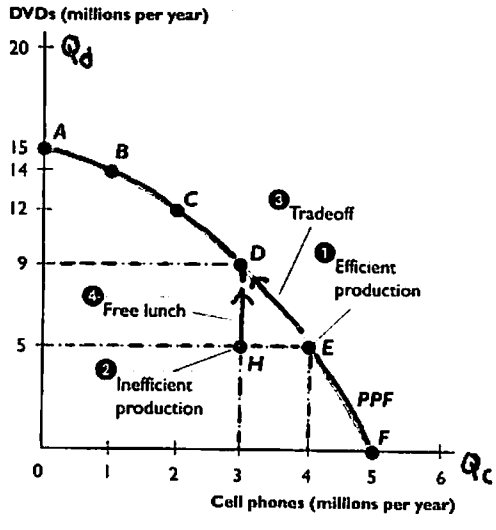
P1. When we have limited factors of production (resources) and unlimited wants, scarcity is a universal fact of life.
P2. If we already use limited factors of production (resources) *efficiently*, we cannot produce more of one good without producing less of some other good.

I: Table

Possibility	Q_c	ΔQ_c	Q_d	ΔQ_d	$\lvert \Delta Q_d/\Delta Q_c \rvert$
A	0		15		
		1		- 1	1/1
B	1		14		
		1		- 2	2/1
C	2		12		
		1		- 3	3/1
D	3		9		
		1		- 4	4/1
E	4		5		
		1		- 5	5/1
F	5		0		

where $\lvert \Delta Q_d/\Delta Q_c \rvert$ is the opportunity cost of a Cell Phone.

II: Graph



❶ When production occurs at a point on the *PPF*, such as point *E*, resources are used efficiently.

❷ When production occurs at a point inside the *PPF*, such as point *H*, resources are used inefficiently.

❸ When production is efficient—on the *PPF*—the economy faces a tradeoff. To move from point *E* to point *D* requires that some cell phones be given up for more DVDs.

❹ When production is inefficient—inside the *PPF*—there is a free lunch. To move from point *H* to point *D* does not involve a trade-off.

III. Equation: $Q_d = f(Q_c)$, $dQ_d/dQ_c < 0$

Notes

(1). The points outside PPF are unattainable. The points inside PPF and on PPF are attainable.

(2) Production at any point on the PPF achieves **production efficiency**. Production at a point inside PPF is **inefficient**, i.e., resources are not used fully (**unemployment**) and efficiently.

(3) The "bowed outward" shape of PPF shows that **the law of increasing opportunity cost prevails.**

(4) When production is efficient – on PPF – people face **tradeoff**. If the production is at a point inside PPF, there is **a free lunch**.
(5) Technological improvement and increases in capital and human capital will push PPF outward. This indicates more DVD and Cell Phones can be produced.

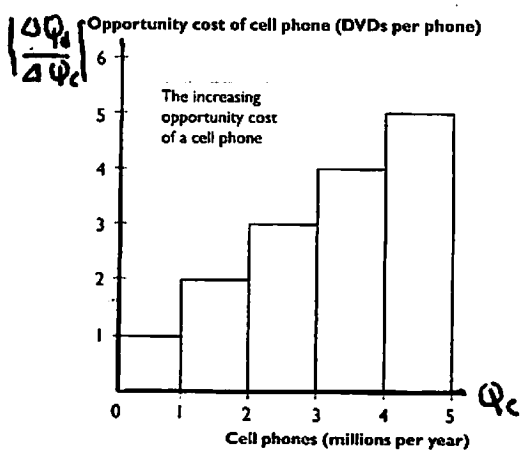
3. **Production efficiency is** a situation in which the economy is getting all that it can from its resources and cannot produce more of one good or services without producing less of something else.
4. **Tradeoff** is an exchange – giving up one thing to get something else.
5. What is opportunity cost?

5.1. **Opportunity cost** of an action is the highest-valued alternative forgone. The opportunity cost of producing an additional unit of a good is the quantity of another good we must forgo.

5.2. **Opportunity cost is a ratio**. It is the decrease in the quantity produced of one good divided by the increase in the quantity produced of another good. For example, $|\Delta Q_d/\Delta Q_c|$.

5.3. **Increasing opportunity cost**: the opportunity cost for a good increases as the quantity of that good produced increases. This is due to resources are not equally productive in all activities.

The opportunity cost of a cell phone: $|\Delta Q_d/\Delta Q_c|$



Because the *PPF* in Figure 3.4 is bowed outward, the opportunity cost of a cell phone increases as the quantity of cell phones produced increases.

Q_c Cell phones (millions)	0 to 1	1 to 2	2 to 3	3 to 4	4 to 5
$\lvert\Delta Q_d/\Delta Q_c\rvert$ Opportunity cost (DVDs per phone)	1	2	3	4	5

6. Application

President Dwight D. Eisenhower
Every gun that is made, every warship launched, every rocket fired signifies, in the final sense, a theft from those who hunger and are not fed.

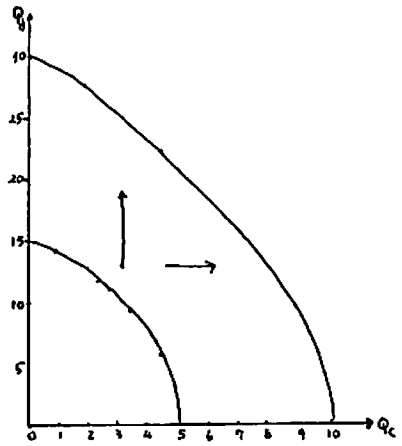
Economic Growth

7. **Economic Growth**: The sustained expansion of PPF. **Technological improvement and increases in Capital (K) and Human Capital (HK)** will push PPF outward.

Example:

A technological improvement **doubles** the production of Q_c and Q_d with the same resources. It will push PPF outward and reduce **SCARCITY.**

Q_c	Q_c'	Q_d	Q_d'
0	0	15	30
1	2	14	28
2	4	12	24
3	6	9	18
4	8	5	10
5	10	0	0



Specialization and Trade

8. **Absolute Advantage** (AA): A country (region or individual) has an absolute advantage in the production if it is more productive than other country in several or even all production activities..
9. **Comparative Advantage** (CA): A country (region or individual) has a comparative advantage in the production of a good if it can produce the good at **lower opportunity cost.**
10. David Ricardo (1817, **Principles of Political Economy and Taxation**)
    Trade and specialization according to comparative advantage will increase total outputs of goods with the given resources, that is, they will use resources more efficiently.

Note: **Specialization**: People concentrate on the production of only one or a few goods.

11. **Example**:

(A) **Assumptions**:
(1) Liz and Joe.
(2) Two goods: Smoothie (Q_m) and Salad (Q_s)
(3) Given resources: Liz: R_L = 60min. Joe: R_J = 60min.
(4) Given technology:
Liz: One smoothie every 2 min. One salad every 2 min.
Joe: One smoothie every 10 min. One salad every 2 min.
(5) Liz: $Q_m = (R_L/2) = (60/2) = 30$, $Q_s = (R_L/2) = (60/2) = 30$.
Joe: $Q_m = (R_J/10) = (60/10) = 6$, $Q_s = (R_L/2) = 30$.

(B) Liz's PPF

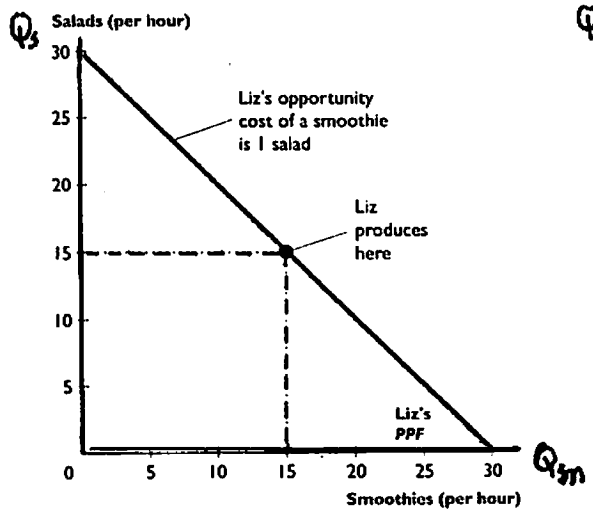
Q_m	ΔQ_m	Q_s	ΔQ_s	$\lvert \Delta Q_s/\Delta Q_m \rvert$	$\lvert \Delta Q_m/\Delta Q_s \rvert$
0		30			
	30		-30	1	1
30		0			

$\lvert \Delta Q_s/\Delta Q_m \rvert = 1$ = Liz's opportunity cost of production 1 smoothie is 1 salad.
$\lvert \Delta Q_m/\Delta Q_s \rvert = 1$ = Liz's opportunity cost of production 1 salad is 1 smoothie.

(C) Joe's PPF

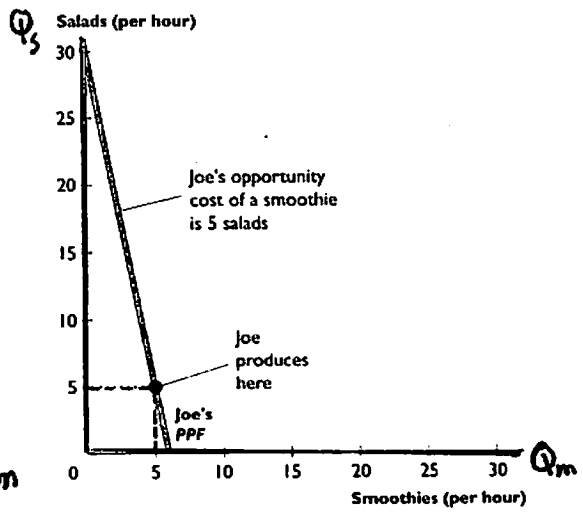
Q_m	ΔQ_m	Q_s	ΔQ_s	$\lvert \Delta Q_s/\Delta Q_m \rvert$	$\lvert \Delta Q_m/\Delta Q_s \rvert$
0		30			
	6		-30	5	1/5
6		0			

$\lvert \Delta Q_s/\Delta Q_m \rvert = 5$ = Joe's opportunity cost of production 1 smoothie is 5 salad.
$\lvert \Delta Q_m/\Delta Q_s \rvert = 1/5$ = Joe's opportunity cost of production 1 salad is 1/5 smoothie.



(a) Liz's *PPF* and production

Liz can produce 30 smoothies per hour or 30 salads per hour or any other combination along her *PPF* in part (a). Liz chooses to produce 15 smoothies and 15 salads per hour.



(b) Joe's *PPF* and production

Joe can produce 6 smoothies per hour or 30 salads per hour or any other combination along his *PPF* in part (b). Joe chooses to produce 5 smoothies and 5 salads per hour.

(D) AA: Liz has AA

(E) CA: Liz has CA on Q_m, because $|\Delta Q_s/\Delta Q_m|_L = 1 < |\Delta Q_s/\Delta Q_m|_J = 5$

Joe has CA on Q_s, because $|\Delta Q_m/\Delta Q_s|_J = 1/5 < |\Delta Q_m/\Delta Q_s|_L = 1$.

(F) **Self-sufficient (no trade)**

	Liz	Joe	Total
Q_m	15	5	15+5 = 20
Q_s	15	5	15+5 = 20.

(G) **CA + Trade + Specialization**

(1) *Specialization according to CA*

	Liz	Joe	Total
Q_m	30	0	30+0 = 30 > 20
Q_s	0	30	0+30 = 30 > 20.

(2) *Pattern of Trade with exchange rate is $1Q_m$ exchanges $2Q_s$*

→ (smoothie) 10

Liz Joe

20 (salad) ←

(3) *After trade*

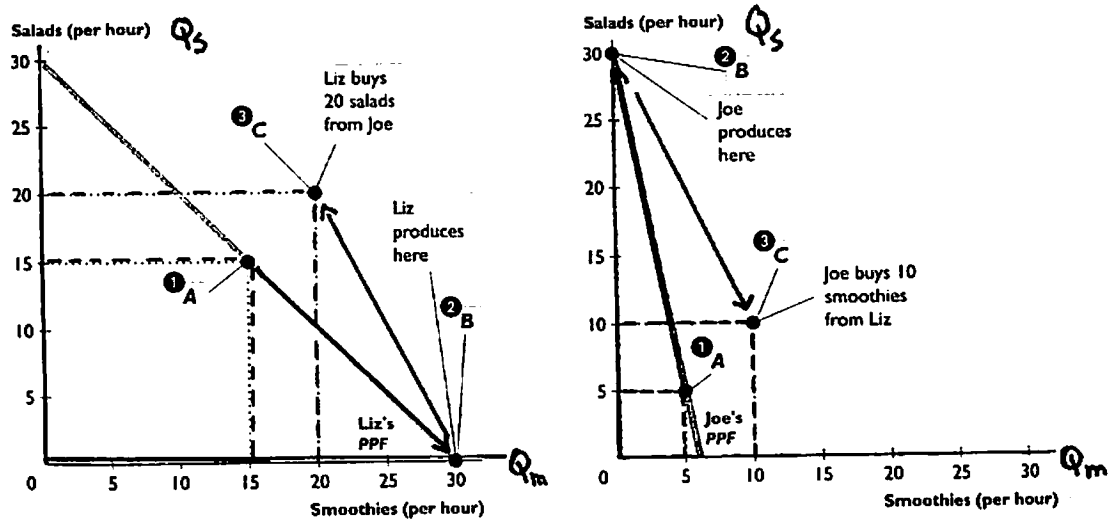
	Liz	Joe	Total
Q_m	20	10	20+10 = 30
Q_s	20	10	20+10 = 30.

(4) *Gains from trade*

	Liz	Joe	Total
Q_m	20-15 = 5	10-5 = 5	+10
Q_s	20-15 = 5	10-5 = 5	+10 .

Proposition: Trade and specialization according to comparative advantage will increase total output of Smoothie and Salad with **same resources**. This indicates that **trade** and **specialization** are **efficient**.

12. Graphic Illustration; Figure 3.8. on p. 77



(a) Liz's gains from trade

(b) Joe's gains from trade

❶ Liz and Joe each produce at point *A* on their respective *PPFs*. Liz has a comparative advantage in producing smoothies, and Joe has a comparative advantage in producing salads.

❷ Joe specializes in salads and Liz specializes in smoothies, so they each produce at point *B* on their respective *PPFs*.

❸ They exchange smoothies for salads at a price of 2 salads per smoothie. Each goes to point *C*—a point *outside* their individual *PPFs*. They each gain 5 salads and 5 smoothies—the quantities at point *C* minus the quantities at point *A*.