

## Math Recitation #1 – September 22, 2009

### I. Production Possibility Frontier

A. Definition: A curve that shows all possible combinations of producing two different goods if all inputs are used to their maximum capacity. These are ‘efficient’ combinations of the two goods.

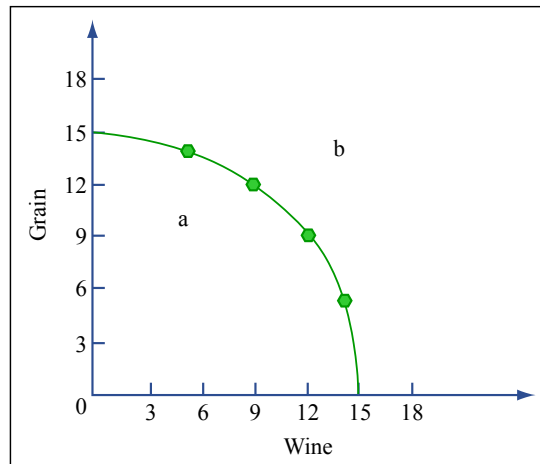


Image by MIT OpenCourseWare.

Why is **a** not efficient?

All inputs would not be used to their capacity. The firm has the capacity to produce more of either or both goods. This is not a *pareto efficient* point, which means that it is possible to make more of one or both goods without making anyone worse off.

Why does **b** not describe a desirable combination?

The firm will be unable to produce this combination of the goods because it does not have the capacity in inputs to do so.

Any of the points along the PPF would be considered ‘efficient’.

### B. Shifts in Production Possibility Frontier

Two things can cause the PPF to change:

1. Changes in the total amount of resources (inputs) that can be allocated to production of goods → the entire PPF will shift out
2. Changes in the productivity of a certain input → improvement in the technology of production of a good either through labor or capital productivity improvements → the manner of shifting depends on how the production of each good benefits from the improvement.

### C. Interpreting opportunity cost on the PPF

If you choose to make a unit of good A (grain) instead of a unit of good B (wine), there is an opportunity cost to *not* producing that amount of good B. If the two products are very similar (the production requires very similar inputs and technology), the opportunity cost of not producing a unit of A is the same as the cost of not producing unit B.

If the products are not similar and utilize different technologies and inputs, the opportunity costs of not producing each one may be different.

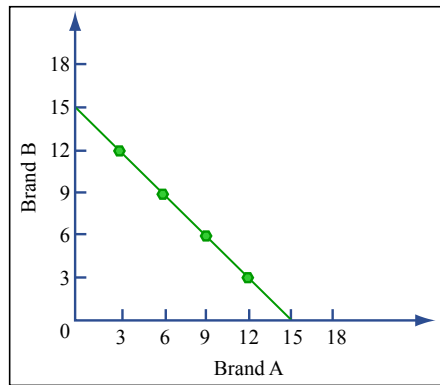


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If there are improvements in the technology to produce wine the PPF will move out as shown below.

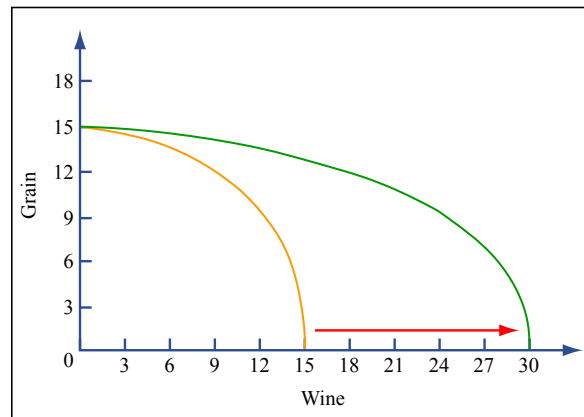


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Now the firm can produce more wine for the same amount of inputs and money; this means that each unit of wine is technically worth less in costs to the firm, so its opportunity cost has gone down relative to the grain. Say the firm wants to move resources from wine production to grain production. If they move \$5 to grain production which can make 2 units of grain, in the old scenario they would be forfeiting 2 units of wine exactly. However, in the second case where wine production has become cheaper, the \$5 can make 4 units of wine rather than 2. The opportunity cost of moving those \$5 to grain is now 4 units of wine.

## II. Supply and demand

### A. Principle of equilibrium

What happens if P is higher than the equilibrium P? Lower?

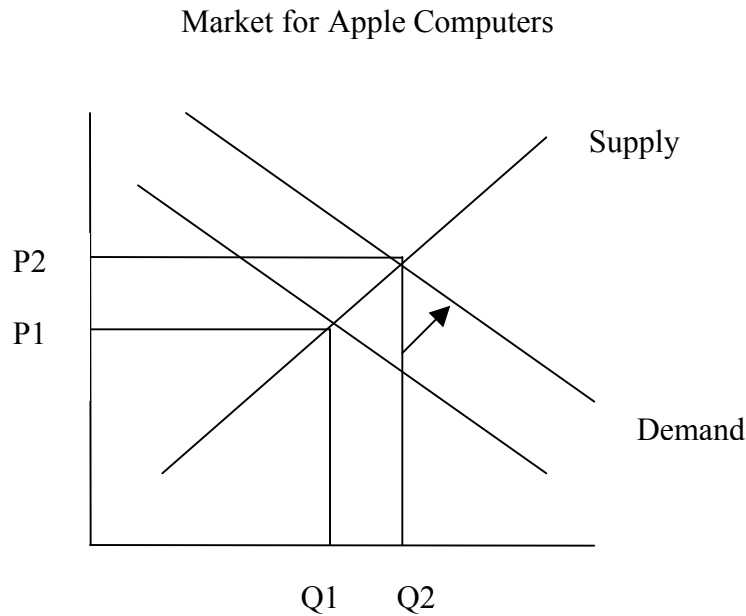
### B. Background variables

Common background variables for demand: cost of substitutes, quality of substitutes, external conditions such as weather or political factors.

Common background variables for supply: cost of inputs, price and quality of substitutes

- If costs facing the producer decreases, the supply curve shifts down (to the right).
- If costs facing the producer increases, the supply curve shifts up (to the left).
- If consumers value a good less, the demand curve shifts in (to the left).
- If consumers value a good more, the demand curve shifts out (to the right).

In-class Apple computer example:



### III. Elasticity

Elasticity generally describes how one thing responds to changes in another thing. In Economics it is common to look at the **price elasticity of demand** which describes how demand changes if price goes up or down by a certain amount. Other common elasticities are **income elasticity of demand** and **price elasticity of supply**.

Price elasticity of demand

$$E_p = \% \text{ change in quantity demanded} / \% \text{ change in price} = \Delta Q / Q / \Delta P / P$$

If elasticity is  $< 1$  for a good, the demand for the good is considered inelastic. This means that the change in quantity is less than the change in price. Demand curve will be steeper. If elasticity is  $> 1$  for a good, the demand for the good is considered elastic. This means that the change in quantity is more than the change in price. Demand curve will be more shallow. Price elasticity tends to be negative, if price increases, quantity will decrease.

Factors determining elasticity:

- 1) Availability of substitutes- If a good is elastic, it implies that consumers have other viable options as alternatives to that good, so an increase in the price results in a large drop in quantity consumed as consumers go to other products (e.x. Tide laundry detergent in the supermarket). If a good is inelastic, the opposite is true. There are not many alternatives so regardless of price increases, individuals do not greatly adjust their consumption level (e.x. insulin for Diabetes patients)
- 2) Durability of the good
- 3) Long-term versus short-term-demand for goods in the long-run tends to be more elastic.

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