Universidad Carlos III de Madrid

MICROECONOMICS I

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SECOND PART: DEMAND AND SUPPLY

The demand curve

The **individual demand curve** describes the quantity of a good or service that a household chooses to buy at any given price.

The **market demand curve** is found by adding the individual curves horizontally, and it gives the total quantity demanded at each price.

By the law of demand, the cheaper (the more expensive) a good is, the more (the less) of it individuals will buy. This holds **ceteris paribus**, i.e., all other things being equal. And that's why the demand curve has negative slope.

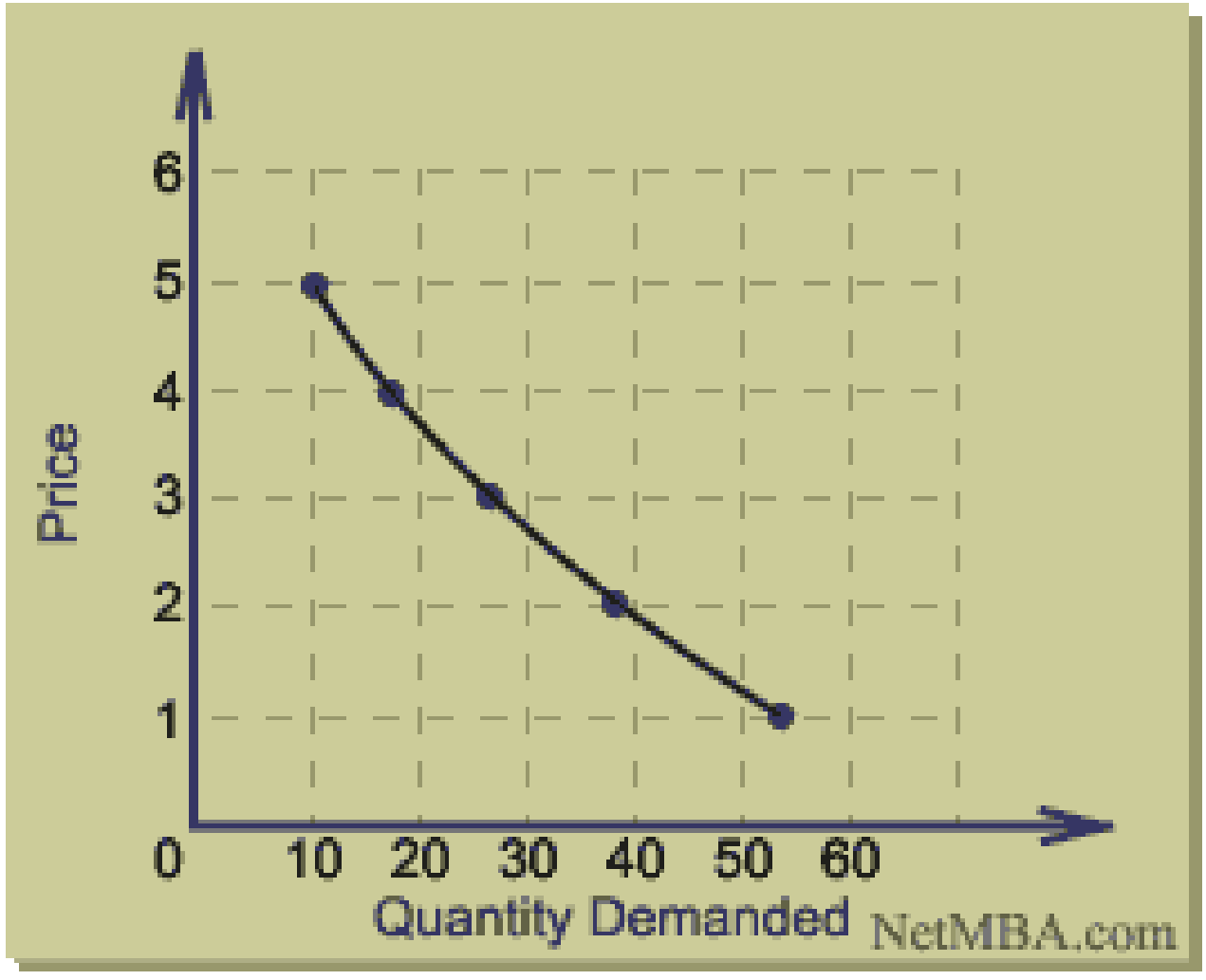
The demand curve (cont.)

Graph the curve associated to this demand schedule:

price	quantity
5	10
4	17
3	26
2	38
1	53

Note that the above curve has non-constant slope. $Alternatively$, the demand curve may be captured by a straight line (with negative slope):

$$Q_d = a - bP.$$


Price
6
5
4
3
2
1
0
10
20
30
40
50
60
Quantity Demanded
NetMBA.com

Sources of shifts in the demand curve

Note the difference between *movements along* the demand curve (as the price changes) and *shifts of* the curve (as one of the other relevant factors changes).

Possible **demand-shifting** factors:

- income;
- price of a related good:
  - substitute;
  - complement;
- individual tastes or cultural factors;
- demography;
- expectations.

The supply curve

The **individual supply curve** describes the quantity of a good or service that a firm chooses to sell at any given price.

The **market supply curve** is found by adding the single-firm curves horizontally, and it gives the total quantity supplied at each price.

By the law of supply, the cheaper (the more expensive) a good is, the less (the more) of it firms will sell. This holds **ceteris paribus**, i.e., all other things being equal. And that's why the supply curve has positive slope.

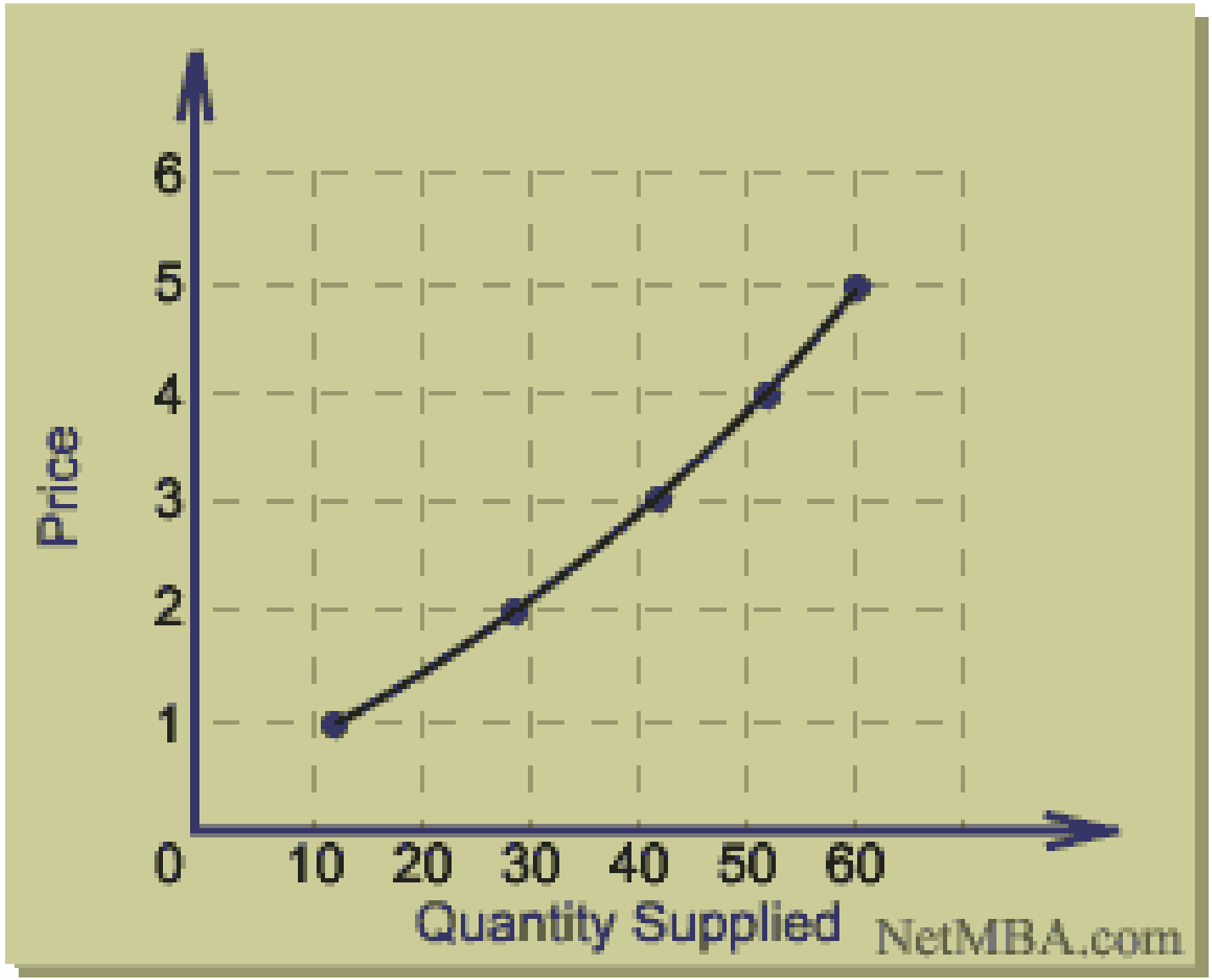
The supply curve (cont.)

Graph the curve associated to this supply schedule:

price	quantity
5	60
4	52
3	42
2	28
1	12

Note that the above curve has non-constant slope. *Alternatively*, the supply curve may be captured by a straight line (with positive slope):

$$Q_s = a + bP.$$


Price
6
5
4
3
2
1
0
10
20
30
40
50
60
Quantity Supplied
NetMBA.com

Sources of shifts in the supply curve

Again, note the difference between *movements along* the supply curve (as the price changes) and *shifts of* the curve (as another factor changes).

Possible **supply-shifting** factors:

- price of a relevant input;
- technology;
- natural environment;
- number of sellers;
- expectations.

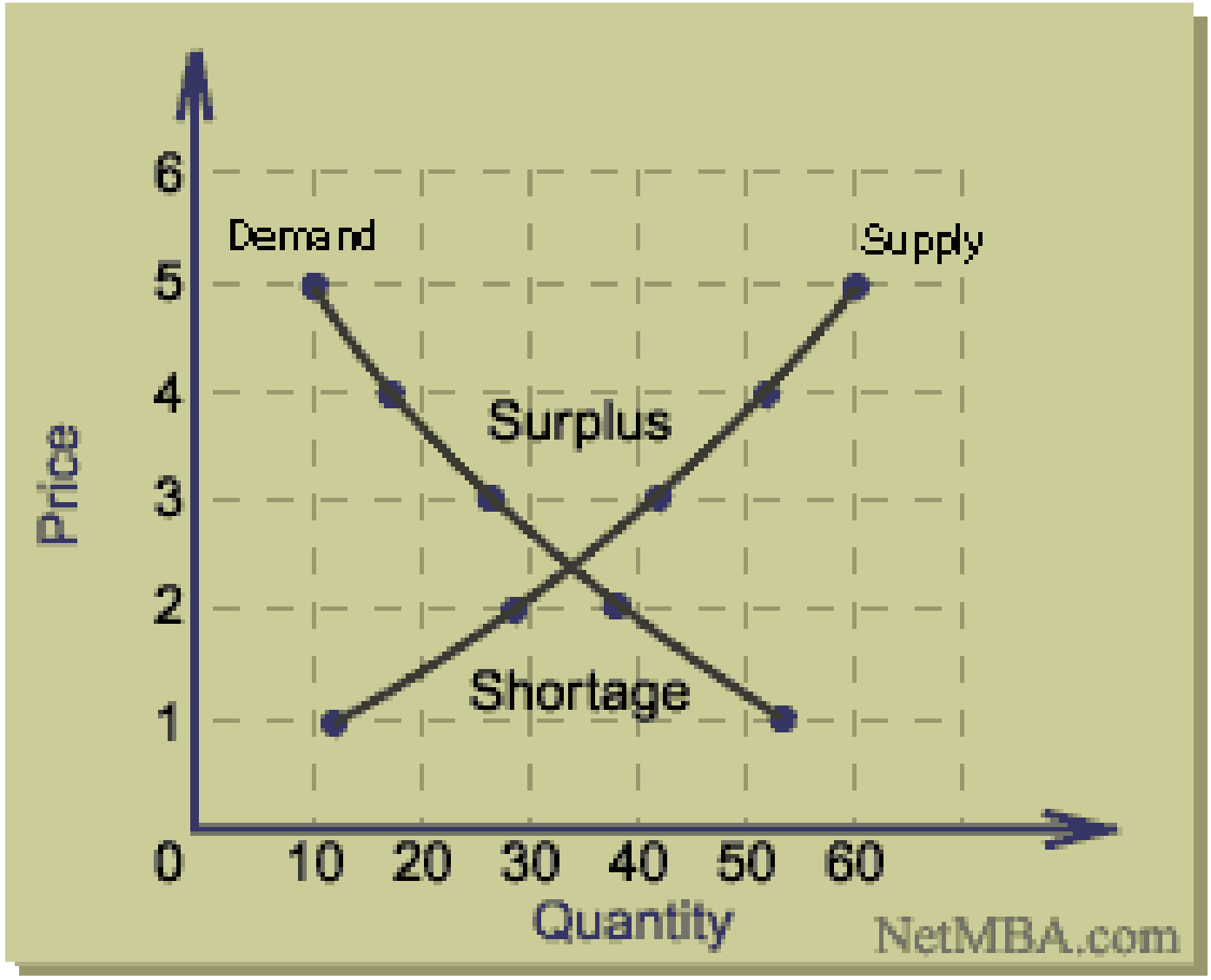
The equilibrium in the demand-supply model

The concept of **equilibrium**: nobody has an incentive to move from there. This doesn't mean that it's like heaven on earth, but that the available alternatives are not sustainable in terms of incentives.

In the demand-supply model, the market is in equilibrium at the point where the demand and the supply curve intersect. At that intersection, we can identify the **equilibrium price** and the **equilibrium quantity**.

Note that at an higher price than the equilibrium one, there is **excess supply** and the price tends to decrease. At a lower price, there is **excess demand** and the price tends to increase. These forces lead to the market-clearing equilibrium.

$\Rightarrow$ Show in a graph that with the above examples of demand and supply curves, the equilibrium price lies between 2 and 3.


Demand
Supply
Surplus
Shortage
Price
6
5
4
3
2
1
0
10
20
30
40
50
60
Quantity
NetMBA.com

Determining the equilibrium with linear demand and supply

The above example shows how to identify the equilibrium point in a graph, i.e., it coincides with the intersection between the demand and supply curve.

If both curves are lines, it is easy to calculate the exact equilibrium price and the associated equilibrium quantity.

- Linear demand: $Q_d = a - bP$ (with $a, b > 0$)
- Linear supply: $Q_s = c + dP$ (with $c, d > 0$)
- Equilibrium condition: $Q_d = Q_s$
- Solving for the equilibrium price: $a - bP = c + dP \Rightarrow P_E = \frac{a-c}{b+d}$
- Solving for the equilibrium quantity: $Q = a - b\frac{a-c}{b+d} \Rightarrow Q_E = \frac{ad+bc}{b+d}$

Equilibrium effects of shifts in the demand or supply curve

demand shift	supply shift	effect on price	eff. on quantity
positive	none	positive	positive
negative	none	negative	negative
none	positive	negative	positive
none	negative	positive	negative
positive	positive	ambiguous	positive
negative	negative	ambiguous	negative
positive	negative	positive	ambiguous
negative	positive	negative	ambiguous

The elasticity of demand

Note the different "reaction" of the quantity demanded (Q_d) to the same price change (ΔP) on the basis of the slope of the demand curve. The steeper the curve, the lower the reaction (e.g., because substitution is more difficult).

The concept of **price elasticity of demand** helps us to capture these differences in the reaction of the quantity demanded to price changes:

$$\texttt{elasticity of demand} = \frac{\Delta\%\ \texttt{quantity demanded}}{\Delta\%\ \texttt{price}}.$$

That is:

$$\epsilon_d = \frac{(Q_2-Q_1)}{(Q_1+Q_2)/2} \Big/ \frac{P_2-P_1}{(P_1+P_2)/2} = \frac{(Q_2-Q_1)(P_1+P_2)}{(P_2-P_1)(Q_1+Q_2)} \text{ (arc elasticity).}$$

Economists assume that the elasticity of demand is larger in the **long run** (i.e., in the period in which all adjustments can be made) than in the **short run**.

The elasticity of demand (cont.)

elasticity	**demand curve**	**price change**	**effect on demand**
$= 0$	vertical	1% increase	no effect
between 0 and 1	inelastic	1% increase	reduced by less 1%
$= 1$	unitary elasticity	1% increase	reduced by 1%
greater than 1	elastic	1% increase	reduced by more 1%
infinite	horizontal	1% increase	reduced to zero

Elasticity of demand and firm's revenues

If there is only one firm and we define firm's total revenues as $R = PQ$, demand elasticity is crucial to understand how firm's revenues respond to price changes.

Example 1. Price elasticity of demand is equal to 2. Initial conditions: price equal to $1,000$ and total sells equal to $100,000$. So, total revenues are 100 million. Show that a 1% increase in price would cause revenues to fall to 98.98 million (with a fall just slightly over 1%).

Example 2. Price elasticity of demand is equal to 1. Initial conditions: price equal to $1,000$ and total sells equal to $100,000$. Again, total revenues are 100 million. Show that a 1% increase in price would leave revenues unchanged (i.e., at the 100-million level).

The elasticity of supply

Again, note the different "reaction" of the quantity supplied (Q_s) to the same price change (ΔP) on the basis of the slope of the supply curve. The steeper the curve, the lower the reaction.

The concept of **price elasticity of supply** helps us to capture this differences in the reaction of the quantity supplied to price changes:

$$\texttt{elasticity of supply} = \frac{\Delta\% \texttt{ quantity supplied}}{\Delta\% \texttt{ price}}.$$

That is:

$$\epsilon_s = \frac{(Q_2-Q_1)}{(Q_1+Q_2)/2} \Big/ \frac{P_2-P_1}{(P_1+P_2)/2} = \frac{(Q_2-Q_1)(P_1+P_2)}{(P_2-P_1)(Q_1+Q_2)} \text{ (arc elasticity).}$$

The elasticity of supply (cont.)

elasticity	**supply curve**	**price change**	**effect on supply**
$= 0$	vertical	1% increase	no effect
between 0 and 1	inelastic	1% increase	increased by less 1%
$= 1$	unitary elasticity	1% increase	increased by 1%
greater than 1	elastic	1% increase	increased by more 1%
infinite	horizontal	1% increase	infinite increase

Tax policy and the law of supply and demand

$\Rightarrow$ Note that demand elasticity is crucial to predict the equilibrium effects of shifts in the supply curve. Similarly, supply elasticity is crucial to predict the effects of shifts in the demand curve.

An example: tax policy. Analyze the introduction of a 10-cent tax on one unit of two very different goods: cigarettes and cheddar cheese. The tax causes the supply curve to shift to the left. Equilibrium price and quantity change.

The magnitude of the change is different in the two markets, because demand elasticity is different for the two goods (i.e., it is greater for cheese).

- The change in the equilibrium quantity is greater in the case of cheese.
- The change in the equilibrium price is greater in the case of cigarettes.
- Consumers of cigarettes bear an higher burden of the tax than consumers of cheddar cheese.

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The tax burden

The burden of a tax - its **incidence** - does not necessarily fail on the agent that must deliver the money to the government. The "true" burden is shared between firms and consumers according to the elasticities of demand and supply.

Consider again the cigarettes and cheese example. We are considering **indirect taxes**, which - officially - must be paid by the sellers. But sellers can shift the tax on consumers as long as the demand is not completely elastic.

In these cases:

- Consumer's burden = new equilibrium price - old equilibrium price.
- Firm's burden = old equilibrium price - new equilibrium price + tax.

Price controls

Governments can decide to interfere with the law of demand and supply, because of equity, political or social considerations. But this comes with a cost.

Price ceilings (e.g., *rent control*). By law, the market price cannot exceed a maximum level (below the market clearing price, if the ceiling is effective). Then, we end up with **excess demand**.

Price floors (e.g., *the minimum wage*). By law, the market price cannot be lower than a minimum level (above the market clearing price, if the floor is effective). Then, we end up with **excess supply**.

- Policy focus (1): debating the effects of minimum wages on unemployment.
- Policy focus (2): the costs of the European Common Agricultural Policy.

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