

# **Part II**

# **Perfectly Competitive Markets**

# What is a Market?

## Definition:

The **Market** for a given good or service is the set of *all the consumers and suppliers who are willing to buy and sell that good or service at a given price.*

# What is a Market?

## Definition:

**Market Equilibrium** occurs when the price and the quantity sold of a given good is stable. Or **market equilibrium** occurs when the equilibrium price is such that the quantity that consumers want today is the same as the quantity that suppliers want to sell.

# What is a Perfectly Competitive Market?

## Characteristics:

- *Consumers and Suppliers are Price-Takers*
- *Homogeneous Goods*
- *No Externality*
- *Goods are Excludable and Rival*
- *Full Information*
- *Free Entry and Exit*

# **Chapter 2: Supply in a Perfectly Competitive Market**

# Supply Curve for an Individual

## Meet Stef 😊

- 2 **productive activities** (Assumption 1):
  - collecting apples and catching fish
- **Productivities**
  - 1<sup>st</sup> bushel of apples takes 1 hour to harvest,
  - 2<sup>nd</sup> bushel of apples takes 1.5 hours
  - 3<sup>rd</sup> bushel of apples takes 2 hours...
  - 1 fish takes 0.5 hours to catch (constant)
- Price:  $P_{\text{fish}} = \$0.50$  and  $P_{\text{apples}} = \$1.90$



**Number of Bushels and fish that max Stef's revenues?**

# Supply Curve for an Individual

**Think at the margin!**

Should Stef produce  
**one extra fish or one extra bushel of apples?**

*...and after the first decision...*

Should Stef produce  
**one extra fish or one extra bushel of apples?**

*...and so on and so forth...*

# Supply Curve for an Individual

Time required to collect apples or catch fish (hours)

Bushels of Apples			Fish		
Units	Total Time	Marginal Time	Units	Total Time	Marginal Time
1	1	1	1	0.5	0.5
2	2.5	1.5	2	1	0.5
3	4.5	2	3	1.5	0.5
4	7.5	3	4	2	0.5
5	14	6.5	5	2.5	0.5
6	30	16	6	3	0.5

Table 2.1: Stef's productivity.

**Marginal Benefit  $\geq$  Marginal Cost    GO! Take the action**

**Marginal Benefit  $<$  Marginal Cost    Don't take the action**

# Supply Curve for an Individual

## Definitions:

The **Marginal Benefit** of producing a certain unit of a given good is the **extra benefit** accrued by producing that unit.

The **Marginal Cost** of producing a certain unit of a given good is the **extra cost** of producing that unit. (**!!!** *The relevant cost is the “opportunity cost” and not just the “absolute cost” of producing the good.*)

# Supply Curve for an Individual

## Cost-Benefit Principle:

The **Cost-Benefit Principle** states that an action should be taken if the marginal benefit is greater than the marginal cost.

# Supply Curve for an Individual

## Definition:

The **Economic Surplus** of a certain action is the difference between the marginal benefit and the marginal cost of taking that action.

# Supply Curve for an Individual

Time required to collect apples or catch fish (hours)

Bushels of Apples			Fish		
Units	Total Time	Marginal Time	Units	Total Time	Marginal Time
1	1	1	1	0.5	0.5
2	2.5	1.5	2	1	0.5
3	4.5	2	3	1.5	0.5
4	7.5	3	4	2	0.5
5	14	6.5	5	2.5	0.5
6	30	16	6	3	0.5

Table 2.1: Stef's productivity.

# Supply Curve for an Individual

## Definition:

The **Quantity Supplied** by a supplier represents the quantity of a given good or service that maximizes the profit of the supplier.

# Supply Curve for an Individual

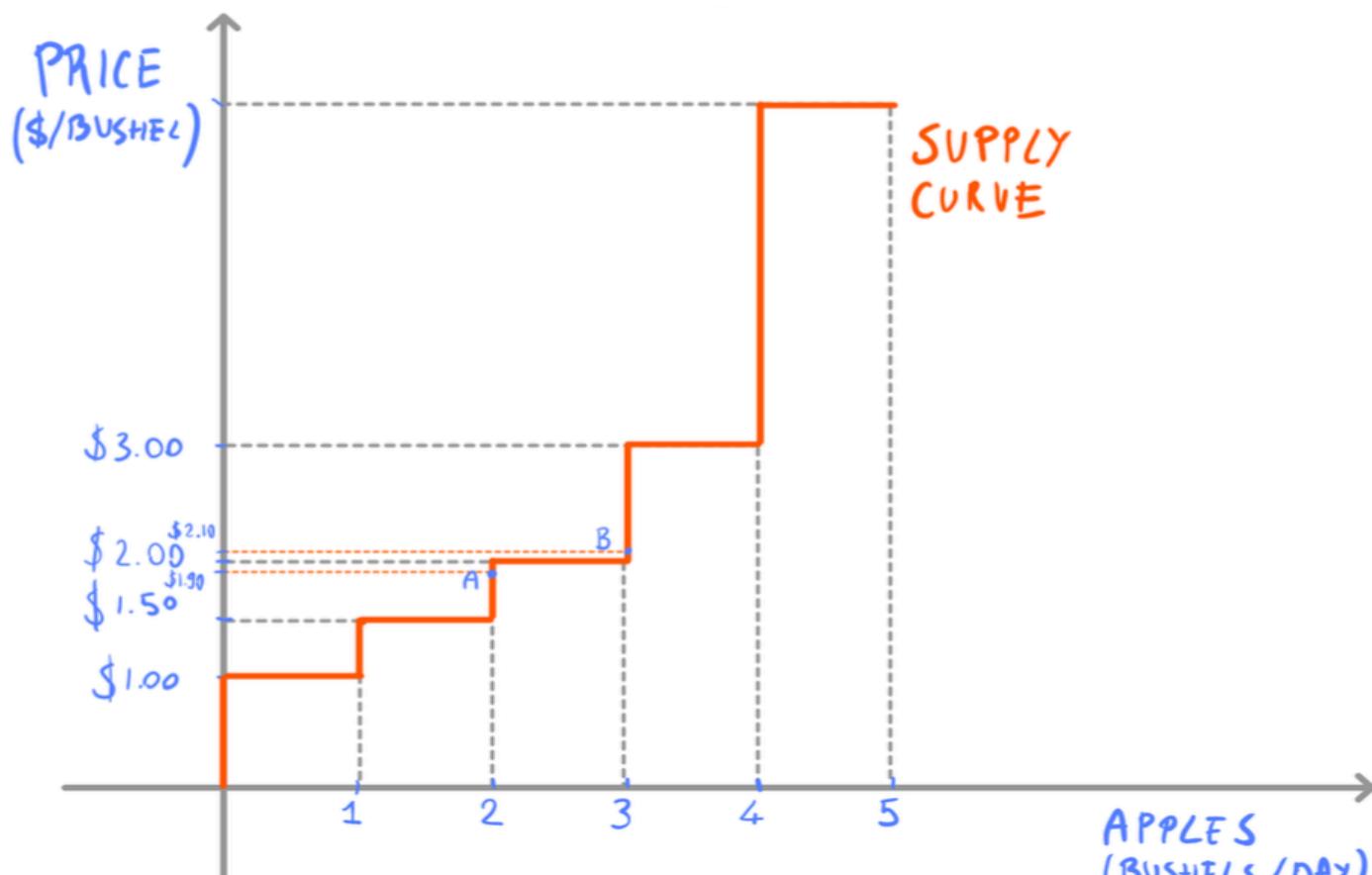
## Definition:

The **Supply Curve** represents the relationship between the price of a good or service and the quantity supplied of that good or service.



Vary the price of apples to see how the supply of apples would change with it

# Supply Curve for an Individual



# Supply Curve for an Individual

## Law of Supply:

The tendency for a producer to **offer more** of a certain good or service **when the price of that good or service increases.**

# Supply Curve for an Individual

Supply curve can be interpreted

- **Horizontally**: Start from a certain Price and then use the supply curve to derive the Quantity of goods that will be supplied at that price.
- **Vertically**: Start from a given Quantity, find the associated Price on the supply curve → the minimum amount of money the producer is willing to accept to supply the *marginal unit* of the good == **Producer Reservation Price**

# Supply Curve for a Firm

**Everything we discussed so far still applies! 😊**

**BUT**

**Suppliers** (entrepreneurs) → **Factors of Production** → **Sunk Cost**

## **Definition:**

A **Sunk Cost** is a cost that once paid **cannot be recovered**.

# Supply Curve for a Firm

## Definition:

If a **Factor of Production is Fixed**, then its **cost does not vary** with the quantity produced.

A **Fixed Cost** is a cost associated with a fixed factor of production.

# Supply Curve for a Firm

## Definition:

If a **Factor of Production is Variable**, then its **cost tends to vary** with the quantity produced.

A **Variable Cost** is a cost associated with a variable factor of production.

# Supply Curve for a Firm

## Definition:

The **Short Run** is a period of time during which **at least of one factor of production is fixed**.

The **Long Run** is a period of time during which ***all* factors of production are variable**.

# Supply Curve for a Firm

Workers <i>W</i>	Quantity <i>Q</i>	Fixed Cost <i>FC</i>	Variable Cost $VC = \$12 \times W$	Total Cost $TC = VC + FC$	Average Cost			Marginal Cost $MC = \frac{\Delta TC}{\Delta Q}$
					Variable $AVC = \frac{VC}{Q}$	Total $ATC = \frac{TC}{Q}$		
0	0	\$100	\$0	\$100	—	—	—	—
1	40	\$100	\$12	\$112	0.30	2.80	0.30	
2	90	\$100	\$24	\$124	0.27	1.38	0.24	
3	120	\$100	\$36	\$136	0.30	1.13	0.40	
4	130	\$100	\$48	\$148	0.34	1.14	1.2	
5	135	\$100	\$60	\$160	0.44	1.19	2.40	

Table 2.2: Production costs in the presence of a fixed cost

# Supply Curve for a Firm

**Think at the margin!**

Should the entrepreneur hire the 1st worker?

*Quantity produced (1st worker): 40 cans (\$1.20 per can)*

*Fixed cost: \$100 (loan)*

*Variable cost: \$12 (wage of 1st worker)*

**Marginal cost (MC):**  $\Delta \text{Total Cost} / \Delta \text{Quantity} = 12 / 40 = 0.30 (\$/\text{unit})$

**Marginal benefit (MB):** Price = **1.20(\$/unit)**

# Supply Curve for a Firm

*Quantity Produced (4 workers) : 130cans (\$1.20 per can)*

*Fixed cost: \$100 (loan)*

*Variable cost: \$48 (wage of 4 workers)*

*Total revenues (4 workers): Price x Quantity = 130x\$1.20=***\$156**

*Total cost: Fixed Cost + Variable Cost = \$100+\$48 =* **\$148**

$$\Pi_{\text{production}} = TR - TC = \$8$$

# Supply Curve for a Firm

## Definition:

The **Profit** represents the **difference** between the total revenues ( $TR$ ) and the total costs ( $TC$ ).

# Supply Curve for a Firm

*Total revenues (4 workers): Price x Quantity = 130x\$1.20=\$156*

*Total cost: Fixed Cost + Variable Cost = \$100+\$48 = \$148*

$$\Pi_{\text{production}} = TR - TC = \$8$$

**Should the firm shut down production or continue to produce using the optimal number of employees?**

$$\Pi_{\text{shut-down}} = FC = -\$100$$

**Continue Production!**

# Supply Curve for a Firm

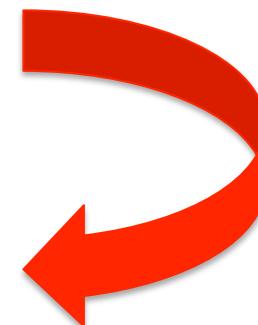
*What if the price decreases to \$0.40 per can?*

*Should the firm continue production or shut down?*

*Total revenues (3 workers): Price x Quantity = \$0.40x120=\$48*

*Total cost: Fixed Cost + Variable Cost = \$100+\$36 = \$136*

$$\Pi_{\text{production}} = TR - TC = -\$88$$



$$\Pi_{\text{shut-down}} = FC = -\$100$$



**Continue Production even when running a loss!**

**→ Fixed Costs at Play!**

# Supply Curve for a Firm

## **Shut Down Condition (Short Run):**

In the short run, the entrepreneur should shut down production if  $\pi_{production} < FC$ .

Otherwise, she should hire the optimal number of workers and continue operations.

# Supply Curve for a Firm

## **Shut Down Condition (Long Run):**

In the long run, the entrepreneur should exit the industry if  $\pi_{production} < 0$ .

Otherwise, she should hire the optimal number of workers and continue operations.

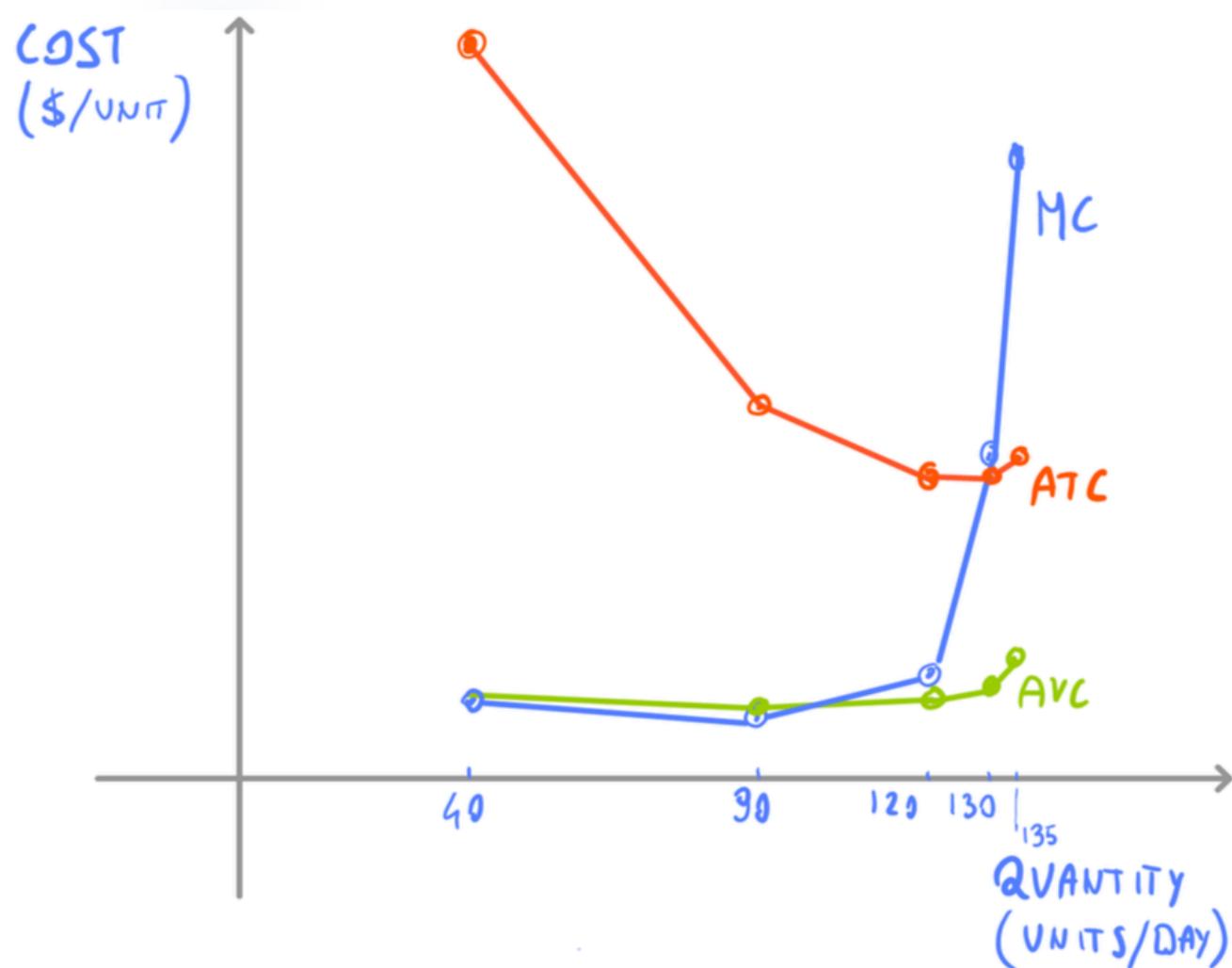
**Why? All factors are variable in the long run!**  
**Exiting the industry brings zero profit:  $\pi_{exit} = 0$**

# From a Discrete to a Continuous Model

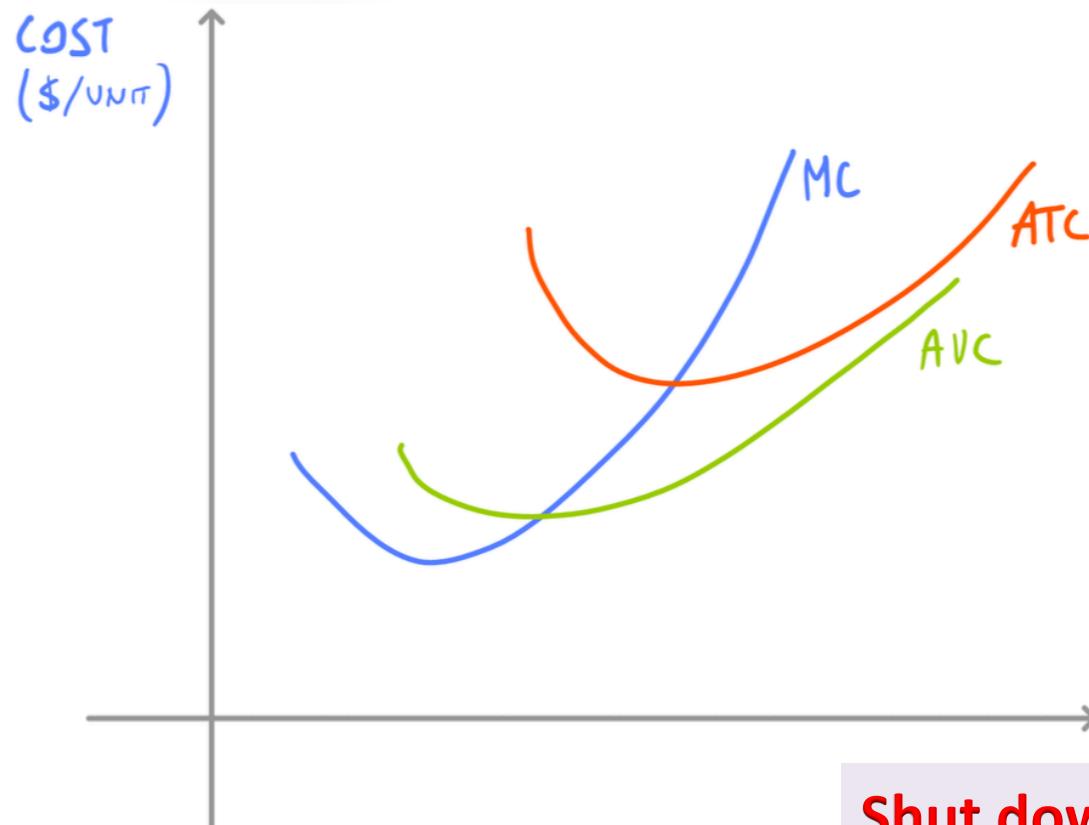
What would happen if the labour supply were much more flexible

→ employees were hired for as many hours (or even min/sec!) the entrepreneur wants?

# From a **Discrete** to a Continuous Model



# From a Discrete to a **Continuous** Model



**Shut down:**  
→ Short run: Price below  $\min(\text{AVC})$   
→ Long run: Price below  $\min(\text{ATC})$

# From a Discrete to a Continuous Model

**Supply Curve =**

The part of the MC Curve above the AVC ( $\rightarrow$  Short run)

The part of the MC Curve above the ATC ( $\rightarrow$  Long run)

$\Delta P \rightarrow \Delta Q \rightarrow$  move *along* the supply curve

$\Delta$ factor of production that affects MC  $\rightarrow$  shift of the supply curve

# From a Discrete to a Continuous Model

What shifts the supply curve to the right:

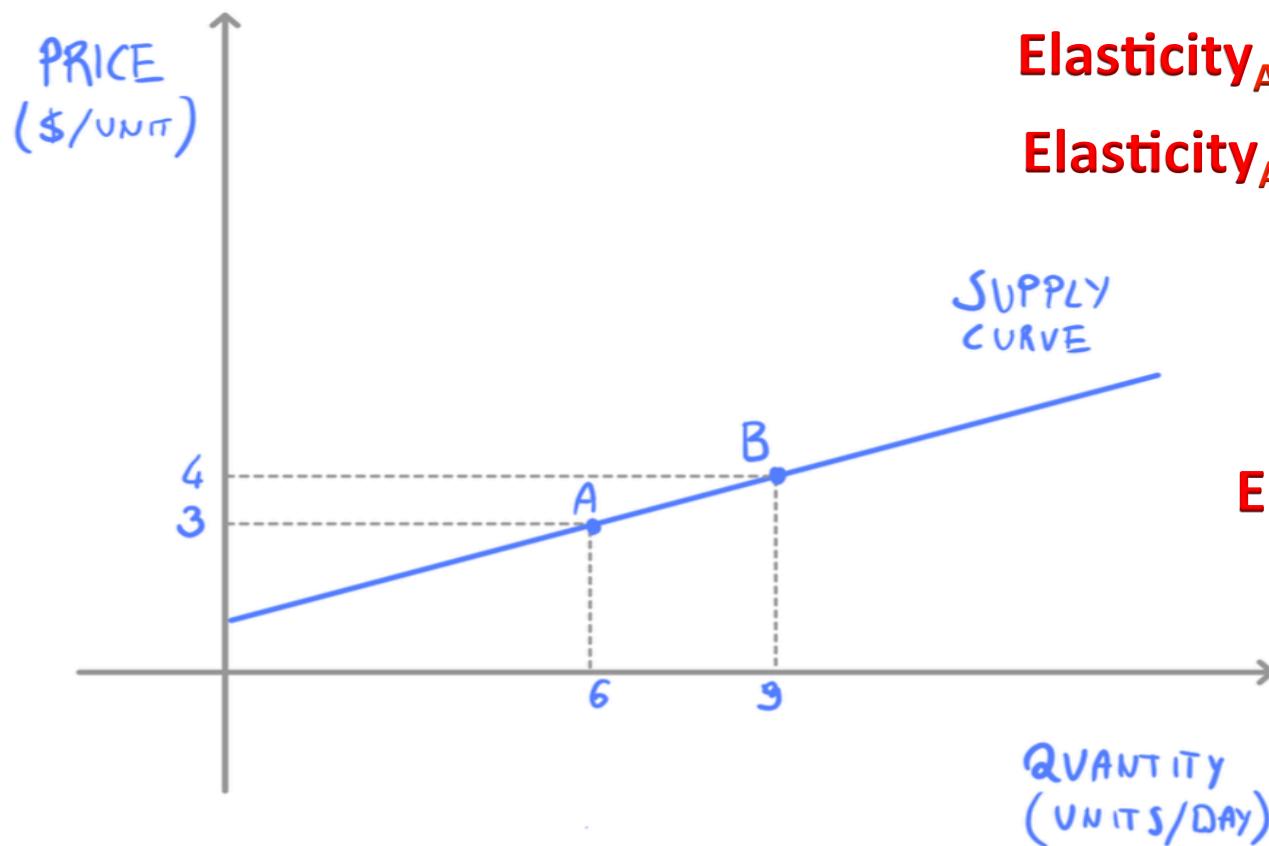
- Drop in the price of (variable) inputs
- Advancements in technology (via its impact on productivity)
- Expectations (on future prices/demand ↑)
- Drop in the price/demand of other products
- ↑ in number of suppliers

# Price Elasticity of Supply

## Definition:

The **Price Elasticity of Supply** represents the *percentage change in the quantity supplied resulting from a very small percentage change in price*. It also measures the **responsiveness of the supply to changes in price**.

# Price Elasticity of Supply



$$\text{Elasticity}_A = (1/\text{slope}) \times (P_A/Q_A)$$

$$\text{Elasticity}_A = (\Delta Q/Q_A) / (\Delta P/P_A)$$

Elasticity<sub>A</sub> > 0 !!!

Why?

↑P → ↑Q  
↓P → ↓Q

# Price Elasticity of Supply

## Law of Supply:

Supply curves have the tendency of being **upward sloping**.

# Price Elasticity of Supply

## Definition:

**Elastic Supply:** Supply is elastic when the price elasticity of supply is **greater than 1**.

**Unit Elastic Supply:** Supply is unit elastic when the price elasticity of supply is **equal to 1**.

**Inelastic Supply:** Supply is inelastic when the price elasticity of supply is **less than 1**.

# Price Elasticity of Supply

What **changes the elasticity of supply**:

- Availability of raw materials
- Factors mobility
- Inventories / Excess capacity
- Time horizon