

Introduction to the costs of production

- The incentive that drives firms to provide goods and services is that of profit maximization. The goal of every firm is to maximize their profits, and so they must produce at a level of output where the difference between their revenue and their costs are maximized.

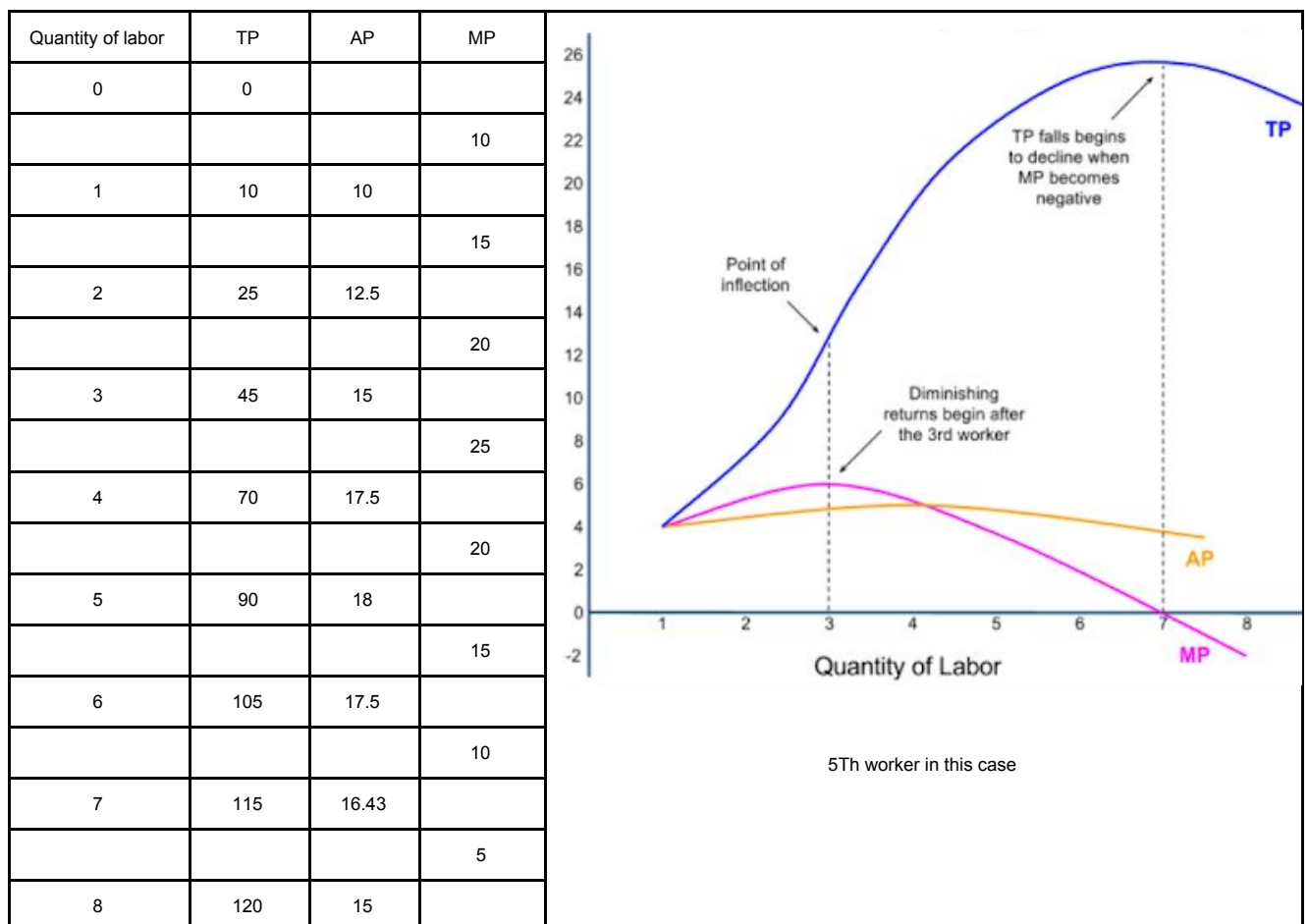
Economic costs	Implicit	Implicit costs are the earnings that a firm could have if it had employed its factors in another use or if it had hired out or sold them to another firm. • The owner of a firm may be able to earn 100,000\$ per year in their next best alternative job. This opportunity cost should be included in the firm's economic costs. • A firm owns buildings that it uses to produce its goods. That building could be rented by 15,000\$. The opportunity cost of using that building itself is the rent that is foregone and the things that could be purchased with that money.
	Explicit	Production costs for which explicit payments are made to owners of resources for the use of land labor and capital • Includes variable costs and fixed costs • Total cost= variable + fixed costs

Short-run versus Long-run Costs of Production

- Short-run → When a firm is producing, some of the factors will be fixed in the short-run, because the firm will not be able to quickly increase the quantity of them that it has. These fixed factors are usually capital or land.
- Long-run → The period of time in which a firm can vary the quantities of all resources they use in production. All factors can change.
- In the short run:
 - Fixed costs: costs that do not change when the level of production varies and they are unavoidable. Exist and have to be paid even is output is 0.
 - Average fixed cost: continually decreases as output increases but it never reaches 0.
 - Variable costs: Costs that vary when the level of production/output varies.
 - Raw materials
 - Components of machinery
 - Marginal cost: additional cost of producing an extra unit of output
- In the long-run, all costs are variable, since all resources can be varied...

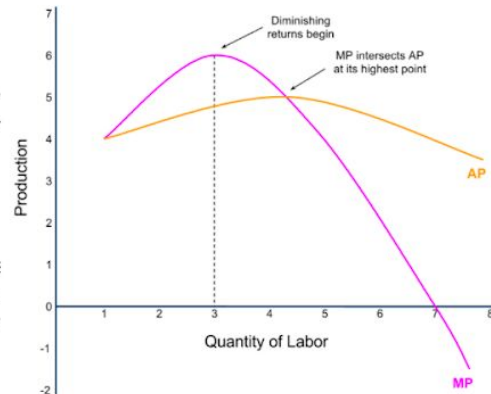
The law of diminishing returns

- As more units of a variable factor (labor) are added to a fixed factor (capital) there is a point beyond where the total product will continue to rise but at a diminishing rate or marginal returns declines.
- Total product → total output that a firm produces, using its fixed and variable factors in a given time period
- Average product → output that is produced, on average, by each unit of the variable factor.
 - Total product/ units of the variable factors
- Marginal product → Extra output that is produced by using an extra unit of the variable factor
 - Change in total product / change in units of the variable factor employed



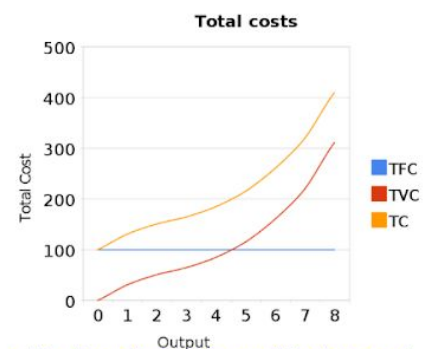
- The productivity of labor is at its greatest at 5 workers, which means the bakery's average costs will be minimized when employing approximately 5 workers.
- Relationship between marginal product and total product
 - The MP is the rate of change in the TP.
 - As MP increases, TP becomes steeper,
 - When MP decreases, TP increases but in a smaller rate

- When MP becomes negative, TP begins decreasing.
- The bakery begins experiencing diminishing marginal returns (the output of additional workers begins decreasing) after the fifth worker. This is because there is not enough capital to allow additional workers to continue to be more and more productive!
- Relationship between AP and MP
 - While the MP is higher than the AP, the average product will rise.
 - The MP and the AP intersect at the MP's highest point. After this intersection, diminishing marginal returns happen.
 - Once the MP is lower than the AP curve, the AP will start to decline.
- Assumptions:
 - Short run law always
 - technology constant always
 - and labour is homogeneous (ability of workers is the same)

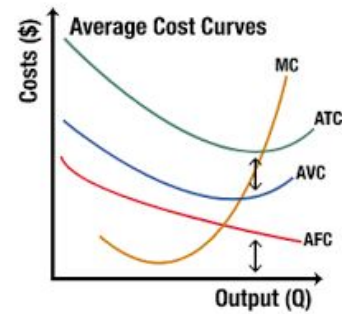


Short-run costs

- Total costs (TC)
 - Total fixed costs (TFC) → the sum of all the fixed costs that are used by a firm in a given period of time. Because the number of fixed costs, do not vary, the TFC curve is constant.
 - Total variable costs (TVC) → the sum of all the variable costs that are used by a firm in a given period of time. $TVC = \text{number of variable factors} \times \text{the cost of each variable factor}$. So, as more workers are being used (variable factors) then the total variable costs will increase.
 - When the output is zero, TVC is zero.
 - Total costs (TC) → the sum of the total variable costs and the total fixed costs used to produce a certain output
- LINK TO LAW OF DIMINISHING MARGINAL RETURNS
 - Notice that TC and TVC increase at a decreasing rate at first. This is when marginal product is increasing as more labor is employed.
 - However, beyond some point, costs begin to increase at an increasing rate. This is where diminishing returns set in and MP is decreasing. The firm is getting less additional output from each worker hired but must pay the same wages regardless.
- Average costs: costs per unit of output

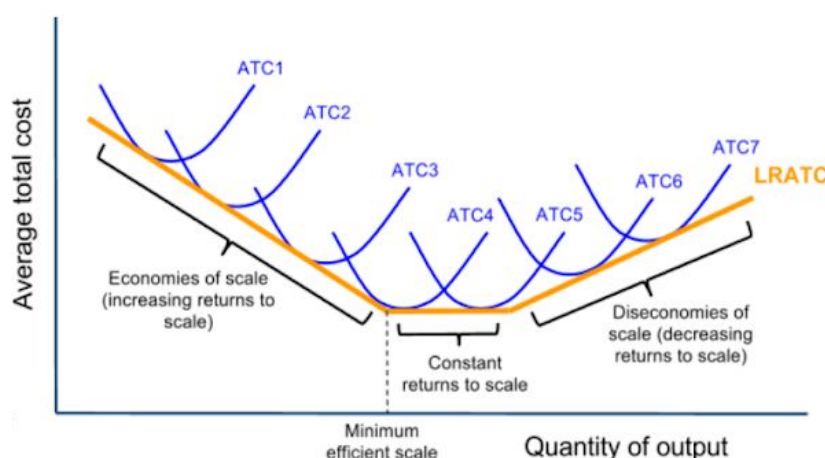


- Average fixed costs (AFC) → Fixed cost per unit of output. $AFC = TFC/q$, q being level of output. Because TFC is constant, AFC decreases as the output produced increases. However, AFC will never reach 0.
- Average variable costs (AVC) → Variable cost per unit of output. TVC/q . Tends to fall as output increases, and then rises again as the output continues to increase. This is explained by the law of diminishing average returns. As more variables are applied to the fixed factors, the output per unit of the variable factors eventually falls, and so the cost per unit eventually rises.
- Average total cost (ATC) → Total cost per unit of output = $AVC + AFC$
- The marginal cost → increase in total cost from producing an extra unit of output.
 - Change in total cost/change in the level of output.
 - Marginal cost decreases as output increases and then rises again as output continues to increase. This is explained by the law of diminishing marginal returns. As more of the variable factors are applied to the fixed factor, the marginal output eventually falls and so the marginal cost of the production of an extra unit eventually rises.
- Relationship between short-run costs curve
 - The marginal cost (MC) curve cuts the average cost curve and the total cost curve at their lowest point. As marginal cost is less than average total cost, the average total cost will fall
 - Average fixed costs decrease as output increases, and because the difference between the average variable costs and the average total cost is this one. The gap between these curves get smaller as output grows.



Long-run costs

- When planning in the long run, all factors of production are variable and is only restrained by the level of technology.
- The whole LRAC is made up of an infinite number of a single point from SRAC curves. These curves represent all possible combinations of fixed and variable factors of production that could be used to produce different levels of output.



- The blue lines represent the short-run ATC curves experienced as the firm opens several factories in the long-run (from 1 to 7 factories).
- When long-run unit costs decrease as output increases, it is said that the firm is experiencing increasing returns to scale. For example, as the firm opens its first 4 factories, its ATC continuously decreases. The firm is becoming more efficient in its production.
 - When the percentage of output is bigger than the percentage in the input. If 1% of input of more than 1% of output will be obtained.
- When long-run average total costs are constant as output increases, it is said that the firm is experiencing constant returns to scale. For example, with the 5th factory, the firm is no longer experiencing increasing returns and instead has experienced constant returns to scale.
 - Increase in input will be the same as increase in output
- When the long-run average total costs increase as the output increases, it is said that the firm is experiencing decreasing returns to scale. For example, with the 6th and 7th factories, the firm's ATC is rising, indicating it is becoming less efficient.
 - Increase in input is bigger than the increase in output

Why long-run costs may increase or decrease as output increases

- Economies of scale → Any decreases in long-run average costs that may come about when a firm alters all of its factors of production to increase the level of output
 - Specialization: In small firms, their management has to take on many roles, some of which may not be fully qualified, leading to high costs. As the firm grows, the management can specialize in these areas, being more efficient, and therefore, decreasing costs. (*internal, technical*)
 - Division of labor: This is breaking a production process into small activities that workers can perform repeatedly and efficiently. As firms get bigger and demand increases, they will do this, lowering production costs.
 - Bulk buying: As firms increase in scale they can make deals with their suppliers that they would not have received when they were smaller. (*Internal, marketing*)
 - Financial economies: Banks tend to give lower interest rates to bigger firms since these firms are considered to be less of a risk.
 - Transport economies: Larger firms may be charged less than smaller, also, they may be able to have their own transport. This will reduce costs because they will not be including a profit margin, like when they hired other firms to do it for them.
 - Large machines: Same as transport but with machines.
 - Promotional economies: The costs of promotion tend not to increase as output increases. Meaning that if the firm produces double the output the cost of the promotion will not double. Thus the cost of promotion per unit decreases.
 - External → costs savings due to developments outside the firms
 - Specialize labor force → schools designed to teach exactly what the firms need. Costs reduce because they are more efficient.

- Better transportation and telecommunication networks
 - Marketing of byproducts may be possible.
- Diseconomies of scale: Increases in long-run average costs that come about when a firm uses all of the factors of production.
 - Control and communication problems: As firms grow in scale, the management will find it harder to control and coordinate activities which increases inefficiency and costs in the end.
 - Alienation and loss of identity: As firms grow, it is suggested that both workers and managers may begin to feel that they are only a very small part of a very big organization. They begin to think that what they do does not matter and they start to lose a sense of belonging. If this happens, then it is likely that workers will become less productive and this will make costs increase.
 - External
 - Congestion costs in an area may increase
 - If the industry increases, costs increase as there is more demand in the same products

REVENUE THEORY

- Revenue is the income that a firm receives from selling its products, goods and services over a certain period of time.

Measurement of revenue

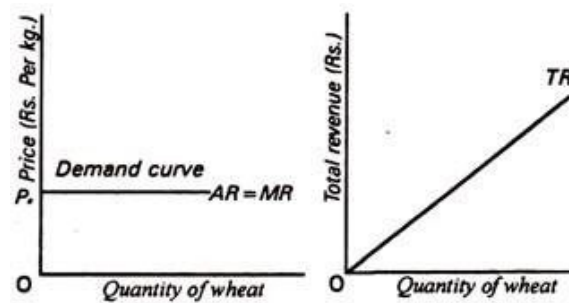
- Total revenue (TR) → total amount of money that a firm receives from selling a certain amount of goods in a certain period of time. $TR = \text{price} \times \text{quantity of good sold}$
- Average revenue (AR) → Revenue per unit of its sales. $AR = \text{Price}$
- Marginal revenue (MR) → extra revenue from selling one extra unit in a given time period. $MR = \frac{\text{change in total revenue}}{\text{change in units sold}}$

Revenue curves and output

- Perfect competition
 - A firm that has a perfectly elastic demand curve

Price	Quantity demanded	Total revenue	Average revenue	Marginal revenue
5	1	5	5	5
5	2	10	5	5
5	3	15	5	5
5	4	20	5	5
5	5	25	5	5

- **The firm wishes to increase output, does not have to lower prices.**
- The firm is very small in terms of the whole industry, so that they can increase their output without affecting the whole industry's supply, and thus, prices.
- The marginal revenue the firm faces and average revenue are equal to the price determined in the market. Also, demand.
- Total revenue increases at a constant rate as output increases, because marginal revenue is the same.

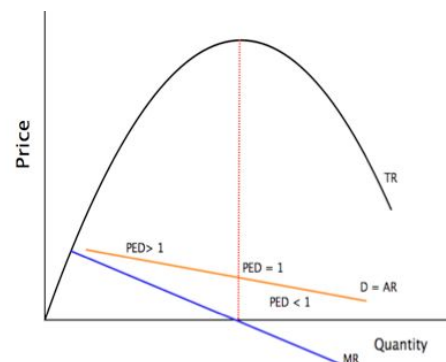


When demand curve is downward sloping

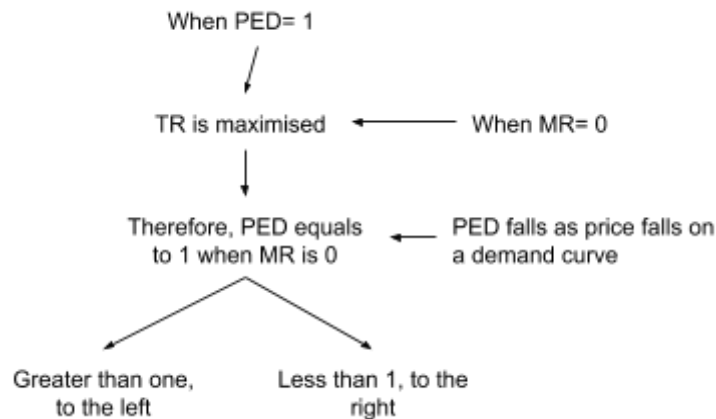
- If a firm wishes to increase output, they will be forced to lower prices and increase demand. (downward sloping demand curve)

Price	QD	TR	AR	MR	PED
35	6	210	35		2.33
				15	
30	8	240	30		1.50
				5	
25	10	250	25		1.00
				-5	
20	12	240	20		0.67
				-15	

- AR falls as output increases, since it is the same as price.
- MR falls as output increases but at a faster rate than AR (twice). This is because in order to sell more products the firm has to lower its prices, losing revenue on the ones that could be sold on a higher price.
- TR rises at first but will eventually start to fall as output increases. This is because the extra revenue gained does not offset the loss in revenue from the units that were being sold at higher prices and now had to be sold at a lower price.



- The negative MR means that total revenue will fall. It is negative because the loss of revenue outweighs the gain from selling more units at lower prices.



- Relationship between PED and TR is very useful for firms when they are trying to assess the impact that a change in price will have in their revenue.
- When PED is elastic, any firm wishing to increase their revenue, should lower prices
- When PED is inelastic firms should raise its prices to increase revenue
- When PED is unity, prices should remain unchanged

PROFIT THEORY

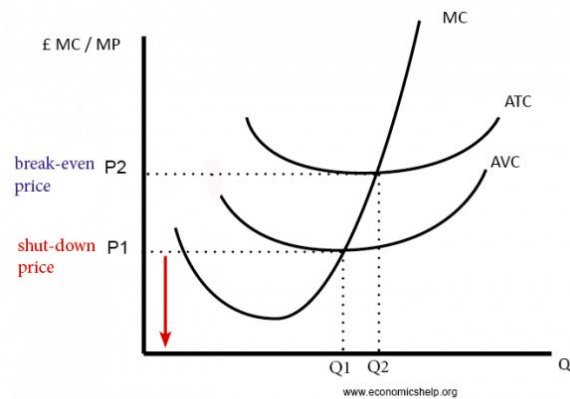
- Total profit = Total revenue - economic cost (explicit and implicit costs)
- If $TR = TC$ then the firm is making normal profit (zero economic profit)
- If $TR < TC$ then the firm is making a loss (negative economic profit)
- If $TR > TC$ then the firm is making abnormal profit.

Shut down price

- Shut-down price is the level of price that enables a firm to cover their variable costs in the short run. It is the price where $price = AVC$. If the price does not cover these costs, then the firm will shut down in the short run.
- Firms can continue to operate in the short run, even when they are making losses.
- Firms can close for a period of time and then open again.
 - When they close, they will produce nothing. By doing so, they will only lose the fixed costs, like rent. Opportunity cost will be also considered as a fixed costs. This way, the firm may be better than producing and not getting enough revenue to cover its variable costs, losing the fixed costs and part of the variable costs that they cannot afford to pay.

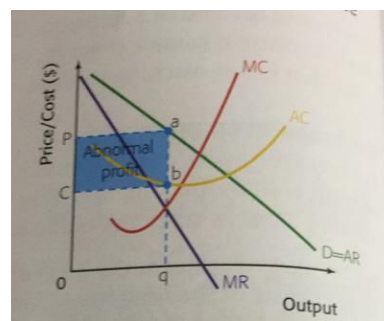
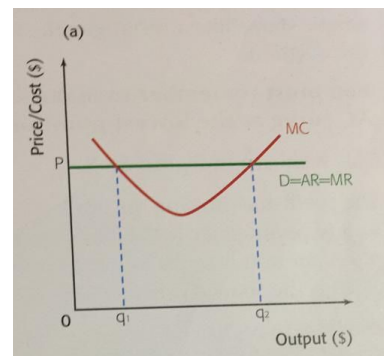
	Firm 1	Firm 2	Firm 3
TR	80 000	120 000	150 000
TFC	100 000	100 000	100 000
TVC	100 000	120 000	140 000
TC	200 000	220 000	240 000
Loss	120 000	100 000	90 000

- Firm 1 should close temporarily and not produce in the short run. Revenue gained fails to cover the variable costs, so the firm loses 20,000 in variable costs plus the 100 000 in fixed costs by producing. If it closes, then it will only have to pay the 100 000 of fixed costs.
- Firm 2 loses 100 000 if it produces or not. This is because its revenue only cover the variable costs, leaving him to pay the fixed costs. If he did not produce, then he would still have to pay 100 000 (the same amount) for the fixed costs. He will likely keep producing, to keep consumers pleased, maintaining employment.
- Firm 3 will produce in the short run because revenue covers all variable costs and part of the fixed costs. If the firm stops producing, then the part of the fixed costs that would be covered, would be lost, firm would lose 100 000 instead of 90 000.
- These firms are making losses in the short run and they cannot do this forever, they have to plan ahead in the long run to devise a situation where they can cover their costs.
- $P \rightarrow$ shut down price
- $P1 \rightarrow$ break even price
- **The break even price** is the price where a firm will be able to make normal profit in the long run. Covering all of its costs, including the opportunity cost.
- Price = ATC

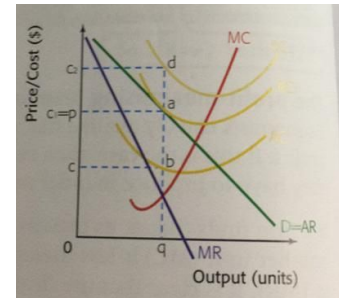


Profit maximising level of output

- Firms need to know on what level of output to produce in order to maximise profits.
- If $MR > MC$ firms should increase output
- **If $MR = MC$ stay at that level of output, profit is maximised**
- $MC > MR$ decrease level of output
- Perfect competition:
 - The first point MC cuts MR is the point of profit minimisation (loss maximisation). The firm has made a loss in every unit produced up to q_1 .
 - From q_1 to q_2 , firm makes profit on every extra unit produced. As long as the profit made between q_1 and q_2 is greater than the loss up to q_1 , they are making abnormal profits.
 - More than q_2 , firm will be making a loss.
- Normal demand curve
 - Profit is maximised when $MC=MR$ at level of output q .
 - To find the price, you go up from q to the demand curve.
 - The cost is from q to the AC curve. $C0qb$ is the costs.
 - Price is higher than the cost so abnormal profits are gained.
 - Profit maximising output is q



- Profit per unit is ab
- What kind of profit is made depends on the position of the AC curve, because the difference between AC and AR is the profit per unit.
- AC → abnormal profit
- AC1 → normal profit
- AC2 → loss



Firms may not always have the aim to maximise profits

- Revenue maximisation: Measure success by the amount of revenue, therefore, producing at a level of output of $MR=0$. This way, they will be producing more than the profit maximisation level of output.
- Growth maximisation: achieve growth in the short run, to gain a large market share and then dominate the market in the long-run.
- Satisficing: Where an economic agent aims to produce satisfactorily rather than to maximise profits, in order to be able to pursue other goals. Work hard to make a reasonable living, but do not push themselves further because they want to pursue other goals, like leisure time.
- Corporate social responsibility: Where the business includes the public interest in its decision-making. Have an ethical code, that includes accepting responsibility on areas like workforce, environment, local community, etc.