Cost

Chapter 6

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Learing Outcomes

In this chapter we will:

- graphically represent, calculate and describe the relationship between total, marginal and average revenue and costs
- apply the distinction between the short and long run in analysing the implications of a firm's costs and revenue situation
- explain and illustrate the conditions for profit maximisation in terms of marginal cost and marginal revenue
- analyse the role of economies and diseconomies of scale in determining the size of firms
- critique the reasons a firm may pursue objectives other than profit maximisation

Law Of Diminishing Marginal Returns

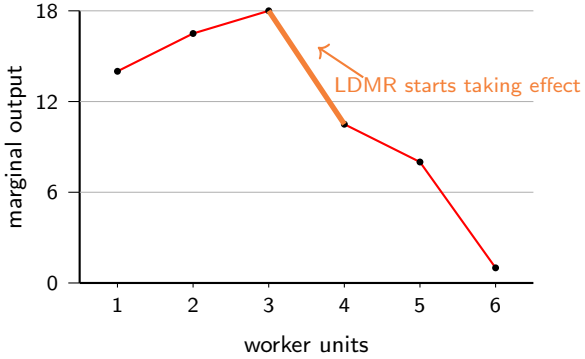
A	B	C	D $= \frac{B}{A}$
No. workers	**Total output**	**Δ total output**	**Workers avg output**
1	10	—	$\frac{10}{1} = 10$
2	25	+15	$\frac{25}{2} = 12.5$
3	42	+17	$\frac{42}{3} = 14$
4	60	+18	$\frac{60}{4} = 15$
5	70	+10	$\frac{70}{5} = 14$
6	76	+6	$\frac{76}{6} = 13$
7	80	+2	$\frac{80}{7} = 11.8$

The table shows that the amount of output rises as extra workers are employed. Seven workers produce more output than 6 (80 vs 76).

Marginal output falls from 18 to 10 between 4^{th} and 5^{th} workers (This represents where LDMR takes effect.)

Despite the fact that employee 5 adds 10 extra units to production, they actually cause the avg cost to rise because they have brought about a reduction in the productivity of firm.

LDMR Graph



LDMR – Definition

LDMR states that as more and more units of a variable factor are combined with a set number of units of a fixed factor, the output per unit of variable factor added will eventually begin to decline.
This is a formal statement of the logic shown in the table and graph above.

Internal Economies/Diseconomies of Scale

Internal Economies of Scale:

1. Financial economies – firm acquires more valuable assets, becomes more financially secure (low risk) and negotiates lower interest rates on loans.
2. Purchasing power economies – firms grow, bulk-buy raw materials and get better discounts from suppliers.
3. Specialisation of labour – workers become very specialised and skilled in one task, so production becomes more efficient.

Internal Diseconomies of Scale:

1. Poor staff morale – repetitive specialised tasks may cause workers to feel meaningless, leading to high staff turnover and absenteeism.
2. Increased layers of middle management make communication more difficult – workers may be unsure of their roles/tasks within the firm.
3. Higher administrative expenses – more spending on solicitors, consultants and accountants without corresponding increases in production levels.

External Economies/Diseconomies of Scale (cont.)

External Economies of Scale:

1. Growth of subsidiary businesses – as Ryanair grew in the airline industry, more hotels set up to cater for passengers to spend the night at airports.
2. Training focused on emerging big business – Irish universities are becoming geared towards the corporate/commercialised nature of large firms like Google, Facebook and KPMG..
3. Better infrastructure – as firms grow and employ more workers, governments and industry leaders attempt to build transport and communications networks around these growing industries – as Ryanair grew in the airlines industry, more hotels.

External Diseconomies of Scale:

1. Lagging infrastructure – use of data centres by big tech companies (Apple, Facebook and Google) has created strain on The National Grid.
2. Lack of raw materials – this scarcity causes basic utilities like water, roads and electricity to become more expensive for wider society.
3. Labour shortages – large firms drain labour supply lead to more unqualified and inefficient workers in the labour force, so production cost rises.

Costs – Key Definitions & Formulae

Explicit and Implicit Costs – Definitions

Explicit Costs refer to payment of expenses by a firm where money is handed over like an electricity bill.
Implicit Costs refer to costs without a direct payment involved. If an entrepreneur invests €20k in their business they don't receive an immediate financial return whereas if that cash had been invested in a savings account at 3% interest they could have ascertained €600 annually, the opportunity cost.

Fixed and Variable Costs – Definitions

Fixed Costs don't change with output and are incurred even when output is nil, like rent.
Variable Costs vary as output changes, like wages and electricity.
Average Costs this enables us to see the cost of producing 1 unit of output.

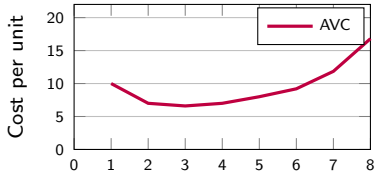
$$\text{ATC} = \frac{TC}{Q} \qquad \text{AFC} = \frac{FC}{Q} \qquad \text{AVC} = \frac{VC}{Q}$$

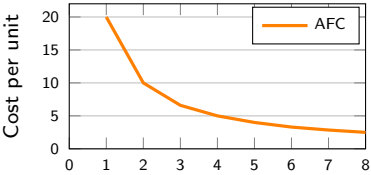
Normal profit is the sufficient return on risk-taking entrepreneurship which a firm requires to stay in business.

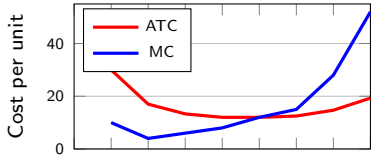
Firm Costs: A Detailed Breakdown

1	2	3	4	5	6	7	8
Qty	**FC**	**VC**	**TC (VC+FC)**	**AFC ($\frac{FC}{Q}$)**	**AVC ($\frac{VC}{Q}$)**	**ATC ($\frac{TC}{Q}$)**	**MC (ΔTC)**
0	20		20				
1	20	10	30	20	10	30	
2	20	14	34	10	7	17	4
3	20	20	40	6.6	6.6	13.3	6
4	20	28	48	5	7	12	8
5	20	40	60	4	8	12	12
6	20	55	75	3.3	9.2	12.5	15
7	20	83	103	2.85	11.85	14.7	28
8	20	135	155	2.5	16.8	19.3	52

Graphing Cost Curves







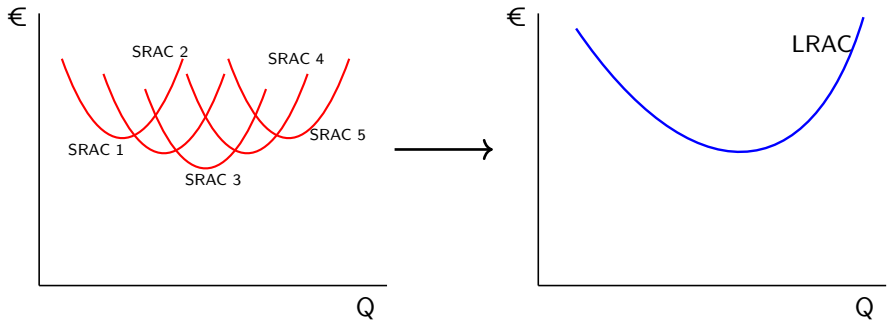
The AVC curve shows the variable cost per unit of output. At low levels of production, AVC falls because of worker specialisation and resources being used more productively. At Q=4, AVC starts to rise again due to the LDMR. Adding extra workers to fixed resources eventually causes inefficiencies.

Average fixed cost curve decays as output rises. Fixed costs (e.g. rent, insurance) do not change with output, so as output increases, these costs are spread over more units.

ATC is U-shaped, falling at first due to falling AFC & rising efficiency in AVC. It rises as AVC rises faster than AFC falls. Key relationship is:

- When MC is below ATC, it pulls ATC down. When MC is above ATC, pushes ATC up.
- MC intersects ATC at ATC's lowest point. It's the point of max. productive efficiency.

Long Run Average Cost (LRAC)



In the long run, since all factors change, firms attempt to solve the problem of diminishing marginal returns by adding not just more variable factors but more (until now) *fixed* factors. To return to the earlier example, the restaurant purchases another oven so that the chefs no longer have to fight over just one oven. This leads to greater output (Q) at a lower cost, requiring us to draw another short run average cost curve, and then another and another as the firm expands, moving from one short run to the next. However, eventually a point is reached beyond which the addition of more ovens (and chefs) will cause **Average Cost (AC)** to rise again. This gives us a U-shaped **Long Run Average Cost (LRAC)**

LRAC Continued

The LRAC is U-shaped for two reasons:

- For lower quantities, **economies of scale** initially outweigh diseconomies of scale (see Chapter 3) and cause it to slope downward. Average cost falls as output increases, e.g. a supermarket can sell bottled water at a lower price than a corner shop can.
- As output increases beyond a certain point, diseconomies of scale outweigh economies of scale and cause it to slope upward again. AC grows as output increases beyond this point.

Company's Short Run Shutdown Point

- From the definition sheet, the short run is a period when at least one factor of production is fixed.
- To continue producing in the short run, a company must cover **all variable costs** and contribute to reducing fixed costs — losses do not always mean shutdown. Let's consider the example of two plumbers:

John	€	**Joe**	€
Fixed costs	600	Fixed costs	600
Variable costs	900	Variable costs	900
Total costs	1,500	Total costs	1,500
Total revenue	750	Total revenue	950

Both plumbers are making a loss, but who, if any, should stop producing?

- John's Revenue €750 $<$ €900 Variable Costs so he should stop producing. By producing, he loses €750 but if he shuts down he only loses €600 in fixed costs.
- Joe's revenue of €950 is enough to cover variable costs of €900 – he should continue production. By producing he only loses €550 but if he shuts down he loses €600 in fixed costs.

Average Revenue in Short & Long Run

Average Revenue

Average Revenue (AR) is equal to total revenue divided by quantity (Q) sold. The AR curve is essentially a firm's demand curve, as it shows all combinations of price & quantity.

$$AR = \frac{TR}{Q}$$

In the short run, AR must be greater than AVC. The rationale for this was explained in the previous slide. *Long run, AR must equal LRAC to make a normal profit, and greater than LRAC in order to make a supernormal profit (SNP).*
Remember, in long run, there are no fixed costs, only variable costs – rent, while fixed in short run, varies if you wait long enough.
If a business wants to make SNP and survive long run, its total revenue must be greater than its total costs. Therefore, its AR must be greater than its LRAC.

- If AR is lower than LRAC, the firm will make a loss and will have to close down.
- If AR is equal to LRAC, normal profit will be earned.
- If AR is greater than LRAC, supernormal profit will be earned.

Maximising Profit

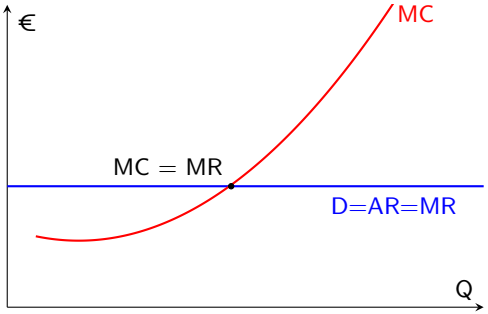
Marginal Revenue – Definition

Marginal Revenue (MR) is the extra revenue earned from selling one more unit of output.

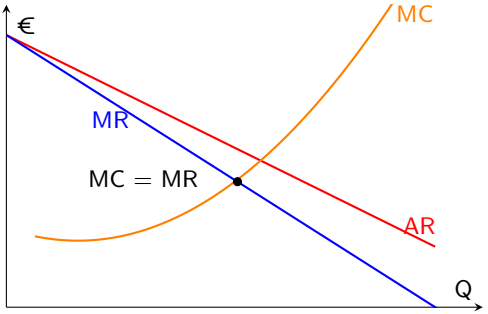
If the MR curve is below the AR curve, the AR curve slopes downward, i.e. to sell more units you usually have to drop your price. (However, in the market structures chapter we will encounter a case where AR and MR are horizontal.) Now, let's answer the question of *how a firm can maximise its profit:*

- The answer is that the profit-maximising condition is MC = MR.
- Imagine a furniture firm that sells 50 chairs a week. Wouldn't it prefer to sell 51? Most people would automatically say the answer is yes.
- But it depends. If the revenue (MR) earned from doing so is greater than the cost (MC) of doing so, then it makes sense. If not, then it doesn't.
- Remember that since MC is rising, the 51st chair will cost more to produce than the 50th while the 51st will likely sell for only the same price as the 50th, if not less. So even though extra profit might be earned as a result of selling the 51st, it will be less than the extra profit from the 50th. The gap between MR and MC is narrowing.
- The MC for the 52nd will be higher still, while again the price will be the same or lower still. When MC becomes greater than MR, it doesn't make sense to sell any more chairs – the extra cost would be greater than the extra revenue.

Graphing Profit Maximisation



Firms facing a flat demand curve must charge the same price (we will explore this idea further in market structures). So, AR, MR & demand are all the same curve, shown by a flat line. Then draw the MC (red) curve. Mark the point where the MC curve intersects $D = AR = MR$. Then draw a vertical line downwards to the Qty axis, to get the firm's equilibrium point.



Firms facing downward-sloping AR curve set their own prices (price maker). The MR curve is *always below* the AR curve, as explained in the prior slide. So, draw a downward slanting AR & a steeper MR. Then draw the MC (orange) curve. Mark the MC-MR intersection point. Again, draw a vertical line down to the Qty axis, to get the firm's equilibrium output.

Besides Making Profit, What Else Do Firms Aim to Do?

- *Become takeover target* – some companies hold a particularly valuable asset so rather than generate profit, they aim to make money by selling this asset – Facebook bought WhatsApp for $19bn to gain hold of WhatsApp's 600mn users (i.e., its asset).
- *Tackle social issue* – an Irish clothing company called House of Akina uses its profits to fund education programmes for migrants – rather than extracting private benefit for its shareholders, the company aims to tackle the social issue of migrant poverty.
- *Sustain a satisfactory level of profit* – some entrepreneurs are simply happy with a reasonable standard of living and aren't interested on earning endless profits. Consider your local butcher. Its unlikely that they want to pursue a global meat processing company and are instead more interested in simply earning enough profit to provide for themselves and their family.

Revision

- Learn all 27 definitions (5–6 per night; repetition; testing).
- Explain why a company would/would not shut down in the short run.
- State and explain economies and diseconomies of scale (internal and external).
- Discuss firm objectives beyond profit.
- Review cost and revenue graphs: replicate and explain in detail.