Princples of Microeconomics-II
L0: Review

August - December 2025

Ananya Iyengar

Review

- What is a *microeconomic* agent?
- *Rational* choice: Consumer + Firm
- Consumer Behaviour: Demand
- Producer Behaviour: Supply

Review: Consumer Optimisation

A rational consumer faces the following optimisation problem:

$$\max_x \ \mathrm{u}(x) \text{ s.t. } p.x = m \tag{1}$$

Here $u(x)$ is strictly increasing in x and depicts diminishing marginal utility. Solving this problem gives x^*, the optimal consumption bundle.

- Variables vs Parameters
- A utility function is a *mapping* from preferences to rankings;
- Ordinality;
- In a two good world: Indifference Curves and the MRS
- In a two good world: A Budget Constraint, the formula for slope, and *given* prices & income
- Optimal choice: MRS = Price Ratio

Review: Consumer Optimisation

- x^* is a function of?
- Comparative Statics: How does x^* vary with p?
- Comparative Statics: How does x^* vary with m?

The Demand Curve

The demand curve is the schedule of all the quantities that a consumer is willing and able to consumer at different prices, keeping income constant.

Implications:

- Each point on the DC corresponds to a bundle that gives **max utility** at a given price.
- The demand curve ordinarily slopes downwards.
- Graphical representation: the “inverse” demand curve. Graphical derivation!

Review: Consumer Optimisation

Graph the following demand curves:

1. P = 2 - 3Q. Direct or Inverse representation? What is the slope?
2. Q = 1 - $\frac{1}{2}$P. Direct or Inverse representation? What is the slope?
3. P(Q) = 10 - Q. What is the slope?

P.S. If you are drawing these by hand, draw them at scale $\implies$ use a ruler and pencil to mark out the axes. This will be important for your exams. If you want to see how these look without drawing, use `https://www.desmos.com/calculator`.

Homework: Review elasticity of demand. How is elasticity different from slope? This counts for Continuous Assessment, to be submitted in the tutorial on 12 August 2025, Tuesday.

Review: Firm Optimisation

- Firms maximise profits.
- Profit Π = Total Revenue (TR) - Total Cost (TC)
- TR = Price $\times$ Quantity. A firm sees the quantities it will be able to sell at different prices, and then decides on the quantity that is profit-maximising/cost-minimising.
- What does it mean to "see" quantities and price? TR = P(Q) $\times$ Q. This is a function of Q!
- TC: what is the total cost of producing Q units? Fixed Cost + Variable Cost. TC $= 30 + \frac{1}{2}Q^2$

Review: Firm Optimisation

A rational firm faces the following optimisation problem:

$$max_Q \ \Pi = \ Q.P(Q) - C(Q) \tag{2}$$

- In a perfectly competitive market, price is taken as a given. So P(Q) is some constant amount, not a function of Q. So the firm's problem reduces to P.Q - C(Q).
- Cost, here, is the opportunity cost!
- We will separately review the revenue and cost functions: understanding this will be fundamental to the rest of the semester!

Review: Totals, Averages, Marginals

The Revenue Function: Q.P(Q)

Consider the demand curve we saw earlier: P(Q) = 10-Q.

- TR $= 10Q - Q^2$
- Average Revenue: Revenue per unit. AR $= \frac{TR}{Q} = \frac{10Q-Q^2}{Q} =$ 10 - Q.
- What is the AR curve? Demand!
- Marginal Revenue: Change in revenue when an additional unit is sold. MR $= \frac{\Delta TR}{\Delta Q}$. MR $= 10 - 2Q$
- In a perfectly competitive market, P is given. TR = 3Q. AR = MR = a constant.
- Where P is a function of Q, MR $\leq$ AR. To sell more, lower price on ALL units.

Aside: MR $= \frac{\delta TR}{\delta Q}$

Review: Totals, Averages, Marginals

The Cost Function: C(Q)

Consider the TC function we saw earlier: $C(Q) = 30 + \frac{1}{2}Q^2$.

- Average Total Cost (ATC) $= \frac{C(Q)}{Q} = \frac{30}{Q} + \frac{1}{2}Q$.
- Average Fixed Cost (AFC) $= \frac{30}{Q}$.
- Average variable Cost (AVC) $= \frac{1}{2}Q$.
- Marginal Cost (MC) $= \frac{\Delta C(Q)}{\Delta Q} = Q$.

Typical shapes of the Cost Curves

- AFC is falling in Q.
- AVC is rising in Q.
- ATC is U-shaped.
- MC is U-shaped. When MC $<$ ATC, ATC is falls. When MC $>$ ATC, ATC rises. When MC $=$ ATC, ATC is minimum.

Review: Totals, Averages, Marginals

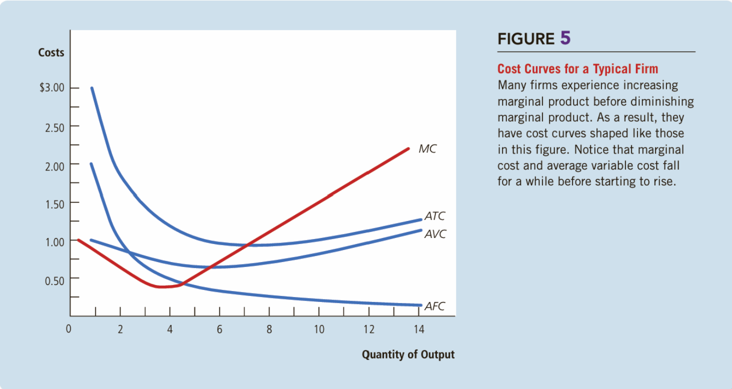

Figure: Typical Cost Curves. *Source*: Chapter 13, Mankiw (2018)

Homework: Review Table 2 - The Various Measures of Cost: Conrad's Coffee Shop on Page 254 from Mankiw (2018). CA, 12 August 2025.

Review: Profit Maximisation

Now we know how both revenue and costs behave. Where does a firm maximise profits? Alternatively, given the demand curve faced by the firm, what quantity minimises its costs? We care about behaviour on the margins!

- If MR $>$ MC, produce more!
- If MR $<$ MC, produce less!
- Equilibrium: Where MR $=$ MC, the firm is maximising profit!
- Shut-down if TR $<$ VC (Have to pay FC anyway).
- In a perfectly competitive market, P $=$ MR $=$ MC at equilibrium. Graphical intuition is important!

Review: Profit Maximisation in Perfect Competition

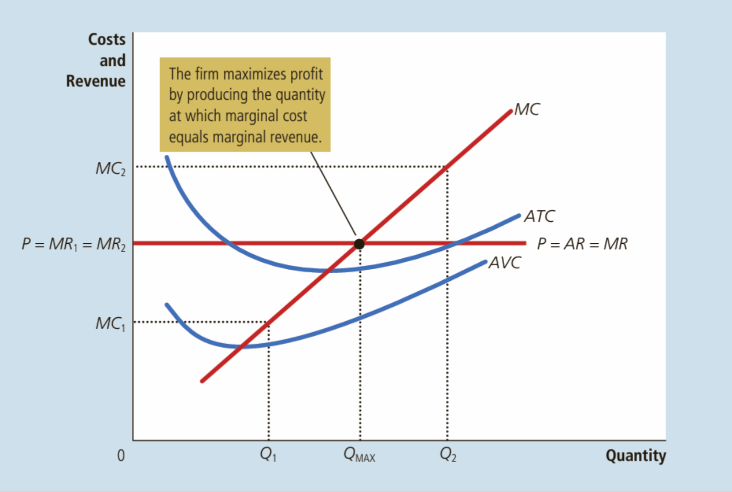

Figure: Profit Maximisation by a Perfectly Competitive Firm. *Source*: Chapter 14, Mankiw (2018)

Summary

Consumers optimise to maximise ordinal utility $\rightarrow$ Given income, their optimal choice at different prices gives the demand curve $\rightarrow$ A firm faces this demand curve and its cost function and must decide (1) if to produce and (2) if yes, how much to produce? $\rightarrow$ it will produce if it can recover its variable cost $\rightarrow$ It will produce such that MR = MC. This is Π maximising and cost-minimising.

Appendix: Mathematical Preliminaries

- Slope of line segment joining (x_0, y_0) and (x_1, y_1) is $\frac{y_1 - y_0}{x_1 - x_0}$.
- Δ (upper case Delta) denotes unit change in a variable.
- Often, dot notation (.) is used to denote multiplication.
- Anything divided by 0 is undefined.
- δ (lower case delta) is used as notation for derivatives. Where Δ is a one unit change, δ is an infinitesimal change. If we have some function $f(x)$, the derivative of $f(x)$ is written as $\frac{\delta f(x)}{x}$ i.e. what happens to the value of $f(x)$ when there is an infinitesimal change in x. As a rule of thumb, if $f(x) = a$, where a is some constant (say, $f(x) = 3$. Then, there is no x to change $f(x)$, and so $\frac{\delta(3)}{x} = 0$. The derivative (think rate of change) of a constant is 0. On the other hand, if we have some function $f(x) = x^a$, then $\frac{\delta x^a}{\delta x} = ax^{a-1}$.
- Anything raised to the power 0 is equal to 1.