

## Chapter 1, 2, 3 & 5: General introduction

**Industrial Organization** is concerned with public policy towards business behavior. It has to do with how market production is arranged. We want to understand how firms interact, and how that affects social welfare. We also want to understand the rationale for certain behavior, to be able to judge whether the government should intervene.

It is difficult to analyze imperfect competition because of the interdependence in the decisions of the firm in the market. Much of the work of industrial organization uses game theory to explain the outcomes of imperfect competition. A major motivation for the study of industrial organization on imperfect competition is the insight that it provides for antitrust policy.

The structure-conduct-performance (S-C-P) paradigm is the organizing framework of research in industrial economics. This framework emphasizes on differences in market structure and business behaviour. With these differences, the differences in market performance are tried to be explained. It consists of the following elements:

- Basic conditions: Supply and demand.
- Market structure: Number of sellers and buyers, barriers, cost structures
- Firm conduct: Pricing behavior, product strategy, advertising
- Market performance: Productive and allocative efficiency, full employment

The basic principle behind this SCP paradigm is that perfect competition and monopoly are viewed as useful opposite ends of market structures. The dominance of this structure grew much in the period from 1945 into the late of 1960s.

In the 1970s academics began to see that the SCP paradigm had some important failings. One failing was that this approach did not pay attention to strategic interaction. Another thing to note was that researchers interpreted the findings of empirical research different. Because of these concerns about the SCP paradigm, economists from the Chicago school were able to establish counter movements.

Industrial organization tools will be useful when antitrust is an active concern of the government. Nichol森 (2008) has constructed an Antitrust Law Index for fifty-two separate countries. One conclusion from this was that emerging countries often adopt extensive antitrust laws.

When looking at the market demand, there is a negative relationship between price and quantity. Total market demand equals  $p = a - bQ$ . This form, with  $p$  in front, is often called the **inverse demand curve**. The vertical intercept 'a' is the maximum willingness to pay. The slope of the line is  $\Delta P / \Delta Q = -b$  and therefore the demand curve is a downward sloping line.

### *Perfect competition*

In the neoclassical model of perfect competition the following assumptions are made:

- Many small buyers and sellers

- Complete and perfect information
- Homogeneous products
- Free and easy entry and exit
- The perfectly competitive firm is a price taker

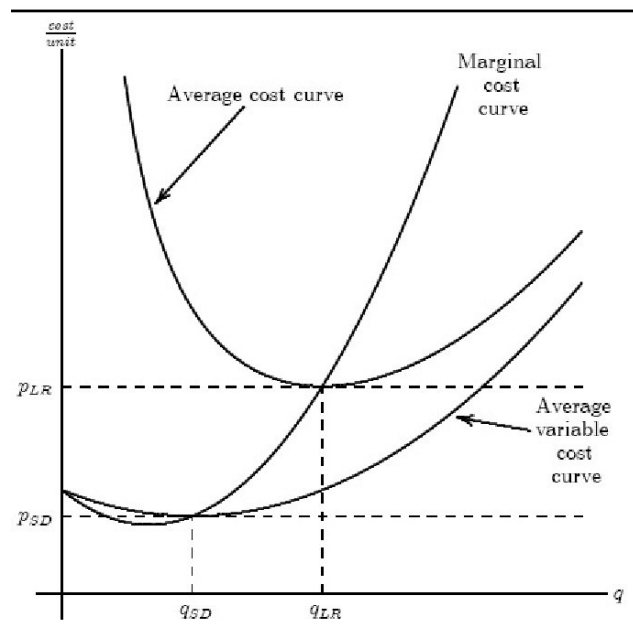
The output decision of a perfectly competitive firm does not affect the price and therefore the inverse demand curve of such a firm is horizontal at the market price.

A firm can have different kinds of costs:

- **Opportunity costs:** The costs of using the factory's services for its own production. Instead of using the factory itself the firm could also rent it to another firm in the market in return for factory services.
- **Average variable costs (AVC):** Variable cost per unit of output
- **Average costs (c):** Cost per unit of output
- **Marginal costs (MC):** The change in total cost per unit change in output
- **Fixes costs (F):** The costs of the services of fixed inputs
- **Sunk costs:** The cost of investing in a tangible or intangible capital asset is said to be sunk if the value of the asset cannot be recovered by resale upon exit from the market.

The general equation of a firm's cost function is;

$$C(q) = F + c(q)$$



In a perfect competitive market the firm maximizes profit when  $P = MC(q)$ , assuming that  $P > AVC$ . If  $P < AVC$  then the firm's profit-maximizing quantity is zero and therefore the firm shuts down.

Short-run equilibrium

In the short-run equilibrium the number of firms that supply the market is fixed. The industry supply

function is the sum of all the supply functions of the firms in the market. The short-run equilibrium price is the price at which the short-run industry supply curve and the demand curve intersect.

### Long-run equilibrium

In a short-run time period firms can make economic losses or profits which affect the long-run equilibrium.

- If  $P < \text{average costs}$  the firms make economic losses. Some firms will then exit the market which results in a lower industry supply. The industry supply curve will then shift to the left.
- If  $P > \text{average costs}$  the firms make economic profits. This will attract new firms to enter the market. The industry supply will increase and therefore the industry supply curve will shift to the right.

Firms keep entering and exiting the market until the equilibrium price equals the minimum value of average costs. In this case all firms produce at  $P = MC(q)$  and so they all maximize profits. Then there is no incentive for firms to exit the market or for new firms to enter the market, the long-run equilibrium is reached. In this long-run equilibrium, each firm earns zero economic profit.

### *Monopoly*

In a monopoly there is only one firm active in the market and it is impossible for other firms to enter the market. With perfect competition all firms are price takers but in a monopoly the firm is a price setter. The demand curve of the monopolist is equal to the market demand curve. A monopolist maximizes profits when  $MC = MR$ .

The total revenue and marginal revenue of the monopolist are:

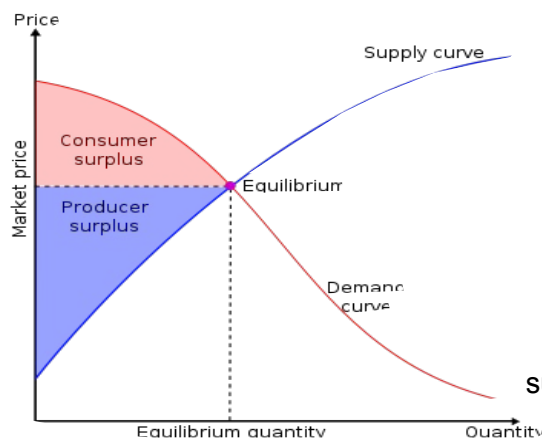
$$R(q) = p(q) Q = (a - bQ) Q$$

$$MR(q) = \Delta R(q) / \Delta Q = a - 2bQ$$

So the marginal revenue curve is almost equal to the demand curve but the difference is that the slope of the marginal revenue curve is twice the slope of the demand curve.

A monopolist charges a higher price and a lower output than would be in the long-run equilibrium of a perfectly competitive industry. People who buy the monopolized product pay now more than they would pay in a perfectly competitive industry. This extra amount is an income transfer from consumers to producers. Because of the higher price consumers who buy the product, have less income to spend on other goods. People who do not want to pay for the higher price lose the surplus value that they would have had in a perfectly competitive market.

**Consumer surplus:** The difference between the maximum amount consumers would pay for a given amount of output and the amount that they actually pay. In the figure below one can see the consumer and producer surplus.

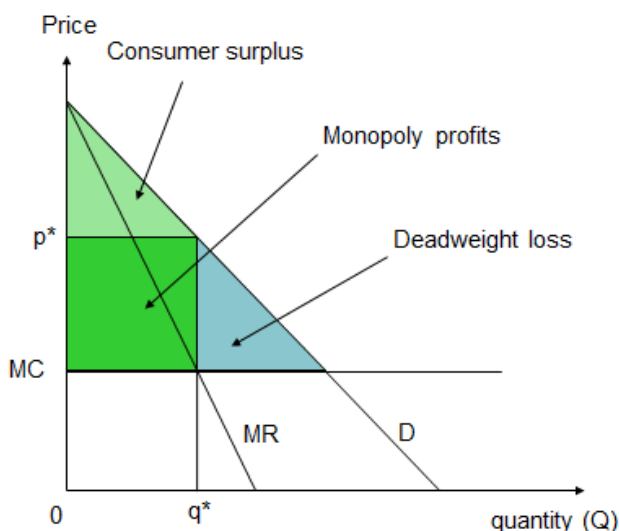


This lost consumer **welfare loss**

surplus is called the **deadweight (DWL)**; the reduction in consumer

welfare that is not balanced out by an increase in the income of the owners of the firm.

The DWL is the consumer surplus in the long-run equilibrium in a perfectly competitive market minus the sum of the monopoly consumer surplus and the monopoly profit. The costs to the consumers are the monopoly profits plus the DWL.



The present value (PV) of a stream of income payments (Z) to be received at different dates extending T periods, with discount factor R, into the future is:

$$PV = RZ_1 + R^2Z_2 + \dots + R^TZ_T$$

When the income payments, Z, are the same in each period then:

$$PV = (Z / (1 - R)) \times (R - R^{T+1})$$

When the income payments, Z, are repeated infinitely the stream becomes both constant and perpetual:

$$PV = Z / r$$

Coase argues that monopolists selling durable goods may still face market pressure to price

competitively. He says that this rests on a very rational model of consumer behavior in which consumers are assumed to be forward looking when making today's buying decisions. Chevalier and Goolsbee investigated this issue. We can conclude that there is strong evidence that supports Coase's argument regarding the pricing constraints facing durable goods monopolist.

The **m-seller concentration** ( $CR_m$ ) is a way governments can evaluate markets and their concentration ratio without revealing the specific firm's revenues. In this way the government enjoyed better cooperation of the involved firms. The m-seller concentration ratio is the sum of the market shares of the m largest firms.

$$CR_m = S_1 + S_2 + \dots + S_m$$

From this equation we can derive concentration curves. However, the equation above shows some implications. A result of  $CR_4 = 80$  can mean a market with one firm with a market share of 71 and three much smaller firms with a market share of 3 or it can mean that the four largest firms all have a market share of 20.

This is where the **Herfindahl-Hirschman index** comes in. The HI measures the sum of the squares of the market share of all firms in a market. The HI for an industry with N firms is ,

$$HI = (S_1)^2 + (S_2)^2 + (\dots) + (S_n)^2$$

Where s stands for the market share of each firm. The result, the H-score will be between zero and one. When the score is closer to zero, the market shares are more equally divided. When the score is closer to one, the market shares are among one or a few players.

If there would be a market with 10 equally sized firms, the H-score would be 0.1 (1/10).

Since then  $1 / HI$  would be 10. So, if there are N equally sized firms in a specific market, they all have  $1 / N$  market share and, of course,  $1 / HI = N$ . We can use the equation **1 / HI** to tell how much firms of equal size there would be in a market. This precise result is almost never the real case, but we can use it to get an idea of the market structure.

A **concentration table** can be showed to sum up the results of the different supply-side measured. In such a table you can often find measures like:  $CR_m$  and HI. With these results it is possible to get a clear picture of the market.

A commonly used set of market conditions is the set maintained by the North American Industry Classification System (**NAICS**). It first categorizes output into broad sectors of the economy. Then the sectors are further subdivided and each subsector is given a two-digit code. The two-digit codes are further classified with more digits. Each digit stands for a subdivision of the initial classification.

When looking at the market demand, there is a negative relationship between price and quantity. Total market demand equals  $p = f(Q)$

A tool to measure the sensitivity of demand to price is the **cross-price elasticity of demand**. It is defined as the percentage change in demand for good i that occurs when there is a 1 percent change in the price of another good j.

$$\eta_{ij} = - p_j/q_i * \partial q_i/\partial p_j$$

This cross-price elasticity measure is used in evaluating mergers. This is referred to as the **SSNIP** standard. This is a small but significant non-transitory increase in price. With this test the government can measure whether a firm is a monopolist or not.

So far, we have seen measurements like the CR and the HI to measure market structures. The **Lerner index** measures how well a market performs from an efficiency point of view. It is the proportional difference between monopoly prices and competitive prices. It is stated as follows;

$$LI = (P - MC) / P$$

In a monopoly a firm maximizes profits where  $MR = MC$ . The value of the Lerner index for this monopolist then equals;

$$LI = (P - MC) / P = - \Delta P/\Delta Q * Q/P = 1/\eta$$

In this formula,  $1/\eta$  is the inverse elasticity of demand. There could be a situation where there is a single supplier active in a market but another firm, which may be located in another region, will try to enter the market. The cost curve of the alternative supplier will probably be higher than the cost curve of the local supplier due to transportation costs. If the local firm charges a price above the price of the alternative firm and consumer have perfect information, consumers will buy the products from the alternative firm and the local firm sells nothing.

To prevent the alternative firm from entering the market, the local firm should charge the monopoly price that maximizes profits by charging the highest price possible that will make entry for the other firm not profitable. If the local firm does not succeed and the alternative firm will enter the market, the market will become an oligopoly.

For an industry with more than one but not large firms, the Lerner index is more complicated:

$$LI = (P - (HI * MC)) / P$$

The greater the Lerner index, the farther the market outcome lies from the competitive case and the more market power is being exploited.

In a competitive market  $P=MC$  leading to the output  $Q^C$  but a monopolist sets its price above marginal cost. We can use a basic measurement of the welfare or dead-weight loss resulting from

pricing above marginal cost. The **welfare loss**, WL, is;

$$WL = 0.5 (P - MC) (Q^c - Q)$$

In this equation, Q is the actual market output and P is the actual price. We can see this welfare loss as a proportion of total sales revenue PQ;

$$WL' = WL/PQ = 0.5 (P - MC)/P * (Q^c - Q)/Q$$

We can rewrite this into;

$$WL' = 0.5 * (1/\eta)$$

So the deadweight loss from a monopoly as a fraction of current industry sales is one-half times the elasticity of demand or the Lerner index.

Robert Hall used a production theory approach to derive estimates of the Lerner index for manufacturing sectors in the US. From his results, Aiginger and Pfaffermayr concluded that the industry price-cost margin measure using MC is equal to the industry HI. If we substitute this into the WL' function we get:

$$WL' = 0.5 (P - MC)/P * (P - MC)/(P - MC)HI$$

**Price discrimination:** Identical units of a good or service are sold at different prices, either to the same customer or to different customers. There are three degrees of price discrimination. Price discrimination can be viewed as an abuse towards other firms that will face a competitive disadvantage.

Non-discriminatory pricing of a monopolist is a constraint on the firm's ability to convert consumer surplus into profit. Price discrimination is a very powerful tool that can greatly increase the profits of a firm.

When a monopolist wants to use price discrimination successfully, it must overcome two obstacles:

- The *identification problem*: the firm needs to be able to identify who is who on the market demand curve of the firm.
- The *arbitrage problem*: the firm must be able to prevent those who are offered a low price from reselling to those charged a high price.

We will now discuss **third-degree or group** price discrimination. The firm can distinguish between different groups, can charge them different prices and there is no consumer arbitrage (resale from one group to another). Consumer arbitrage is impossible for goods sold in different regional markets due to transportation costs.

This is the most common type of pricing policy found and is often in industrial organization literature referred to as linear pricing.

Each different group of consumers has a different price elasticity of demand and therefore will a monopolist find it profitable to charge each group a different price. Consumers with high elasticity are charged lower prices than those with low elasticity. They are more sensitive to the price.

Each consumer group has its own inverse demand curve. These curves form together the combined inverse demand curve. The two demand curves have to be added horizontally. For instance:

$$p_1 = 200 - 2Q_1 \quad \text{and} \quad p_2 = 100 - Q_2$$

Together they form  $Q = (200-p)/2 + 100 - p$

A monopolist will charge a higher price to one group and a lower price to the other group compared with a case of no price discrimination. The price it charges the each specific group is found where  $MC = MR$ ; each group is seen as a separate market in which the monopolist maximizes profits

There is a group that loses consumer surplus but there is also a group that gains consumer surplus. All the profits and consumer surplus that result from third-degree price discrimination will increase social welfare.

Price discrimination makes it possible to supply to small markets that otherwise would not have been supplied. Most examples of third-degree price discrimination arise when the seller offers differentiated products.

Price discrimination suggests inequality. Economists see arrangements as less socially optimal when there are potential other trades that could make both parties better off.