Chapter 6

Perfect Competition

Market structures provide the framework through which we analyze how firms and consumers interact beyond the basic forces of supply and demand. Having studied consumer and producer theory, as well as the determination of equilibrium prices and quantities, the next step is to examine how the number of firms, the degree of competition, and the presence of market power influence outcomes in markets. Market structure addresses questions such as whether firms behave competitively, whether they can set prices above marginal cost, and how entry and exit affect long-run equilibrium. By moving into this topic, we connect the theoretical underpinnings of individual decision-making to broader patterns of industrial organization, efficiency, and welfare in the economy. The first market structure—which is covered in this chapter—is perfect competition. The next chapters cover imperfect competition which are markets composed of a single or a handful of firms.

Perfect competition is characterized by many buyers and many sellers in the market. All market participants exhibit so-called price taking behavior, i.e., all market actors take the prevailing market price as given knowing that their output or purchase decision does not affect the market price. Examples for perfectly competitive markets are agriculture, restaurant businesses, standardized products (e.g., office supplies, T-shirts), or the unskilled labor market. Another important characteristic is the absence of market entry and exit barriers. That is, any consumer or firm can participate in the market without any barrier. A common example here are ridesharing apps since everyone with a car and a phone can engage as a consumer or producer.

The opposite case is a monopoly where we have a market with many buyers but only one seller. The monopoly is characterized by price-setting behavior since the monopolist has full control over the price. Examples are De Beers, a university-managed parking system, or Luxottica controlling about 80% of the market for sunglasses. Perfect competition and monopolies are relatively

straightforward to analyze since in the case of the former, the market price is given, and in the case of the latter, the firm has full control over the price. A more difficult situation occurs if the firm has partial control over the price. This third market structure is the most common and called an oligopoly. In an oligopoly, we have many buyers but only a "handful" of sellers. Examples are Airbus and Boeing, car manufacturers, airlines, or the soft drink industry. Some oligopolies are not as well known as other such as the mining industry composed of BHP, Rio Tinto, Vale, and Glencore (with some additional but much smaller companies). The global market for aerial tramways is controlled by Doppelmayr/Garaventa Group (Austria/Switzerland) and Leitner Ropeways (Italy). Other market structures include monopsonies (one buyer many sellers) and oligopsonies (few buyers and many sellers).

6.1   First Welfare Theorem

Before turning to the zero economic profit condition, let us first consider the First Welfare Theorem that states the following:

> *"Under certain conditions, decentralized markets maximize total surplus for society, leaving no possible way for anyone to change the situation and make someone better off without making anyone else worse off."*

The first welfare theorem states that under certain conditions, a competitive equilibrium allocation of resources is Pareto efficient. The necessary conditions are that markets are perfectly competitive (i.e., all agents are price takers and there are no firms with market power), preferences are locally non-satiated (i.e., consumers prefer more of at least one good), and all goods and factors of production are traded in complete markets (i.e., no missing markets or externalities). In addition, information is assumed to be perfect and there are no distortions such as taxes, subsidies, or transaction costs. When these assumptions hold, the interaction of self-interested consumers and producers in competitive markets leads to outcomes where no individual can be made better off without making someone else worse off, linking individual optimization to overall efficiency. The invisible hand by Adam Smith refers to the information contained in prices and the self-interest by the market participants. The following is a quote from *An Inquiry into the Nature and Causes of the Wealth of Nations* by Adam Smith (1723–1790):

> *"It is not from the benevolence of the butcher, the brewer, or the baker, that we expect our dinner, but from their regard to their own interest. We address ourselves, not to their humanity but to their self-love, and never talk to them of our own necessities but of their advantages."*

6.2 Zero Economic Profit Condition

The firm takes the market price as given and sets $P = MC$ to obtain the profit-maximizing output level, i.e., slides along its MC curve (above average variable cost) with changing output price. Recall how profit and loss can be derived from the marginal and average cost functions based on the price (Figure 6.1). In the short-run, competitive firms can earn an economic profit or suffer an economic loss. The market sums buying and selling preferences of individual consumers and producers, and determines the market price. Each buyer and seller takes market price as given and is able to buy or sell the desired quantity. In the long-run, entry and exit of firms because of profits or losses. This shifts the market supply curve and changes the market price. Positive economic profit attracts new entrants until economic (not accounting!) profit is zero. This is called the zero economic profit condition in the long-run.
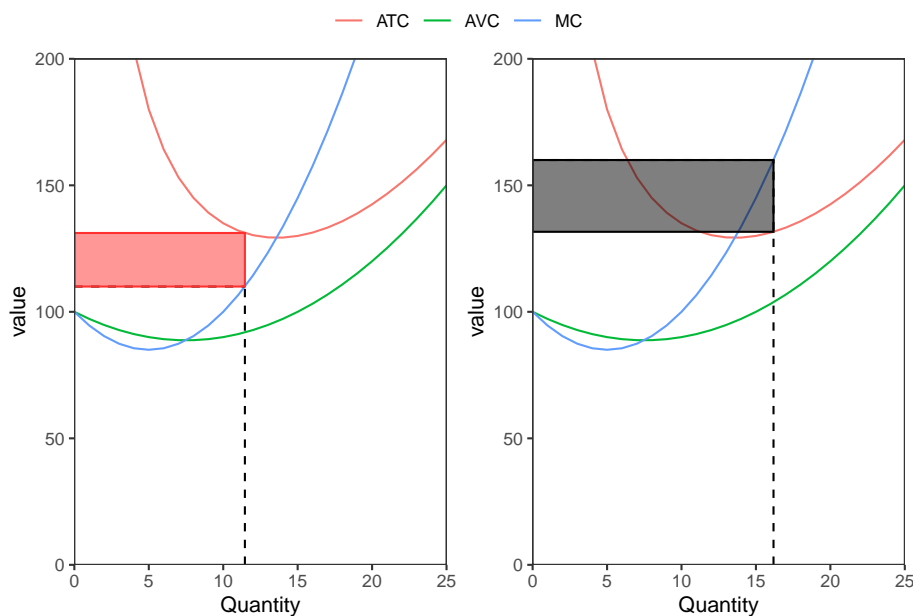

Figure 6.1: Derivation of profit and loss from the marginal and average cost functions based on the price. Left panel: Price below the ATC, and firm making a loss in the amount of the area of the shaded red box. Right panel: Price above the ATC, and firm making a profit in the amount of the area of the shaded gray box.

Shifting of the average cost and marginal cost curves occur if the variables costs are affected. If the fixed costs change, only the average cost curve shifts.
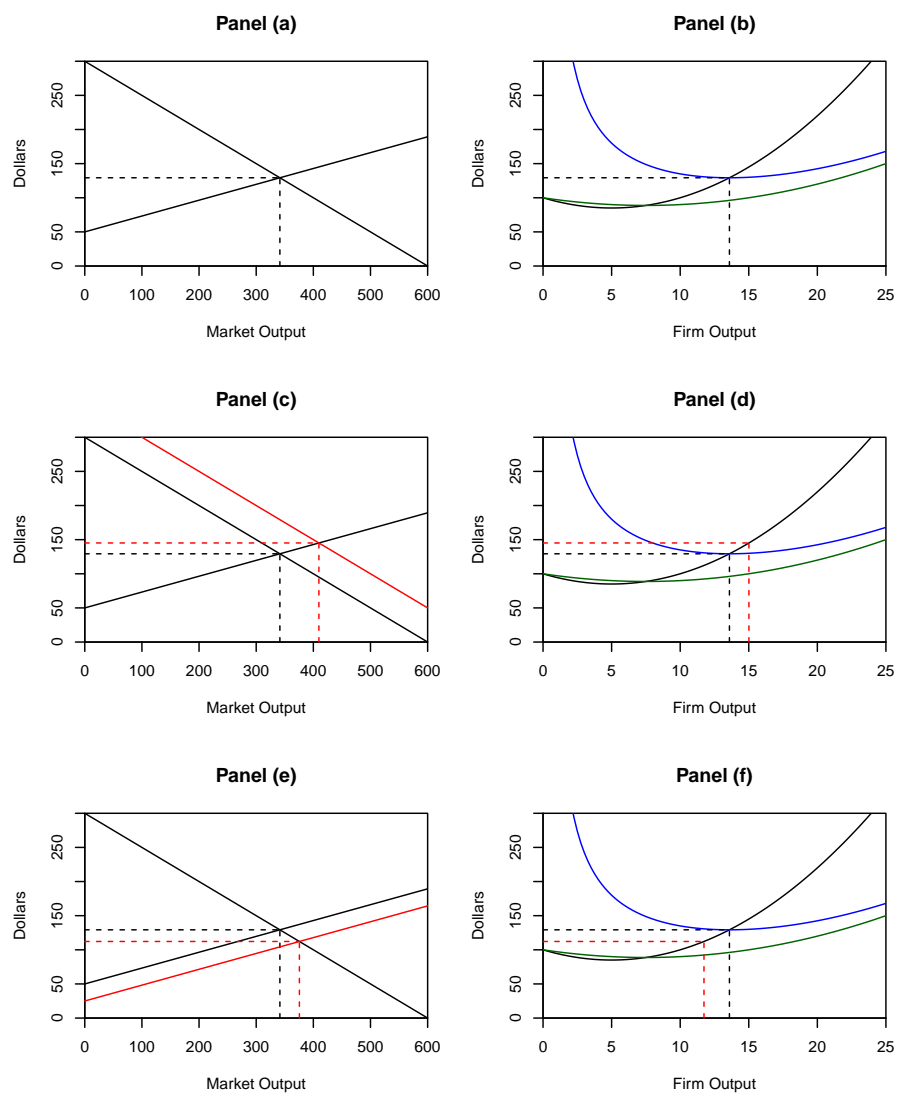
Figure 6.2: Long-run equilibrium.

6.3 Market Interventions

After having covered perfectly competitive markets, this section introduces taxes, subsidies, price ceilings, and price floors as market interventions. The mechanics of those interventions will be used in future chapters as well. Besides introducing those market interventions, the section presents the topic of deadweight loss that is at the heart of economic analysis. If those market interventions are implemented in a perfectly competitive market, a deadweight loss occurs, i.e., a decrease in efficiency. It is key to note that taxes, subsidies, price ceilings, and price floors lead to a welfare loss in a perfectly competitive market but may restore welfare in an imperfectly competitive market.

6.3.1 Taxes and Subsidies

The economic incidence of a tax falls disproportionately on those who are less responsive to price changes; i.e., those whose behavioral response to price is more inelastic. In the case of a subsidy, there is an increase in the equilibrium quantity, a decrease in the price by consumers, and an increase in the price received by producers. The incidence of the subsidy is identical to the tax case.

Imposing a per-unit tax on either the consumer or the producer results is the same outcome. Assume that the demand is written as

$$Q^D = 10 - 2 \cdot P$$

and the supply is written as

$$q^s = 2 \cdot p - 2$$

Without any taxes, this results in a market equilibrium:

$$10 - 2 \cdot p = 2 \cdot p - 2$$
$$\Rightarrow p^* = 3$$
$$\Rightarrow q^* = 4$$

Now assume that we impose a tax on the producer. The price received by the producer is now $p - t$, i.e., supply is written as $q^s = 2 \cdot (p - t) - 2$. And the resulting market equilibrium

$$10 - 2 \cdot p = 2 \cdot (p - t) - 2$$
$$\Rightarrow p^* = 3 + \frac{1}{2} \cdot t$$
$$\Rightarrow q^* = 4 - t$$

If $t = 1$, the consumer pays $p^d = \$3.50$ and the producer receives $p^s = \$2.50$. The equilibrium quantity is $q^* = 3$. If the tax is imposed on the consumer, the consumer pays $p + t$ and demand is written as $q^d = 10 - 2 \cdot (p + t)$. The resulting market equilibrium
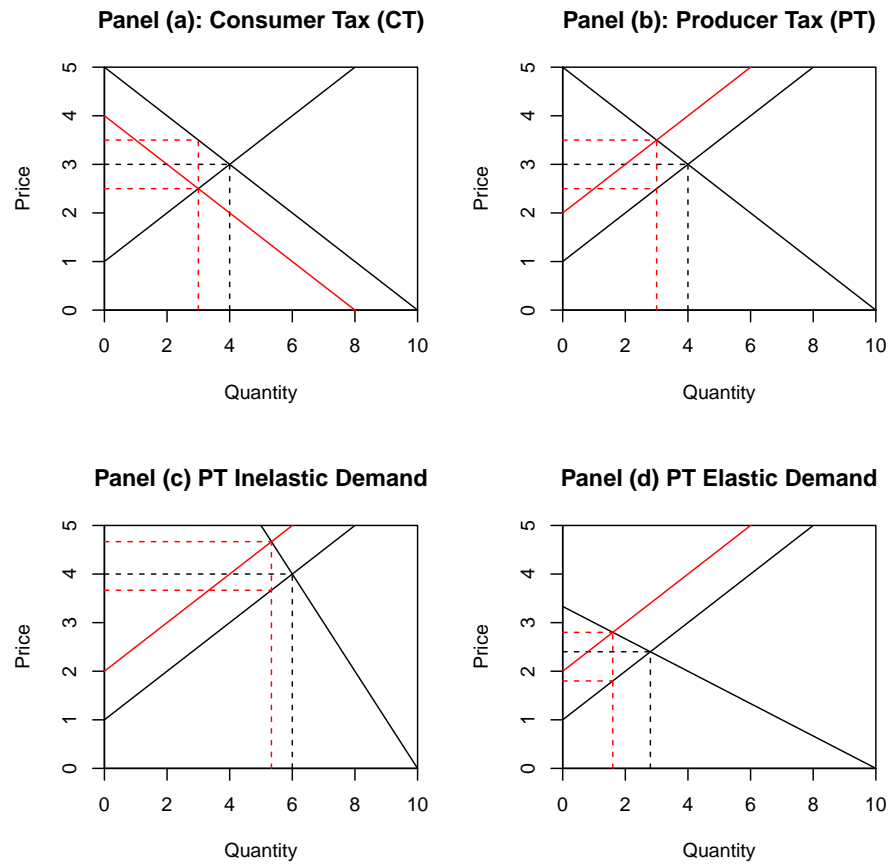
Figure 6.3: Consumer and producer taxes example (Panels (a) and (b)). Effect on tax burden under inelastic demand (Panel (c)) and elastic demand (Panel (d)).

$$10 - 2 \cdot (p + t) = 2 \cdot p - 2$$
$$\Rightarrow p^* = 3 - \frac{t}{2}$$
$$\Rightarrow q^* = 4 - t$$

If $t = 1$, the consumer pays $p^d = \$3.50$ and the producer receives $p^s = \$2.50$. This is equivalent to the producer tax scenario. The equilibrium quantity is $q^* = 3$. Consider the equilibrium quantity as a function of the tax rate, i.e., $q^* = 4 - t$. This function also determines the tax revenue (l) for the government as a function of t, i.e., $l = t(4 - t)$.

6.3.2 Price Ceilings and Price Floors

Price ceilings are maximum legal price mandated in a particular market, making all trades at prices above the price ceiling illegal. Price ceilings benefit consumers and a common example is rent control for apartments. Both interventions imposed in a competitive market result in a deadweight loss. A price floor is a minimum legal price mandated in a particular market, making all trades at prices below the price floor illegal. A price floor benefits producers since the market price is above the equilibrium price that would prevail in the absence of the floor. Examples are minimum wage in the United States and other countries, price floors for agricultural commodities, or the minimum unit pricing for alcohol in Scotland. Until 1978, there were price floors for airline tickets in the U.S. which artificially inflated ticket prices. Deregulation made those airline tickets decrease since 1980.

6.4 Exercises

1. **Fair Trade Coffee** (***): Fair Trade USA defines fair trade as follows:

   > *"Fair Trade goods are just that. Fair. From far-away farms to your shopping cart, products that bear our logo come from farmers and workers who are justly compensated. We help farmers in developing countries build sustainable businesses that positively influence their communities."*

   Assume that a successful marketing campaign has shifted consumer preferences towards fair trade coffee as opposed to regular coffee. Draw two supply and demand graphs: (1) Fair trade coffee and (2) regular coffee. Assume that both markets are in equilibrium before the marketing campaign. Mark the equilibrium price and quantity. Next, show the new equilibrium quantity and price (after the marketing campaign) in the graph for fair trade coffee and regular coffee. What conclusions do you draw? How does the zero-economic profit condition affect the market for regular coffee?

2. **Pontoon Boats** (***): The demand function for pontoon boat rentals on Lake Michigan is written as $Q^D = 50 - 0.2 \cdot P$. The supply curve is $Q^S = 0.3 \cdot P$. When answering, be sure to differentiate between the price paid by the (1) consumer and (2) producer. Calculate producer and consumer surplus for each part.

    a. What are the equilibrium price and quantity?
    b. Because of air and noise pollution, a per-unit tax of \$10 per rental is imposed on consumers. What are the new equilibrium price and equilibrium quantity?
    c. A state representative from one of the bordering states argues that pontoon boat rental operators only have revenue in the summer and thus, suffer from the tax. Hence, a proposal of a per-unit subsidy of \$6 to the rental operators is introduced in addition to the tax on consumers. What are the new equilibrium price and quantity under this scheme?
    d. What are the equilibrium prices and quantity if the per-unit tax on consumers is reduced to \$4 and the per-unit subsidy for rental operators is eliminated? How is this different from the answer in the previous part?

3. **License Fee Reduction** (***): Draw a marginal and average total cost curves for a perfectly competitive industry that is in the long-run equilibrium. What is the profit of a representative firm in the initial situation? The legislator wants to support businesses and reduces the annual (fixed) business license fee for all firms. What happens to this industry in the short- and long-run? Illustrate in your graph.

4. **Hallstatt** (***): Take any tourist spot around the world and you will find the same situation: A lot of vendors selling some souvenir item. To put the question in context, consider the following excerpt from a Washington Post article titled *Nothing to see here: Popular European destinations want fewer tourists* on August 8, 2019:

    > *"Hallstatt may not have the same name-recognition as Venice or Amsterdam. But if you Google Austria, you'll see the village dominates the images that pop up. It looks a lot like Arendelle in Disney's Frozen, with the bell tower of the Lutheran Church standing in for the central tower of Queen Elsa's castle. A salt-mining town dating from the late Bronze Age, and a UNESCO World Heritage site since 1997, Hallstatt has become especially popular among travelers from Asia. The hype began with a 2006 South Korean TV series, "Spring Waltz,'' that was partially shot in Hallstatt. Six years later, the China Minmetals mining company opened a life-size replica of Hallstatt in the southern Chinese province of Guangdong. The company even mimicked Hallstatt's central church, although the Chinese version contains a banquet hall. Residents of the real Hallstatt, who hadn't been*

consulted on the project, were stunned when they learned of it. Now, filmmakers, journalists and tourists alike come to Hallstatt in droves. The town, with a population of about 800, drew 1 million visitors last year."

a. Assume a small tourist town with a souvenir market initially in its long-run equilibrium. Draw the initial situation in two, interconnected graphs. On the left side, you have the market, and on the right side, you have one individual representative producer.

b. A TV show brought fame to our small city and suddenly, many more tourists come to the town. What happens to the demand for the souvenir item in the town in the short-run? What happens in the long-run? Use your graph to illustrate the effects.