University of Zurich[UZH]

Leseaufträge «Mikroökonomik I»

Modul 2: Konsument und Nachfrage

Unit 7:

– Aggregierte Nachfrage

Quellen:

- **Chapter 4 – Rational Consumer Choice**
  Frank, Robert H, & Cartwright, Edward. (2016). *Microeconomics and Behaviour (2nd European ed.)*. London: McGraw-Hill Education.

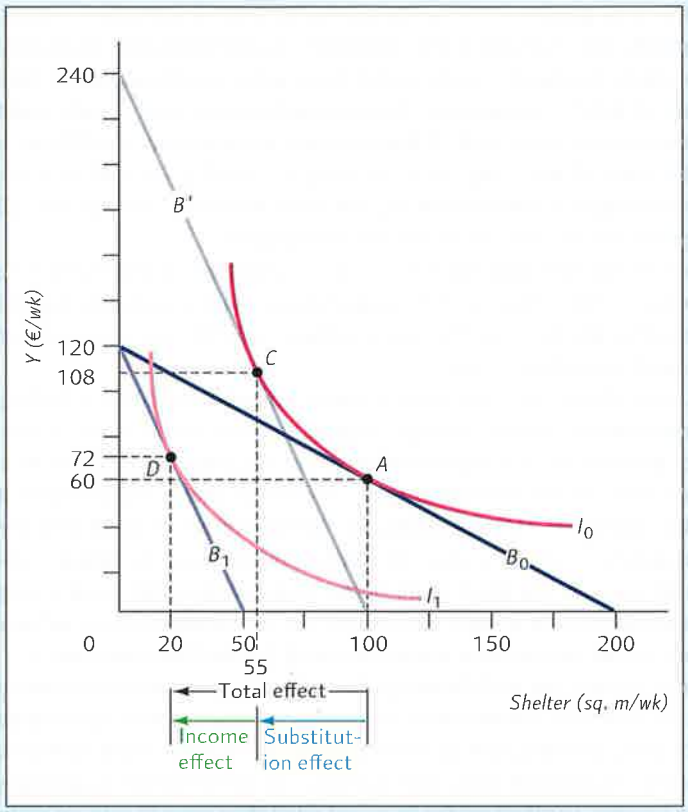


FIGURE 5.14
Income and Substitution Effects for a Price-Sensitive Good
Because shelter occupies a large share of the budget, its income effect tends to be large. And because it is practical to substitute away from shelter, the substitution effect also tends to be large. The quantities demanded of goods with both large substitution and large income effects are highly responsive to changes in price.

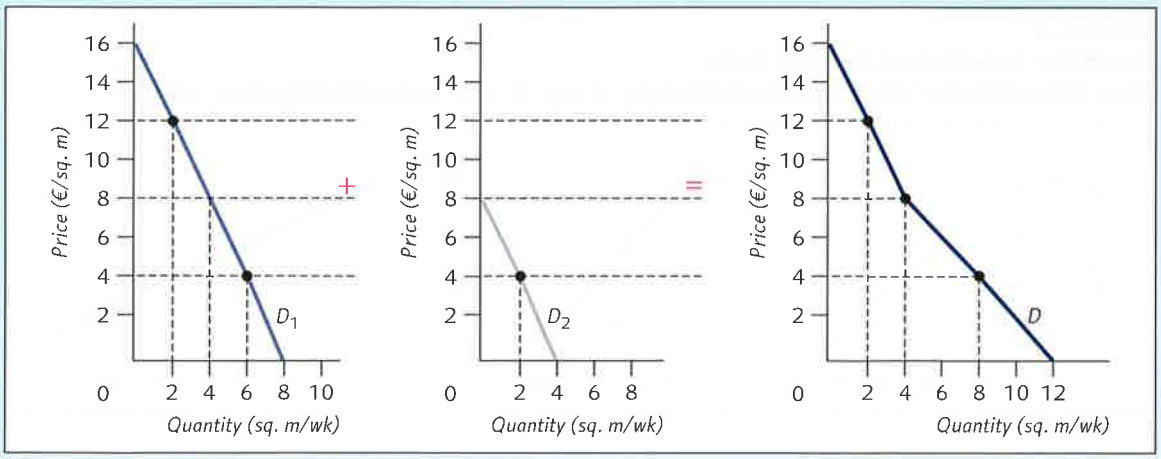
located housing. Someone who works in London can live near her job and pay high rent; alternatively, she can live outside London and pay considerably less. Or she can choose an apartment in a less-fashionable neighbourhood, or one not quite as close to a convenient underground station. The point is that there are many different options for housing, and the choice among them depends strongly on income and relative prices.

In Figure 5.14, the consumer's income is €120/wk and the initial price of shelter is €0.60/sq. m. The resulting budget constraint is B_0, and the best affordable bundle on it is A, which contains 100 sq. m/wk of shelter. An increase in the price of shelter to €2.40/sq. m causes the quantity demanded to fall to 20 sq. m/wk. The smooth convex shape of the indifference curves represents the high degree of substitution possibilities between housing and other goods and accounts for the relatively large substitution effect (the fall in shelter consumption associated with the movement from A to C). Note also that the original equilibrium bundle, A, was far from the vertical pivot point of the budget constraint. By contrast to the case of salt, here the rotation in the budget constraint caused by the price increase produces a large movement in the location of the relevant segment of the new budget constraint. Accordingly, the income effect for shelter (the fall in shelter consumption associated with the movement from C to D) is much larger than for salt. With both a large substitution and a large income effect working together, the total effect of an increase in the price of shelter (the fall in shelter consumption associated with the movement from A to D) is very large.

MARKET DEMAND: AGGREGATING INDIVIDUAL DEMAND CURVES

Having seen where individual demand curves come from, we are now in a position to see how individual demand curves may be aggregated to form the market demand curve. Consider a market for a good—for the sake of concreteness, again shelter—with only two

FIGURE 5.15
Generating Market Demand from Individual Demands
The market demand curve (D in the right panel) is the horizontal sum of the individual demand curves, D_1 (left panel) and D_2 (centre panel).



potential consumers. Given the demand curves for these consumers, how do we generate the market demand curve?

In Figure 5.15, D_1 and D_2 represent the individual demand curves for consumers 1 and 2, respectively. To get the market demand curve, we begin by calling out a price—say, €4/sq. m—and adding the quantities demanded by each consumer at that price. This sum, 6 sq. m/wk + 2 sq. m/wk = 8 sq. m/wk, is the total quantity of shelter demanded at the price €4/sq. m. We then plot the point (8, 4) as one of the quantity–price pairs on the market demand curve D in the right panel of Figure 5.15. To generate additional points on the market demand curve, we simply repeat this process for other prices. Thus, the price €8/sq. m corresponds to a quantity of 4 + 0 = 4 sq. m/wk on the market demand curve for shelter. Proceeding in like fashion for additional prices, we trace out the entire market demand curve. Note that for prices above €8/sq. m, consumer 2 demands no shelter at all, and so the market demand curve for prices above €8 is identical to the demand curve for consumer 1.

The procedure of announcing a price and adding the individual quantities demanded at that price is called *horizontal summation*. It is carried out the same way whether there are only two consumers in the market or many millions. In both large and small markets, the market demand curve is the horizontal summation of the individual demand curves.

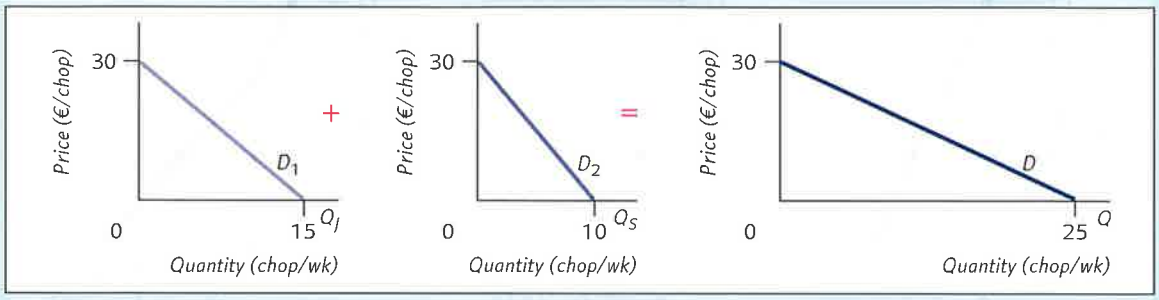
In Chapter 2 we saw that it is often easier to generate numerical solutions when demand and supply curves are expressed algebraically rather than geometrically. Similarly, it will often be convenient to aggregate individual demand curves algebraically rather than graphically. When using the algebraic approach, a common error is to add individual demand curves vertically instead of horizontally. A simple example makes this danger clear.

EXAMPLE 5.3 Smith and Jones are the only consumers in the market for lamb chops in a small town in Wales. Their (inverse) demand curves are given by $P = 30 - 2Q_J$ and $P = 30 - 3Q_S$, where Q_J and Q_S are the quantities demanded by Jones and Smith, respectively, at price P. What is the market demand curve for lamb chops in their town?

When we add demand curves horizontally, we are adding quantities, not prices. Thus it is necessary first to solve the individual demand equations for the respective quantities in terms of price. This yields $Q_J = 15 - (P/2)$ for Jones, and $Q_S = 10 - (P/3)$ for Smith. If the quantity demanded in

the market is denoted by Q, we have $Q = Q_J + Q_S = 15 - (P/2) + 10 - (P/3) = 25 - (5P/6)$. Solving back for P, we get the equation for the market demand curve: $P = 30 - (6Q/5)$. We can easily verify that this is the correct market demand curve by adding the individual demand curves graphically, as in Figure 5.16.

FIGURE 5.16
The Market Demand Curve for Lamb Chops
When adding individual demand curves algebraically, be sure to solve for quantity first before adding.



The common pitfall is to add the demand functions as originally stated and then solve for P in terms of Q. Here, this would yield $P = 30 - (5Q/2)$, which is obviously not the market demand curve we are looking for. ◆

EXERCISE 5.3 **Write the individual demand curves for shelter in Figure 5.15 in algebraic form, then add them algebraically to generate the market demand curve for shelter. (*Caution*: Note that the formula for quantity along D_2 is valid only for prices between 0 and 8.)**

The horizontal summation of individual consumers' demands into market demand has a simple form when the consumers in the market are all identical. Suppose n consumers each have the demand curve $P = a - bQ_i$. To add up the quantities for the n consumers into market demand, we rearrange the consumer demand curve $P = a - bQ_i$ to express quantity alone on one side, $Q_i = a/b - (1/b)\,P$. Then market demand is the sum of the quantities demanded Q_i by each of the n consumers:

$$Q = nQ_i = n\left(\frac{a}{b} - \frac{1}{b}P\right) = \frac{na}{b} - \frac{n}{b}P$$

We can then rearrange market demand $Q = na/b - n(P/b)$ to get back in the form of price alone on one side, $P = a - (b/n)Q$. The intuition is that each one unit demanded by the market is $1/n$ unit for each consumer. These calculations suggest a general rule for constructing the market demand curve when consumers are identical. If we have n individual consumer demand curves $P = a - bQ_i$, then the market demand curve is $P = a - (b/n)Q$.

EXAMPLE 5.4 **Suppose a market has 10 consumers, each with demand curve $P = 10 - 5Q_i$, where P is the price in euros per unit and Q_i is the number of units demanded per week by the ith consumer (Figure 5.17). Find the market demand curve.**

First, we need to rearrange the representative consumer demand curve $P = 10 - 5Q_i$ to have quantity alone on one side:

$$Q_i = 2 - \frac{1}{5}P$$

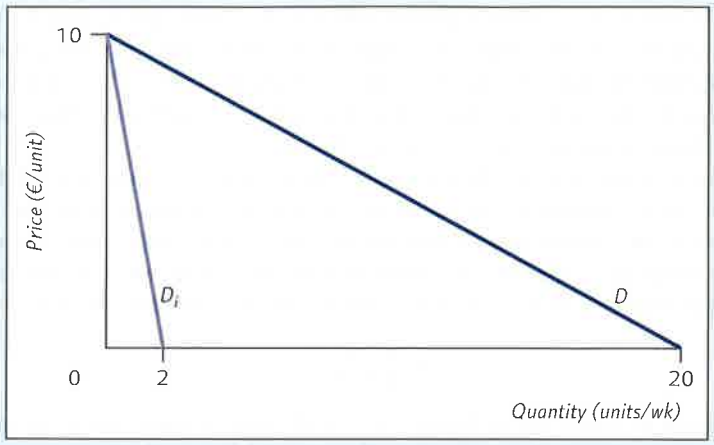


FIGURE 5.17
Market Demand Curve with Identical Consumers
When 10 consumers each have demand curve $P = 10 - 5Q_i$ the market demand curve is the horizontal summation $P = 10 - (\frac{1}{2})\,Q$, with the same price intercept and $\frac{1}{10}$ the slope.

Then we multiply by the number of consumers, $n = 10$:

$$Q_i = nQ_i = 10Q_i = 10\left(2 - \frac{1}{5}P\right) = 20 - 2P$$

Finally, we rearrange the market demand curve $Q = 20 - 2P$ to have price alone on one side, $P = 10 - (\frac{1}{2})\,Q$, to return to the slope-intercept form. ◆

EXERCISE 5.4 **Suppose a market has 30 consumers, each with demand curve $P = 120 - 60Q_i$, where P is price in euros per unit and Q_i is the number of units demanded per week by the ith consumer. Find the market demand curve.**

PRICE ELASTICITY OF DEMAND

price elasticity of demand
the percentage change in the quantity of a good demanded that results from a 1 per cent change in its price.

An analytical tool of central importance is the **price elasticity of demand.** It is a quantitative measure of the responsiveness of purchase decisions to variations in price, and as we will see in both this and later chapters, it is useful for a variety of practical problems. *Price elasticity of demand is defined as the percentage change in the quantity of a good demanded that results from a 1 per cent change in price.* For example, if a 1 per cent rise in the price of shelter caused a 2 per cent reduction in the quantity of shelter demanded, then the price elasticity of demand for shelter would be −2.

The price elasticity of demand will almost always be negative (or zero) because price changes move in the opposite direction from changes in quantity demanded. The demand for a good is said to be *elastic* with respect to price if its price elasticity is less than −1. So, if shelter has a price elasticity of −2 then demand is elastic with respect to price. The demand for a good is *inelastic* with respect to price if its price elasticity is greater than −1 and *unit elastic* with respect to price if its price elasticity is equal to −1. These definitions are portrayed graphically in Figure 5.18.

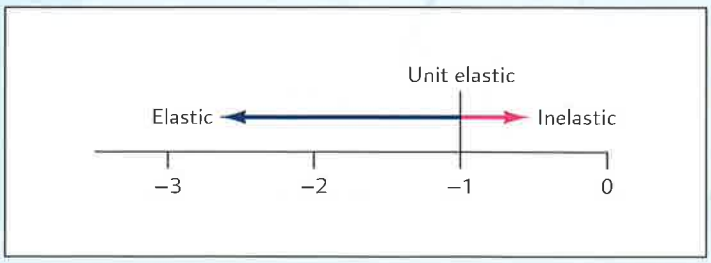


FIGURE 5.18
Three Categories of Price Elasticity
With respect to price, the demand for a good is elastic if its price elasticity is less than −1, inelastic if its price elasticity exceeds −1, and unit elastic if its price elasticity is equal to −1.