

## Test your understanding 4.5

- Why does a subsidy create a welfare (deadweight) loss?
- (a) Using a diagram showing the cheese market, show equilibrium price and quantity, and consumer and producer surplus that arise in a free market equilibrium. (b) The government decides to grant a £0.50 subsidy per kilogram of cheese. Drawing a new diagram showing the pre-subsidy and after-subsidy equilibrium, identify the price paid by consumers, the price received by producers and the quantity bought and sold. (c) Using your diagram, illustrate the increase in consumer surplus and producer surplus, government expenditure and deadweight loss at the after-subsidy market equilibrium. (d) Explain the changes in consumer surplus, producer surplus, government revenue, deadweight loss and allocative efficiency. (e) How does the relationship between marginal benefit and marginal cost at the new (after-subsidy) equilibrium relate to allocative efficiency (or inefficiency)?
- In the market for good alpha the  $P$  intercept of the demand curve is at the point  $(0,7)$ , and the  $P$  intercept of the supply curve is at the point  $(0,1)$ . The point of intersection of the demand curve and the supply curve at free market equilibrium is at  $(6,4)$ . (a) Plot the demand and supply curves, and identify the equilibrium price and quantity. (b) Suppose that price is measured in £, and quantity in tonnes per day, and that a subsidy of £2 per tonne is granted. Plot the new supply curve, and find (through your graph) the price paid by consumers, the price received by producers and the new equilibrium quantity. (c) Using your results, calculate the change in consumer expenditure, the change in firm revenue, government expenditure, the change in consumer surplus, the change in producer surplus and deadweight loss. (d) The demand function for this market is  $Q_d = 14 - 2P$  and the pre-subsidy supply function is  $Q_s = -2 + 2P$ . Find the post-subsidy supply function, and using the demand function, calculate the post-subsidy price paid by consumers, the price received by producers and the new equilibrium quantity. Do your results match your graph?
- A market is defined by the following equations:  $Q_d = 10 - \frac{1}{10}P$ , and  $Q_s = -2 + \frac{1}{10}P$ , where  $P$  is in £. (a) Find the equilibrium price and quantity.

(b) The government grants a subsidy of £20 per unit. Derive the new supply function and calculate the price paid by consumers, the price received by producers and the new equilibrium quantity. (c) Calculate the change in consumer expenditure, the change in firm revenue, government expenditure, the change in consumer surplus, the change in producer surplus and welfare (deadweight) loss.

## 4.5 Price controls

### Introduction to price controls

The third type of intervention we will consider involves price controls.

**Price controls** refer to the setting of minimum or maximum prices by the government (or private organisations) so that prices are unable to adjust to their equilibrium level determined by demand and supply. Price controls result in market disequilibrium, and therefore in shortages (excess demand) or surpluses (excess supply).

Price controls differ from indirect taxes and subsidies in a fundamental way. When a tax is imposed or a subsidy granted, the market *settles at a new equilibrium*. The new equilibrium differs from the pre-tax or pre-subsidy equilibrium, but it is still a new equilibrium, because there is a balance of demand with the new supply. Price controls differ because, once they are imposed, they do not allow a new equilibrium to be established, and instead force a situation where there is *persisting market disequilibrium*.

Market disequilibrium means that the market is prevented from reaching a market-clearing price, and there emerge shortages (excess demand) or surpluses (excess supply) (see page 30). Shortages and surpluses involve a misallocation of resources and welfare losses.

In the discussion that follows, it is important to bear in mind that the term *surplus* has two different meanings. In one sense it refers to excess supply resulting when quantity supplied is greater than quantity demanded (see page 30). In the second sense it refers to the benefits that consumers or producers receive from buying or selling (see pages 42–3). This is not as confusing as it may sound, because *surplus* in the second sense is referred to as ‘consumer surplus’, or ‘producer surplus’ or ‘social surplus’.

## Price ceilings: setting a legal maximum price

- ◆ Explain why governments impose price ceilings, and describe examples of price ceilings, including food price controls and rent controls.

### What is a price ceiling?

A government may in some situations set a legal **maximum price** for a particular good; this is called a **price ceiling**. It means that the price that can be legally charged by sellers of the good must not be higher than the legal maximum price. Figure 4.12 shows how this works. The equilibrium price is  $P_e$ , determined by the forces of demand and supply. The price ceiling,  $P_c$ , is set by the government at a level below the equilibrium price, leading to a shortage (excess supply), since quantity demanded,  $Q_d$  is greater than quantity supplied,  $Q_s$ . If the market were free, the forces of demand and supply would force price up to  $P_e$ . However, now this cannot happen, because the price hits the legally set price ceiling.

Note that to have an effect, the price ceiling must be *below* the equilibrium price. If it were higher than the equilibrium price, the market would achieve equilibrium, and the price ceiling would have no effect.

### Impacts on market outcomes

- ◆ Draw a diagram to show a price ceiling, and analyse the impacts of a price ceiling on market outcomes.

By imposing a price that is below the equilibrium price, a price ceiling results in a lower quantity supplied and sold than at the equilibrium price. This is shown in Figure 4.12, where the price ceiling,  $P_c$ , corresponds to quantity  $Q_s$  that firms supply, which

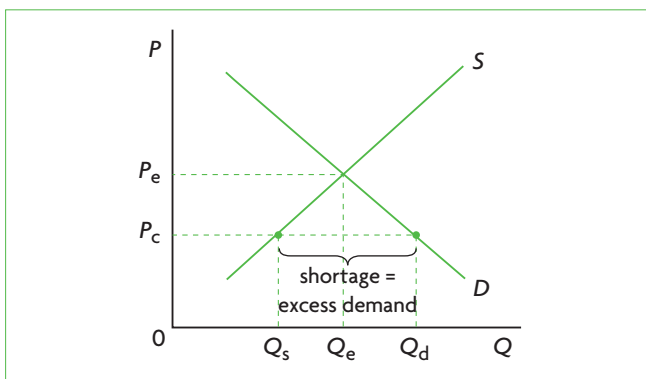


Figure 4.12 Price ceiling (maximum price) and market outcomes

is less than the equilibrium quantity  $Q_e$  that suppliers would supply at price  $P_e$ .

In addition, the price ceiling,  $P_c$ , gives rise to a larger quantity demanded than at the equilibrium price: the quantity consumers want to buy at price  $P_c$  is given by  $Q_d$ , which is greater than quantity  $Q_e$  that they would buy at price  $P_e$ .

A price ceiling does not allow the market to clear; it creates a situation of disequilibrium where there is a shortage (excess demand).

### Consequences for the economy

- ◆ Examine the possible consequences of a price ceiling, including shortages, inefficient resource allocation, welfare impacts, underground parallel markets and non-price rationing mechanisms.

#### Shortages

A price ceiling,  $P_c$ , set below the equilibrium price of a good creates a shortage. At  $P_c$ , not all interested buyers who are willing and able to buy the good are able to do so because there is not enough of the good being supplied. In Figure 4.12, the shortage is equal to  $Q_d - Q_s$ .

#### Non-price rationing

The term 'rationing' refers to a method of dividing up something among possible users. In a free market, this is achieved by the price system: those who are willing and able to pay for a good will do so, and the good is rationed among users according to who buys it; this is called *price rationing*. However, once a shortage arises due to a price ceiling, the price mechanism is no longer able to achieve its rationing function. Some demanders willing and able to buy the good at  $P_c$  in Figure 4.12 will go unsatisfied. How will the quantity  $Q_s$  be distributed among all interested buyers? This can only be done through **non-price rationing** methods, which include the following:

- waiting in line and the first-come-first-served principle: those who come first will buy the good
- the distribution of coupons to all interested buyers, so that they can purchase a fixed amount of the good in a given time period
- favouritism: the sellers can sell the good to their preferred customers.

#### Underground (or parallel) markets

**Underground** (or **parallel**) **markets** involve buying/selling transactions that are unrecorded, and are usually illegal. In the case of price ceilings, they are a special kind of price rationing. They involve buying a good at the maximum legal price, and

then illegally reselling it at a price above the legal maximum. Underground markets can arise when there exist dissatisfied people who have not succeeded in buying the good because there was not enough of it, and are willing to pay more than the ceiling price to get it. If there were no shortage, the price of the good would be at its equilibrium price, and no one would be interested in paying a higher than equilibrium price for it. Underground markets are inequitable, and frustrate the objective sought by the price ceiling, which is to set a maximum price.

### **Underallocation of resources to the good and allocative inefficiency**

Since a lower than equilibrium price results in a smaller quantity supplied than the amount determined at the free market equilibrium, there are too few resources allocated to the production of the good, resulting in underproduction relative to the social optimum (or 'best'). Society is worse off due to underallocation of resources and allocative inefficiency.

### **Negative welfare impacts**

In Figure 4.13, with no price control, the market determines price  $P_e$  and quantity  $Q_e$  at equilibrium. Consumer surplus, or the area under the demand curve and above  $P_e$ , is equal to areas a + b. Producer surplus, the area under  $P_e$  and above the supply curve, is equal to areas c + d + e. Consumer plus producer surplus is maximum, and is equal to a + b + c + d + e. Also,  $MB = MC$ , and there is allocative efficiency.

If a price ceiling,  $P_c$ , is imposed, only the quantity  $Q_s$  is produced and consumed. Consumer surplus is now the area under the demand curve and above  $P_c$ , but only up to  $Q_s$ , since that is all that is consumed. Therefore, consumer surplus becomes a + c. Producer surplus is the area above the supply curve and below  $P_c$ , also only up to  $Q_s$  since that is all that is produced. Producer surplus therefore falls to area e. Total social surplus after the subsidy is a + c + e. Comparing with total social surplus before the subsidy, we see that the shaded areas b and d have been lost and represent **welfare loss** (deadweight loss), or lost social benefits due to the price ceiling. Welfare loss represents benefits that are lost to society because of resource misallocation.

We can see there is allocative inefficiency also because  $MB > MC$  at the point of production,  $Q_s$ : the benefit consumers receive from the last unit of the good they buy is greater than the marginal cost of producing it. Therefore, society is not getting enough of the good, as there is an underallocation of resources to its production.

A price ceiling creates a welfare (deadweight) loss, indicating that the price ceiling introduces allocative inefficiency due to an underallocation of resources to the production of the good, seen by  $Q_s < Q_e$ .  $MB > MC$ , indicating that society is not getting enough of the good.

## **Consequences for various stakeholders**

- ◆ Discuss the consequences of imposing a price ceiling on the stakeholders in a market, including consumers, producers and the government.

### **Consumers**

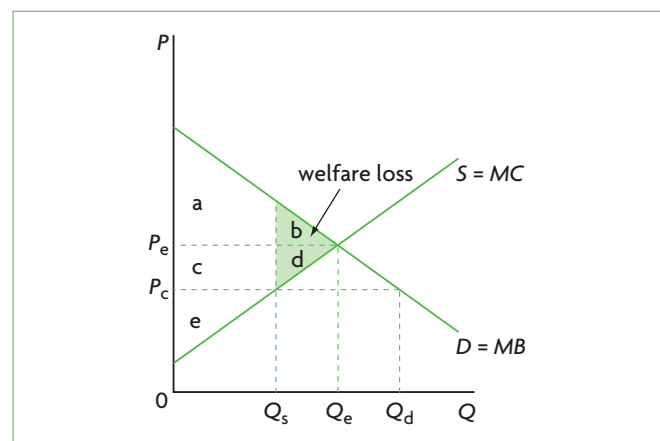
Consumers partly gain and partly lose. They lose area b but gain area c from producers (see Figure 4.13). Those consumers who are able to buy the good at the lower price are better off. However, some consumers remain unsatisfied as at the ceiling price there is not enough of the good to satisfy all demanders.

### **Producers**

Producers are worse off, because with the price ceiling they sell a smaller quantity of the good at a lower price; therefore, their revenues drop from  $P_e \times Q_e$  to  $P_c \times Q_s$ . This is clear also from their loss of some producer surplus, area c, (which is transferred to consumers), as well as area d (welfare loss) in Figure 4.13.

### **Workers**

The fall in output (from  $Q_e$  to  $Q_s$ ) means that some workers are likely to be fired, resulting in unemployment; clearly these workers will be worse off.



**Figure 4.13** Welfare impacts of a price ceiling (maximum price)

## Government

There will be no gains or losses for the government budget, yet the government may gain in political popularity among the consumers who are better off due to the price ceiling.

## The examples of rent controls and food price controls

Price ceilings are for the most part set in order to make certain goods considered to be necessities more affordable to low-income earners.

### Rent controls

Rent controls consist of a maximum legal rent on housing, which is below the market-determined level of rent (the price of rental housing). It is undertaken by governments in some cities around the world to make housing more affordable to low-income earners. Consequences of rent controls include:

- housing becomes more affordable to low-income earners
- a shortage of housing, as the quantity of housing demanded at the legally maximum rent is greater than the quantity available
- a smaller quantity of housing at the legally maximum rent than at the free market rent, since owners of housing supply a smaller quantity; in

Figure 4.12, at price  $P_c$ , the quantity  $Q_s$  is lower than  $Q_e$

- long waiting lists of interested tenants waiting for their turn to secure an apartment/flat
- a market for rented units where tenants sublet their apartments at rents above the legal maximum (an underground market)
- run-down and poorly maintained rental housing because it is unprofitable for landlords to maintain or renovate their rental units since low rents result in low revenues.

### Food price controls

Some governments use food price controls as a method to make food more affordable to low-income earners, especially during times when food prices are rising rapidly (for example, in the period 2008–9). The results of food price controls follow the same patterns as discussed above: lower food prices and greater affordability; food shortages as quantity demanded is greater than quantity supplied; non-price rationing methods (such as queues) to deal with the shortages; development of underground markets; falling farmer incomes due to lower revenues; more unemployment in the agricultural sector; misallocation of resources; possible greater popularity for the government among consumers who benefit.

## Real world focus

### Price controls in Vietnam

Due to high rates of inflation (a rising general price level), the Vietnamese government is considering the imposition of price controls, namely price ceilings on numerous products, including chemical fertilisers, salt, milk powder, rice, sugar, animal feeds, coal, cement, paper, textbooks and many more. If it goes ahead with these measures, the pricing rules will apply not just to domestic government-owned businesses but also private firms and foreign-owned

businesses. It is feared that Vietnam may be moving away from its freer market orientation of recent years and back toward the ways of a command economy. Foreign diplomats are warning the government that price controls will damage business confidence in the country.

Source: Adapted from The Economist Intelligence Unit, 'Vietnam economy: reform roll-back?' in ViewsWire News Analysis, 21 September 2010.

## Applying your skills

- 1 What does it mean to move toward the ways of a 'command economy'?
- 2 Discuss the consequences for the economy and stakeholders that may arise if the government moves forward with the price controls.
- 3 Why do you think that price controls may damage business confidence?

## Test your understanding 4.6

- Using a diagram, explain why price controls lead to disequilibrium market outcomes.
- Define a price ceiling, and providing examples, explain some reasons why governments impose them.
- Draw a diagram illustrating a price ceiling, and analyse its effects on market outcomes (price, quantity demanded, quantity supplied, market disequilibrium) and consequences for the economy (shortages, non-price rationing, allocative inefficiency, deadweight loss).
- (a) Explain the difference between price rationing and non-price rationing. (b) Under what circumstances does non-price rationing arise? (c) What are some forms of non-price rationing? (d) In what way are underground markets a form of price rationing?
- (a) Draw a diagram showing producer and consumer surplus in a free market competitive equilibrium. (b) Assuming a price ceiling is imposed in this market, draw a new diagram showing the new consumer surplus, producer surplus and welfare (deadweight) loss. (c) Comparing your diagrams for parts (a) and (b), what can you conclude about consumer surplus, producer surplus and deadweight loss? (d) What is the relationship between marginal benefits and marginal costs in the new equilibrium? What does this reveal about allocative efficiency (or inefficiency)?
- Examine the consequences of price ceilings for different stakeholders in the case of (a) rent controls, and (b) food price controls.

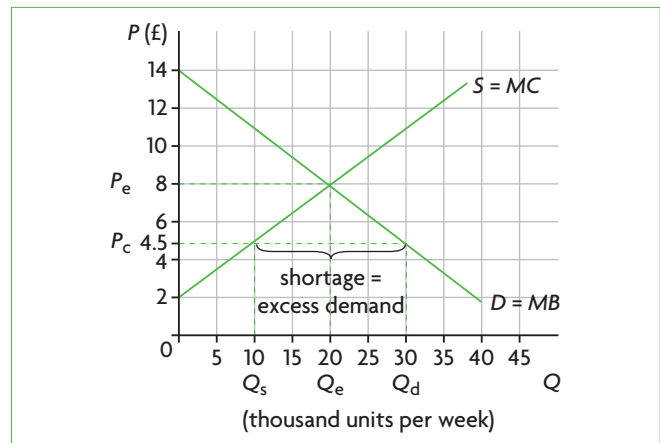


Figure 4.14 Calculating effects of price ceilings

### Change in consumer expenditure

Consumer expenditure is given by the price per unit of the good times the number of units purchased. At equilibrium, prior to the price ceiling, consumers spend  $P_e \times Q_e = £8 \times 20\,000$  units = £160 000. After the price ceiling is imposed, consumers spend  $P_c \times Q_s = £4.50 \times 10\,000$  units = £45 000. The change is therefore £160 000 – £45 000 = £115 000, meaning that consumers now spend £115 000 less than at equilibrium.

### Change in producer (firm) revenue

Firm revenue is the same as consumer expenditure both before and after the imposition of the price ceiling. This is because revenue is equal to price per unit times quantity of units sold, and both the price ( $P_c$ ) and the quantity ( $Q_s$ ) are the same for both consumers and producers. Therefore, before the price ceiling is imposed, firm revenue is £160 000, and after the price ceiling, firm revenue is reduced to £45 000. Therefore, firm revenues fall by the amount £115 000.

HL

## Calculating effects of price ceilings (higher level topic)

- Calculate possible effects from the price ceiling diagram, including the resulting shortage, and the change in consumer expenditure (which is equal to the change in firm revenue).

Figure 4.14 provides us with a numerical example of a price ceiling. At equilibrium, price is equal to £8 and quantity demanded and supplied is 20 000 units of the good per week. When a price ceiling is imposed at  $P_c = £4.50$  per unit, quantity demanded becomes  $Q_d = 30\,000$  units, and quantity supplied  $Q_s = 10\,000$  units.

### Shortage (excess demand)

The shortage, or excess demand, is equal to  $Q_d - Q_s$ , which in this case is  $30\,000 - 10\,000 = 20\,000$  units per week.

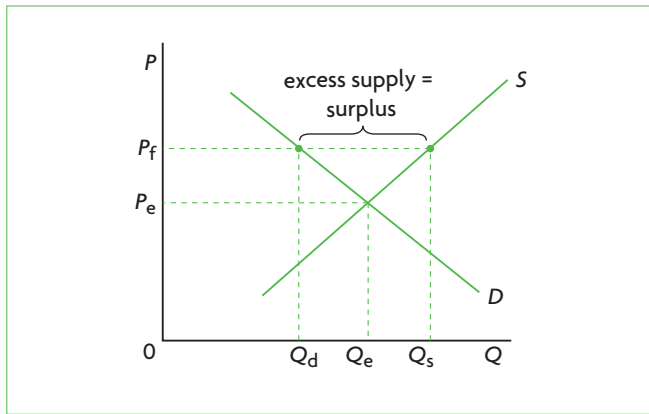
## Test your understanding 4.7

- In the example of the market illustrated in Figure 4.14, what would be the effect of a price ceiling set at £10?
- Suppose a price ceiling is set at £4 per unit (Figure 4.14). Calculate (a) the shortage (excess demand), (b) the change in consumer expenditure, and (c) the change in producer revenue.

## Price floors: setting a legal minimum price

### What is a price floor?

A legally set **minimum price** is called a **price floor**. The price that can be legally charged by sellers of the good must not be lower than the price floor, or



**Figure 4.15** Price floor (minimum price) and market outcomes

minimum price. In Figure 4.15, a price floor,  $P_f$ , is set above the equilibrium price,  $P_e$ . At  $P_e$ , consumers are willing and able to buy  $Q_d$  of the good, but firms are willing and able to supply  $Q_s$  of the good. Therefore, a surplus, or excess supply, equal to the difference between  $Q_s$  and  $Q_d$ , arises. If the market were free, the forces of demand and supply would force the price down to  $P_e$ . However, now this cannot happen.

Note that to have an effect, the price floor must be *above* the equilibrium price. If it were below the equilibrium price, the market would achieve equilibrium and the price floor would have no effect.

### Why governments impose price floors

- ◆ Explain why governments impose price floors, and describe examples of price floors, including price support for agricultural products and minimum wages.

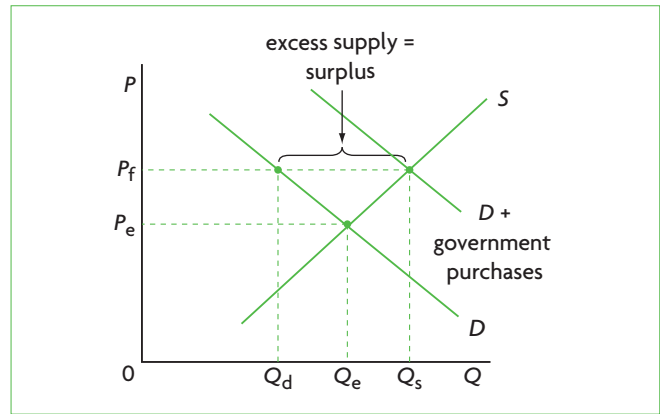
Price floors are commonly used for two reasons: (a) to provide income support for farmers by offering them prices for their products that are above market-determined prices; and (b) to protect low-skilled, low-wage workers by offering them a wage (the minimum wage) that is above the level determined in the market. Note that the first of these involves price control in product markets, while the second concerns price control in a resource market. While market outcomes are similar, each type of price control has different consequences for the economy and stakeholders. We will therefore consider each one separately.

### Price floors for agricultural products

#### Impacts of price floors on market outcomes

- ◆ Draw a diagram of a price floor, and analyse the impacts of a price floor on market outcomes.

Farmers' incomes in many countries, resulting from the sale of their products in free markets, are often unstable



**Figure 4.16** An agricultural product market with price floor and government purchases of the surplus

or too low. Some important reasons for both instability and low incomes were considered in Chapter 3. Unstable incomes arise from unstable agricultural product prices, which are due to low price elasticities of demand and low price elasticities of supply for agricultural products (see pages 56–7 and 70). Low income elasticities of demand are an important factor accounting for low farmer incomes (see page 64).

One method governments use to support farmers' incomes is to set price floors for certain agricultural products, the objective being to raise the price above their equilibrium market price; such price floors are called **price supports**. Figure 4.16 illustrates the market for an agricultural product with a price floor,  $P_f$ , set above the equilibrium price,  $P_e$ . The price floor results in a larger quantity supplied,  $Q_s$ , than the quantity supplied at market equilibrium,  $Q_e$ . In addition, the price floor,  $P_f$ , leads to a smaller quantity demanded and purchased than at the equilibrium price: the quantity consumers want to buy at  $P_f$  is  $Q_d$ , which is smaller than the quantity  $Q_e$  that they bought at price  $P_e$ .

A price floor does not allow the market to clear; it results in disequilibrium where there is a surplus (excess supply). A common practice is for the government to buy the excess supply, and this causes the demand curve for the product to shift to the right to the new demand curve 'D plus government purchases'. By buying up the excess supply, the government is able to maintain the price floor at  $P_f$ .

#### Consequences of agricultural price floors for the economy

- ◆ Examine the possible consequences of a price floor, including surpluses and government measures to dispose of the surpluses, inefficient resource allocation and welfare impacts.

**Surpluses** The effect of a price floor set above the equilibrium price of a good is to create a surplus (excess supply) equal to  $Q_s - Q_d$ , shown in Figure 4.16, since the quantity consumers demand is given by  $Q_d$ , while the quantity farmers want to supply is given by  $Q_s$ .

**Government measures to dispose of surpluses**

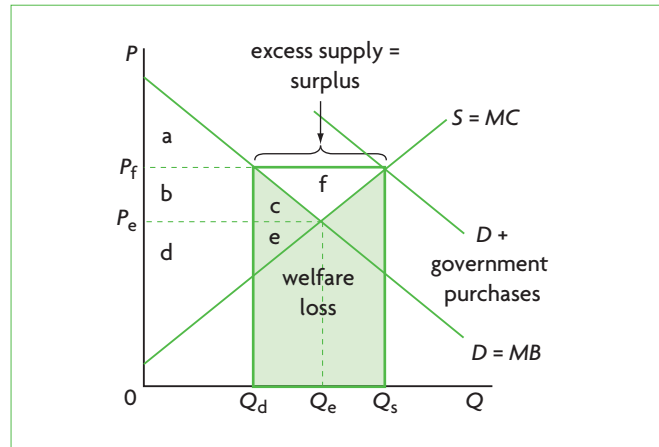
The government must make a decision about what to do with the surplus (excess supply) it purchases. One option is store it, giving rise to additional costs for storage above the costs of the purchase. Another method is to export the surplus (sell it abroad); this often requires granting a subsidy to lower the price of the good and make it competitive in world markets, since the price floor has increased the price of the good above the market price (foreign countries would not want to buy it at the high price). Clearly, subsidies involve additional costs for the government. A third option is for the government to use it as aid sent to developing countries, which often poses problems for the developing countries intended to benefit from the aid (see page 513). In general, any course chosen by the government to get rid of the surpluses is problematic.

**Firm inefficiency** Higher than equilibrium product prices can lead to inefficient production; inefficient firms with high costs of production do not face incentives to cut costs by using more efficient production methods, because the high price offers them protection against lower-cost competitors. This leads to inefficiency.

**Overalllocation of resources to the production of the good and allocative inefficiency** Too many resources are allocated to the production of the good, resulting in a larger than optimum (or 'best') quantity produced. Whereas the optimum quantity is  $Q_e$ , actually  $Q_s$  is produced.

**Negative welfare impacts** In Figure 4.17 (which is similar to Figure 4.16), price  $P_e$  and quantity  $Q_e$  represent market equilibrium with no price floor, and where social surplus is maximum; consumer surplus is given by  $a + b + c$  and producer surplus by  $d + e$ . Also,  $MB = MC$ .

After a price floor,  $P_f$  is imposed, consumer surplus becomes the area under the demand curve and above  $P_f$ , up to the quantity consumers buy,  $Q_d$ , and so falls to  $a$ . Producer surplus becomes the area above



**Figure 4.17** Welfare impacts of a price floor (minimum price) for agricultural products and government purchases of the surplus

the supply curve and below  $P_f$ , up to the quantity produced,  $Q_s$ , and so becomes  $d + e + b + c + f$ . This means that the sum of consumer plus producer surplus *increases* by the area  $f$  after the price floor is imposed. (This happens because producers gain the area  $b$  and  $c$  lost by consumers, and in addition gain  $f$ .)

Government spending to buy the excess supply is equal to the price paid per unit,  $P_f$ , times the surplus quantity it purchases:  $P_f \times (Q_s - Q_d)$ , corresponding to the rectangle outlined in bold. Since government spending is financed out of taxes with alternative uses (opportunity costs), government spending to maintain the price floor involves losses for society.

We therefore have a gain in surplus of  $f$  and a loss equal to the rectangle shown in bold. If we subtract the loss from the gain we are left with the green shaded area, which is welfare (deadweight) loss, representing loss of benefits due to allocative inefficiency caused by overallocation of resources to the production of the good. This is also shown by  $MB < MC$  at the point of production,  $Q_s$ , indicating that society would be better off if less of the good were produced.

A price floor creates welfare (deadweight) loss, indicating that the price floor introduces allocative inefficiency due to an overallocation of resources to the production of the good, seen by  $Q_s > Q_e$ .  $MB < MC$ , indicating that society is getting too much of the good.

## Consequences of price floors for various stakeholders

- ◆ Discuss the consequences of imposing a price floor on the stakeholders in a market, including consumers, producers and the government.

**Consumers** Consumers are worse off, as they must now pay a higher price for the good ( $P_f > P_e$ ), while they buy a smaller quantity of it ( $Q_d < Q_e$ ). This is clear also from their loss of some consumer surplus.

**Producers** Producers gain as they receive a higher price and produce a larger quantity, and since the government buys up the surplus, they increase their revenues from  $P_e \times Q_e$  to  $P_f \times Q_s$ . Remember, this is the main rationale of agricultural price floors. Also, producers become protected against low-cost competition and do not face as strong incentives to become efficient producers; they are therefore less likely to go out of business if they are producing inefficiently (with higher costs).

**Workers** Workers are likely to gain as employment increases on account of greater production of the good.

**Government** When the government buys the excess supply, this is a burden on its budget, resulting in less government funds to spend on other desirable activities in the economy. The costs to the government are paid for out of taxes (and therefore by taxpayers). In addition, there are further costs of storing the surplus or subsidising it for export (sale to other countries).

**Stakeholders in other countries** The European Union, the United States and many other more developed countries rely on price floors for agricultural products to support their farmers. The surpluses are sometimes exported (sold to other countries), leading to lower world prices due to the extra supply made available in world markets. Countries that do not have price supports are forced to sell their agricultural products at low world prices. The low prices in these countries signal to local farmers that they should cut back on their production, resulting in an underallocation of resources to these products. These events often work against the interests of less

developed countries (this topic will be discussed in Chapters 13 and 17).

If excess supplies of agricultural products are used as aid to developing countries, they are sold at low (below-market) prices in local markets. Consumers of those countries gain, as they buy the good at a lower than market price, but producers lose as they have to compete with lower-priced foreign goods, and some of them may go out of business, losing their only source of income (see the Real world focus feature on page 513).

Overall, a global misallocation of resources can result, as price floors cause high-cost producers to produce more and low-cost producers to produce less than the social optimum, resulting in a waste of resources.

### Test your understanding 4.8

- 1 Define a price floor, and providing examples, explain some reasons why governments impose them.
- 2 Draw a diagram illustrating a price floor that is imposed in a product market, and analyse its effects on market outcomes (price, quantity demanded, quantity supplied, market disequilibrium) and consequences for the economy (excess supply, firm inefficiency, possible illegal sales, allocative inefficiency, welfare (deadweight) loss).
- 3 What are some measures governments can take to dispose of surpluses that result from the imposition of a price floor in an agricultural product market? What are some problems associated with these measures?
- 4 Assuming a price floor is imposed in a market for an agricultural product, and that the government purchases the entire excess supply that results in order to maintain the price, **(a)** draw a diagram illustrating welfare (deadweight) loss. **(b)** What is the relationship between marginal benefits and marginal costs in the new equilibrium? What does this reveal about allocative efficiency (or inefficiency)?
- 5 Examine the consequences for different stakeholders of a price floor for an agricultural product whose excess supply is purchased by the government.



## Calculating effects of price floors (higher level topic)

- Calculate possible effects from the price floor diagram, including the resulting surplus, the change in consumer expenditure, the change in producer revenue, and government expenditure to purchase the surplus.

Figure 4.18 provides a numerical example of a price floor on an agricultural product. At equilibrium, price is equal to £20 and quantity is equal to 60 000 kg per week. When a price floor is imposed at  $P_f = £25$ , quantity demanded is  $Q_d = 40\ 000$  kg per week and quantity supplied is  $Q_s = 80\ 000$  kg per week.

### Surplus (excess supply)

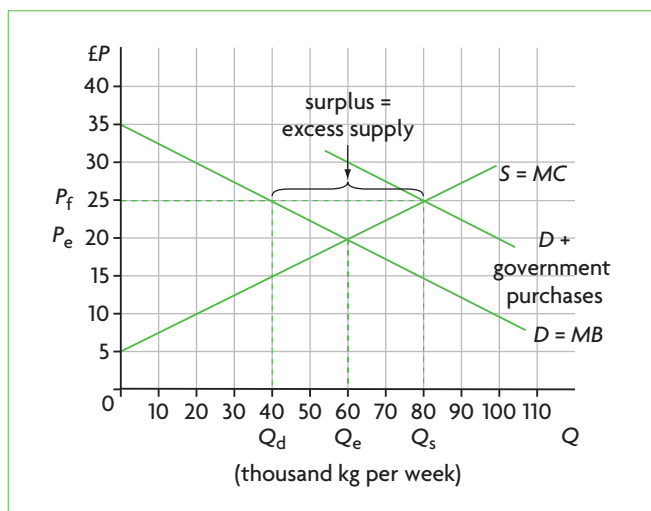
The surplus, or excess supply is equal to  $Q_s - Q_d$ , which in this case is  $80\ 000 - 40\ 000 = 40\ 000$  kg per week.

### Change in consumer expenditure

Consumer expenditure is given by the price per kg of the good times the number of kg purchased per week. At equilibrium, before the price floor, consumers spend  $P_e \times Q_e = £20 \times 60\ 000$  kg = £1.2 million per week. After the price floor is imposed, consumers spend  $P_f \times Q_s = £25 \times 40\ 000$  kg = £1 million per week. Therefore, consumers spend £200 000 less on the good per week.

### Change in producer revenue

Before the price floor, producer revenue is the same as consumer expenditure, since revenue is equal to price per kg times quantity sold, and both the price ( $P_e$ ) and the quantity ( $Q_e$ ) are the same for consumers and producers. Therefore producer revenue before the price



**Figure 4.18** Calculating effects of a price floor on an agricultural product with government purchases of the surplus

floor is £1.2 million per week. Once the price floor is imposed and the government purchases the surplus (excess supply), firms receive revenues of  $P_f \times Q_s$ , and so producer revenue increases to  $£25 \times 80\ 000 = £2$  million per week. Therefore, the change is £800 000, or additional producer revenue of this amount per week.

### Government expenditure

In order to purchase the excess supply of the agricultural product, the government spends an amount equal to the price of the good at the price floor times the number of kg purchased, or  $P_f \times (Q_s - Q_d) = £25 \times 40\ 000 = £1$  million.

Note that government expenditure (£1 million) is equal to total producer revenue (£2 million) minus total consumer expenditure (£1 million) per week.

### Test your understanding 4.9

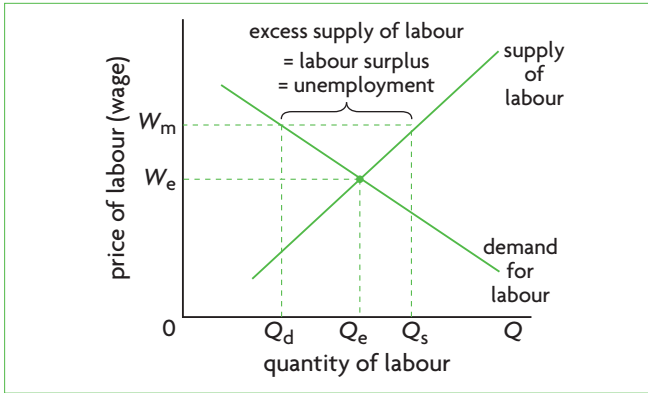
- In the example of the market illustrated in Figure 4.18, what would be the effect of a price floor set at £15?
- Suppose a price floor is set at £30 per unit (Figure 4.18). Calculate (a) the surplus (excess supply), (b) the change in consumer expenditure, (c) the change in producer revenue, and (d) government expenditure needed to purchase the surplus (excess supply) and maintain the price floor.

## Minimum wages

### Impacts of minimum wages on market outcomes

- Draw a diagram of a price floor, and analyse the impacts of a price floor on market outcomes.

Many countries around the world have **minimum wage** laws that determine the minimum price of labour (the wage rate) that an employer (a firm) must pay. The objective is to guarantee an adequate income to low-income workers, who tend to be mostly unskilled. (The market-determined wages of skilled workers are usually higher than the minimum wage.) Figure 4.19 shows the market for labour. The demand for labour curve shows the quantity of labour that firms are willing and able to hire at each wage, and the supply of labour curve shows the quantity of labour that workers supply at each wage. Supply and demand determine the equilibrium 'price' of labour, which is the wage,  $W_e$ , where the quantity of labour demanded is equal to the quantity of labour supplied,  $Q_e$ .



**Figure 4.19** Labour market with minimum wage (price floor)

The minimum wage,  $W_m$ , lies above the equilibrium wage,  $W_e$ . Therefore, at  $W_m$ , the quantity of labour supplied,  $Q_s$ , is larger than the quantity of labour demanded when the labour market is in equilibrium ( $Q_e$ ). The quantity of labour demanded,  $Q_d$ , is less than the quantity demanded at equilibrium,  $Q_e$ . There results a surplus of labour in the market equal to the difference between  $Q_s$  and  $Q_d$ . The labour market does not clear when there is a minimum wage.

### Consequences of minimum wages for the economy

- ◆ Examine the possible consequences of a price floor, including surpluses, inefficient resource allocation and welfare impacts.<sup>3</sup>

**Labour surplus (excess supply) and unemployment** The imposition of a minimum wage in the labour market creates a surplus of labour equal to  $Q_s - Q_d$  in Figure 4.19, which is unemployment, as it corresponds to people who would like to work but are not employed. The unemployment is due partly to the decrease in quantity of labour demanded by firms (the difference between  $Q_e$  and  $Q_d$ ) and partly to an increase in the quantity of labour supplied (the difference between  $Q_s$  and  $Q_e$ ) which occurs because the higher wage makes work more attractive, causing a movement up the labour supply curve. This unemployment is likely to involve unskilled workers.

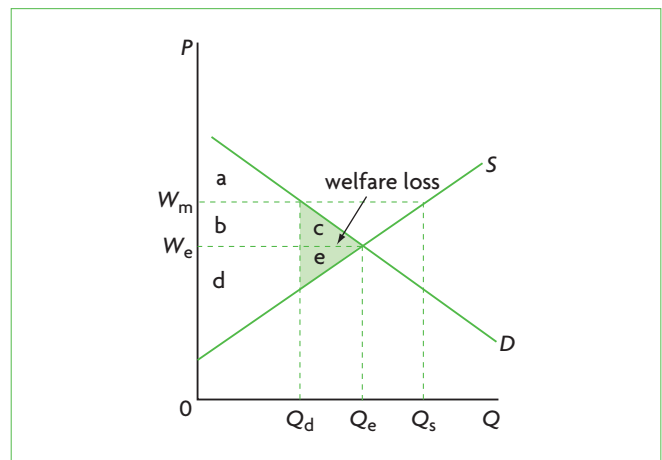
**Illegal workers at wages below the minimum wage** Illegal employment of some workers at wages below the legal minimum may result; this often

involves illegal immigrants who may be willing to supply their labour at very low wages.

**Misallocation of labour resources** The minimum wage affects the allocation of *labour resources*, as it prevents the market from establishing a market-clearing price of labour. In Chapter 2, page 41, we saw how the wage acts as a signal and incentive to workers (the suppliers of labour) and firms (the demanders of labour) to determine the optimal allocation of labour resources. The imposition of a minimum wage changes these signals and incentives for unskilled labour, whose wage is affected by the price floor. Therefore, industries that rely heavily on unskilled workers are more likely to be affected, and will hire less unskilled labour.

**Misallocation in product markets** Firms relying heavily on unskilled workers experience an increase in their costs of production, leading to a leftward shift in their *product* supply curve (see Chapter 2, page 28), resulting in smaller quantities of output produced. Therefore, the misallocation of labour resources leads also to misallocation in product markets.

**Negative welfare impacts (supplementary material)** Figure 4.20 shows the labour market, with the market-clearing wage at  $W_e$ , and equilibrium quantity of labour demanded and supplied at  $Q_e$ . The imposition of a minimum wage,  $W_m$ , creates a labour surplus (excess labour supply), or unemployment of  $Q_s - Q_d$ . To examine the welfare impacts of the minimum wage, note that we are



**Figure 4.20** Welfare impacts of a minimum wage

<sup>3</sup> The phrase 'government measures to dispose of the surpluses' has been deleted because it does not apply to the minimum wage.

dealing with *employer surplus* (the area under the demand curve) and *worker surplus* (the area above the supply curve).

In the free market, with no minimum wage, employer surplus consists of areas  $a + b + c$ , and worker surplus consists of areas  $d + e$ , making a total social surplus of  $a + b + c + d + e$ . After the imposition of the minimum wage, employer surplus is reduced to area  $a$ , and worker surplus becomes areas  $d + b$ , so that total social surplus is  $a + b + d$ . Therefore, the minimum wage has resulted in a loss of social surplus equal to  $c$  and  $e$ , representing welfare (deadweight) loss. The deadweight loss arises because there is an underallocation of labour resources (usually unskilled labour) relative to the social optimum, since  $Q_d < Q_e$ .

(The reason why the welfare analysis of the minimum wage differs from that of price floors for agricultural products with government purchases of the excess supply is that the government does not 'buy' the excess labour supply that results from the minimum wage by offering the excess workers jobs.)

### **Consequences of minimum wages for various stakeholders**

◆ Discuss the consequences of imposing a price floor on the stakeholders in a market, including consumers, producers and the government.

**Firms (employers of labour)** Firms are worse off as they face higher costs of production due to the higher labour costs. This is reflected in the loss of employer surplus.

**Workers (suppliers of labour)** The impacts on workers are mixed. Some gain, as they receive a higher wage than previously ( $W_m > W_e$ ), but some lose as they lose their job. Note that the workers who lose their job are those represented by  $Q_e - Q_d$ . This is not the full amount of unemployment created by the minimum wage, because the minimum wage leads to *additional* unemployment of  $Q_s - Q_e$ , since more workers supply their labour in the market when the wage increases.

The mixed effects on workers are reflected in the gain in worker surplus of area  $b$ , and the loss of area  $e$ .

**Consumers** Consumers are negatively affected, because the increase in labour costs leads to a decrease in supply of products (a leftward shift in firm supply curves) causing higher product prices and lower quantities.

### **Price floors and minimum wages in the real world**

Economists agree that price floors for agricultural products lead to surpluses (excess supplies) and are highly inefficient for the reasons discussed above. Yet they continue to be used in many countries because of strong political pressures exerted by farmers who claim to need these for income support.

The effects of minimum wages, on the other hand, tend to be controversial, as it is uncertain whether they produce an increase in unemployment to the extent that economic theory predicts. There is agreement that if a minimum wage is set at a high level relative to the free market equilibrium wage, it is likely to create some unemployment. Yet some studies have shown that a minimum wage in some situations may have no effect or even a positive effect on *total* employment. Some firms respond to the minimum wage by maintaining the same number of workers but cutting non-wage benefits (such as paid holidays or sick leave); or they may hire fewer unskilled workers and more skilled workers. Also, it is possible that labour productivity (defined as the amount of output produced per worker) may increase due to the minimum wage, as workers feel motivated to work harder, with the result that some firms hire more unskilled labour in response to minimum wages.

While the effects of minimum wages remain controversial, there is generally strong political support for their continued use on the grounds of greater equity in income distribution.

### **Setting fixed prices**

Sometimes prices may be fixed at a particular level, such as with ticket prices for theatres, movies and sports events, where prices are usually fixed ahead of time by the organising body (which may be private or public), and cannot increase or decrease according to supply and demand.

Figure 4.21 shows the market for tickets for a sports event. The supply curve is vertical because there is a fixed supply of tickets (due to a fixed number of seats; see page 27). The ticket price is fixed at  $P_{fx}$  by the organising body. Figure 4.21(a) illustrates an event for which there is large demand, given by  $D_1$ . If the price could respond to market forces, it would rise to  $P_e$ , but since it is fixed at  $P_f$  a shortage of tickets arises equal to the horizontal difference between points  $a$  and  $b$ . Figure 4.21(b) illustrates an event for which there is low demand, given by  $D_2$ . Here, the equilibrium price would have been  $P_e$ , however price is fixed at the higher level  $P_{fx}$ , resulting in a surplus of tickets equal to the horizontal difference between points  $c$  and  $d$ .

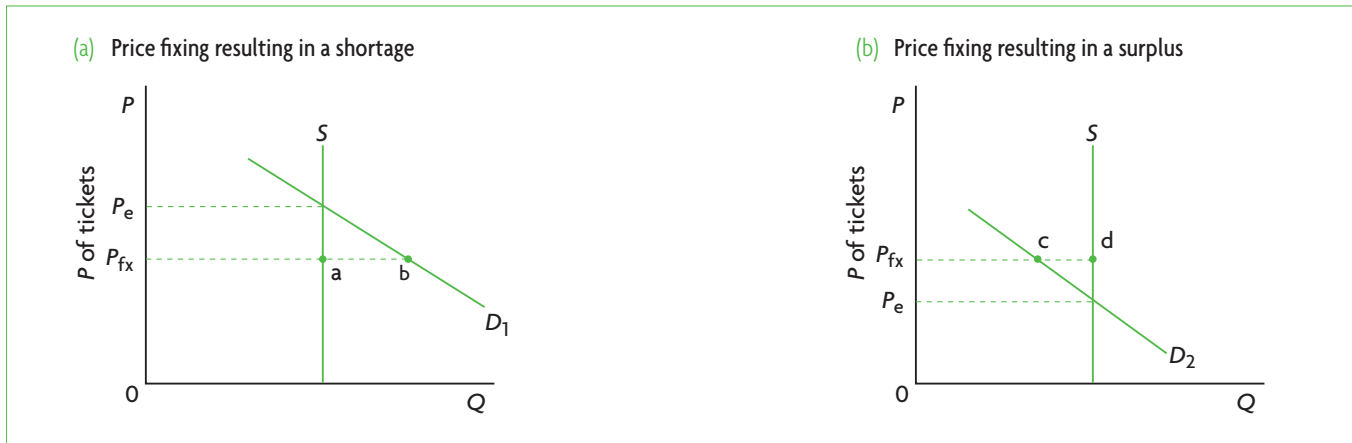


Figure 4.21 Price fixing and surpluses and shortages

### Test your understanding 4.10

- 1 Define a minimum wage. Why do many governments around the world impose them?
- 2 Draw a diagram illustrating the imposition of a minimum wage, and analyse its effects on market outcomes (the wage, quantity of labour demanded and supplied, market disequilibrium) and consequences for the economy (unemployment of labour, illegal work, resource misallocation, welfare (deadweight) loss).
- 3 (Optional) Assuming a minimum wage is imposed, draw diagrams to illustrate (a) the loss

in employer surplus, (b) the gain and the loss in worker surplus, and (c) welfare (deadweight) loss. (d) What is the impact of the minimum wage on allocative efficiency?

- 4 Examine the consequences of a minimum wage for different stakeholders.
- 5 Using diagrams show how excess demand or excess supply of tickets results when ticket prices are set at a level that is (a) lower than equilibrium, or (b) higher than equilibrium.



### Theory of knowledge

#### Allocative efficiency: is it really value-free?

Throughout this chapter, we have used the competitive market model, explained in Chapter 2, as the basis for making assessments about government intervention in the economy. According to this model, when there is competition in the sense of many buyers and sellers who act according to their best self-interest, and when market forces are free to determine equilibrium prices, a situation is reached where there is allocative efficiency and maximum social welfare. Scarce resources are allocated in the best possible way, producing the most of what people mostly want, and it is not possible to make anyone better off without making someone worse off, a condition called *Pareto optimality* (see page 42).

The concept of Pareto optimality emerged in the late 19th century after a period when economists were trying to make economics more scientific in its approach.

‘Scientific’ meant economics should get rid of any value judgements about things that ‘ought to be’ and base itself entirely on positive thinking (see page 11). The famous classical economists of earlier times (Adam Smith, Robert Malthus, David Ricardo, John Stuart Mill, Karl Marx and many others) openly discussed their ideas about what ought to happen in society (normative ideas) together with their positive ideas of things that ‘are’ or ‘will be’. Yet by the late 19th century, it was believed that a true science is value-free, and economists set out to imitate the methods of the natural sciences, especially physics.

The concept of Pareto optimality, developed by Vilfredo Pareto (an Italian engineer, sociologist, economist and philosopher), was welcomed as being truly free of normative aspects. It simply stated that under certain

(continued over)