

# EC 131 - Price Controls and Taxation

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## 1 Price Controls

Price controls may come in the form of **Price Ceilings** or **Price Floors**. In order to know the effect that such policies may have in market outcomes we should first know whether they are *binding* or *not binding*. The general method is the following (where  $P^c$  is the value of the price ceiling and  $P^f$  the value of the price floor):

1. Solve for the equilibrium price  $P^*$
2. If  $P^* > P^c$  **or**  $P^* < P^f$ , the constraint is *binding*. We can then find quantity demanded and supplied for the binding price in order to measure surpluses or shortages.
3. If  $P^* < P^c$  **and**  $P^* > P^f$ , the constraint is *not binding*, so there's no effect in the market equilibrium.

Note: if there's only price ceiling or only price floor, we only have to check for that binding, of course.

### 1.1 Example

Let the following functions define demand and supply (where  $Q_D$  is quantity demanded and  $Q_S$  quantity supplied):

$$Q_D = 100 - 2P$$

$$Q_S = 3P$$

### 1.1.1 Market equilibrium

First let's see what is the value of  $P^*$  and  $Q^*$ :

$$Q_D = Q_S \implies 100 - 2P = 3P$$

$$5P = 100$$

$$P^* = 20$$

$$Q^* = 60$$

### 1.1.2 Price ceiling of $P^c = 25$

Here  $P^* < P^c$ , since  $20 < 25$ , the constraint is *not binding* and thus there is **no effect**.

### 1.1.3 Price ceiling of $P^c = 10$

Here  $P^* > P^c$ , since  $20 > 10$  and we have a binding constraint. The effective price will be  $P = 10$ , and thus:

$$Q_D = 100 - 2P = 100 - 20 = 80$$

$$Q_S = 3P = 30$$

That is, we have a **shortage** of  $80 - 30 = 50$  units.

### 1.1.4 Price floor of $P^f = 25$

Here  $P^* < P^f$ , since  $20 < 25$  and we have a binding constraint. The effective price will be  $P = 25$ , and thus:

$$Q_D = 100 - 2P = 100 - 50 = 50$$

$$Q_S = 3P = 75$$

That is, we have a **surplus** of  $75 - 50 = 25$  units.

## 2 Taxes

Taxes charged per unit of product sold/purchased have the effect of creating a gap between the price the consumer pays and the price the producer receives for each good. Let's call the price the consumer pays  $P^C$  and the price the producer receives  $P^S$  and use the same demand and supply function as before. Then:

$$Q_D = 100 - 2P^C$$

$$Q_S = 3P^S$$

We have two equations and four unknowns ( $Q_D, Q_S, P^C$  and  $P^S$ ). We need two more equations. One of them is the market equilibrium condition (that is, that quantity demanded equals quantity supplied):

$$Q_D = Q_S$$

The fourth equation is the one that relates the two prices  $P^C$  and  $P^S$ . Suppose first that the government will tax the producer a tax of \$2 per unit sold. Then:

$$P^S = P^C - 2$$

since what the producer will receive is whatever the consumer paid **minus \$ 2**. If the consumer pays the tax, then:

$$P^C = P^S + 2$$

since what the consumer will pay is whatever the producer charged **plus \$ 2**. Notice, however, that the two conditions are *identical!* This shows that regardless of who is paying the tax, *the market equilibrium is the same*.

We can now solve for the market equilibrium. first, let  $Q_D = Q_S$ :

$$100 - 2P^C = 3P^S$$

Now replace  $P^C$  by  $P^S + 2$  (or  $P^S$  by  $P^C - 2$ , it doesn't matter):

$$100 - 2(P^S + 2) = 3P^S$$

$$100 - 2P^S - 4 = 3P^S$$

$$96 = 5P^S$$

$$P^{S*} = \frac{96}{5} = 19.2$$

and thus:

$$P^{C*} = \frac{96}{5} + 2 = \frac{106}{5} = 21.2$$

The equilibrium quantity is, then:

$$Q^* = 3P^S = 3 \times \frac{96}{5} = 57.6$$

We see, thus, that with taxes the quantity reduces from 60 to 57.6, the price to consumers rises from 20 to 21.2 and the price received by producers falls from 20 to 19.2.

Total tax revenue is of  $57.6 \times 2 = \$115.20$ . The money may be sent to the government by the consumer (if consumers are taxed) or by the producers (if producers are taxed), but the burden of the tax is shared among them. How so? If compared to the original equilibrium in which there were no taxes, consumers payed \$20.00 per unit, while now \$21.20. Since they purchase a total of 57.6 units, consumers are paying  $\$1.2 \times 57.6$ , or \$69.12 of those taxes, or 60% of them. The firms are paying the rest.