

These notes essentially correspond to chapter 9 of the text.

1 Applying the Competitive Model

The focus of this chapter is welfare economics. Note that "welfare" has a much different meaning in economics than it does in everyday language. People regularly use the term "welfare" to refer to government aid programs, particularly government aid programs for low income individuals. In economics, the term "welfare" is used to measure how much society, or particular parts of society, gains in a market.

2 Consumer welfare

Earlier in the course we discussed the concept of utility and described consumers as utility maximizers. Ideally, we would measure welfare in terms of utility gains and losses for the consumer. However, utility functions are generally not known, so it is difficult, if not impossible, to measure welfare in terms of utility. Rather than utility we measure welfare using dollars, because dollars are the standard monetary unit.

Begin with a basic example of one consumer purchasing a good. Perhaps the consumer pays \$25 for a sweater. The consumer should value the sweater at more than \$25 (at least at the time of purchase that should be true). Suppose the consumer values the sweater at \$40. Then the consumer has some surplus value for the sweater beyond the price paid. We call that surplus the "consumer surplus." For an individual consumer purchasing an individual unit of a good, the consumer surplus is simply the difference between the value the consumer places on that unit of the good and the price paid. In this example, consumer surplus is \$15 for the sweater. Any time someone buys a good and thinks "I would gladly have paid \$Z for it but am so happy I only had to pay \$X for it," that someone has had consumer surplus (specifically $Z - X$ in this example).

We can move from a one consumer, one unit of a good example to a one consumer, multiple units of a good example. Recall that the "value" of a unit of a good for a consumer is really just a point on the consumer's demand curve. So generalizing from one unit to many units for the consumer means creating the consumer's demand curve. Look at Figure 1. In this figure, the price is the blue line at \$2. The consumer will buy 4 units at that price.¹ The consumer receives no surplus from the 4th unit, \$1 in surplus from the 3rd unit, \$2 in surplus from the 2nd unit, and \$3 in surplus from the 1st unit. In sum, the consumer receives \$6 in total consumer surplus when the price of this good is \$2.

We can extend the analysis to a demand curve that is smooth, and not stepwise. Figure 2 shows a comparison between consumer surplus (CS) and expenditures under curved and linear demand curves. We can either view these demand curves as an individual demand curve or a market demand curve. Note that expenditures are represented by the same rectangle in both pictures because expenditures are the product of price and quantity, $p_1 * q_1$. Consumer surplus varies though. In the picture with the linear demand curve it is a triangle and calculating the value of consumer surplus is easy enough using geometry (use q_1 as the base of the triangle, the difference between where the demand curve intersects the price axis and p_1 as the height, and multiply by $\frac{1}{2}$). Finding the value of consumer surplus for the picture with the curved demand curve is a little more challenging – we would need to know the function for the demand curve, and then take the integral of that function from 0 to q_1 , and then subtract off the expenditures. Technically, we can use integration for both pictures, but calculating the area of the triangle works just fine for the picture on the right. The interpretation as an individual's consumer surplus or the consumer surplus from the market depends on the context.

Suppose there are two demand curves, A and B, both of which (initially) have the same equilibrium price and quantity. The demand curves have different elasticities – one is relatively inelastic, and the other is relatively elastic. We can show that the reduction in consumer surplus is larger (in total dollars) for the demand curve that is relatively inelastic.

¹The consumer purchases the 4th unit, which it values exactly at \$2, because the additional unit of the good is worth exactly as much as the price.

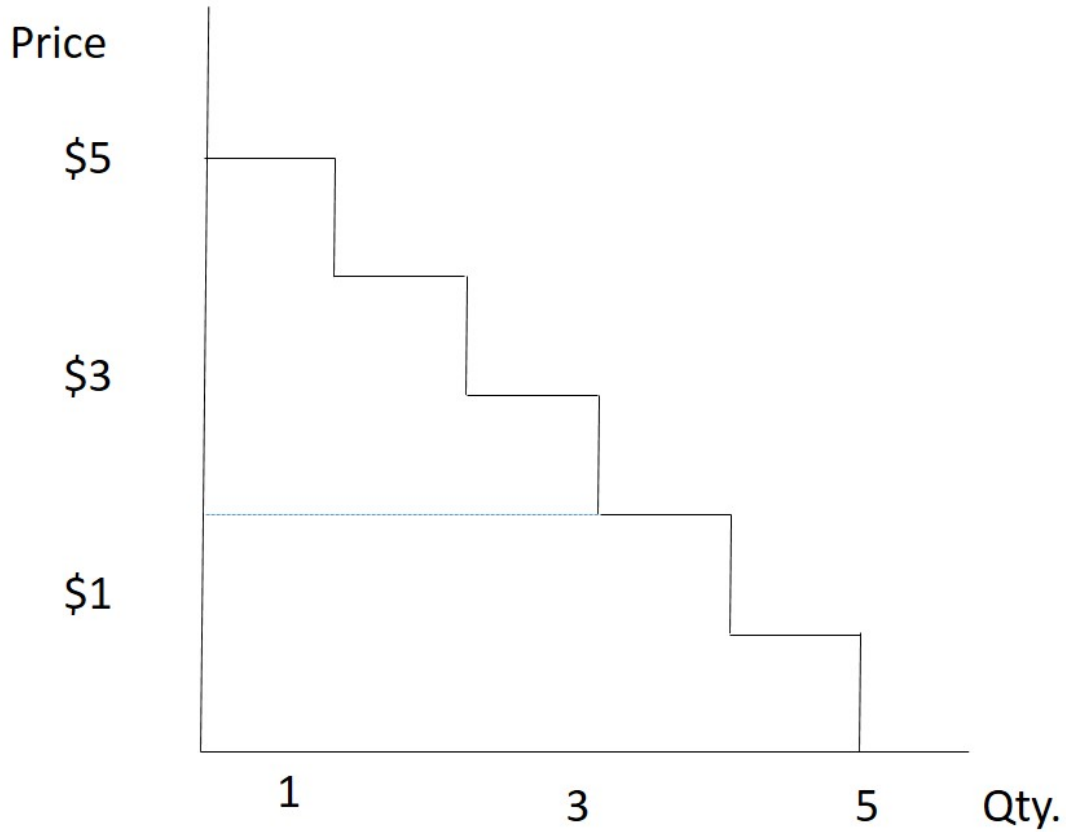


Figure 1: A stepwise demand function for a consumer. At \$5 the consumer is not willing to buy any units. As the price decreases by \$1, the consumer buys one more unit, "purchasing" a maximum of 5 units when the price is zero.

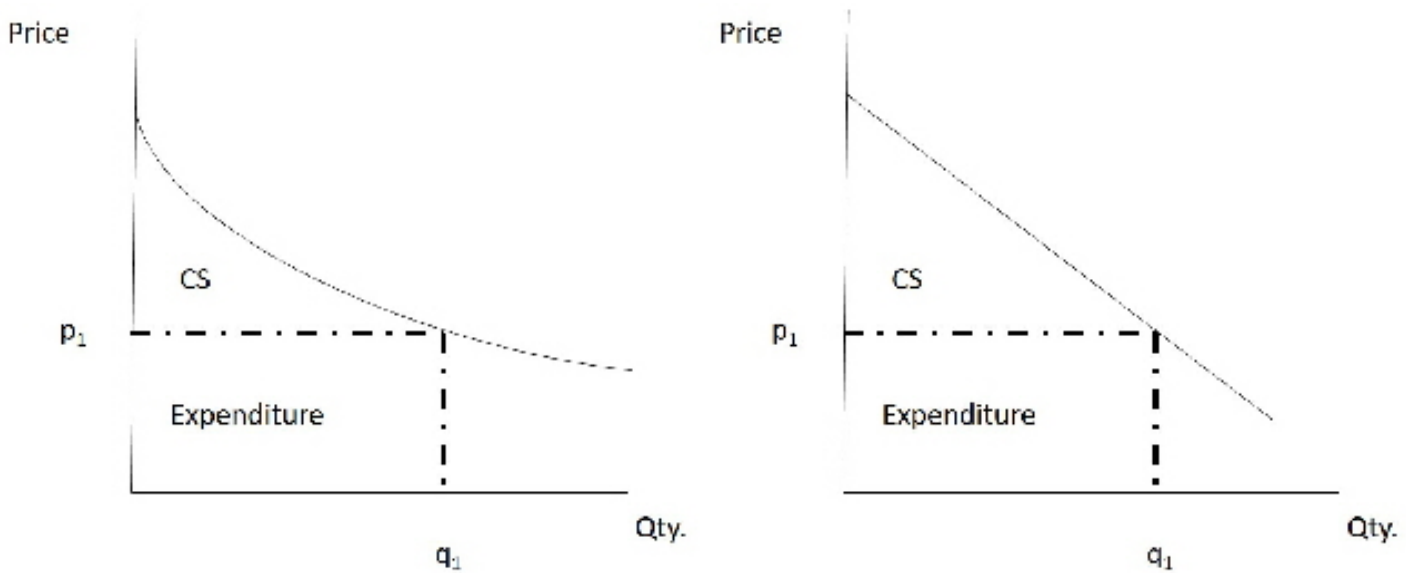


Figure 2: Consumer surplus and expenditures with a curved demand curve and a linear demand curve.

3 Producer welfare

It might seem like "producer welfare" would be equivalent to "profit" but it is not. When considering consumer surplus, we looked at the marginal benefit to the consumer and subtracted the marginal cost to the consumer (the price of the item). For producers we will do the same thing, only now we "reverse" the cost and benefit. The benefit to the producer is the price paid for the unit, while the cost is the firm's marginal cost. And therein lies the difference between "profit" and "producer surplus." Recall that when we calculate profit we are subtracting total costs, which include fixed costs. But marginal costs do not include fixed costs, thus there will be a difference between producer surplus and profit.

I am not going to reproduce the producer figures – they are just the flip side of the consumer figures, only now subtracting the marginal cost of the unit from the price, and summing those differences to find producer surplus.

4 Competitive markets and welfare

While very few markets are truly competitive, we can use the perfectly competitive market outcomes as a benchmark with which to measure outcomes in other market structures. In particular, when we discuss monopoly, we will compare social welfare under monopoly to social welfare under perfect competition. But first, how to measure social welfare?

In an economy there are consumers and producers. As previously discussed, consumers receive consumer surplus, CS , from purchasing goods, and producers receive producer surplus, PS , from selling goods. One method by which to measure society's welfare (W) is to sum up those two: $W = CS + PS$. We are abstracting a little from reality. This calculation of welfare assumes that the only people who benefit from the transaction, or the only ones to pay a cost, are the buyer and seller. There are of course goods that can be purchased that have effects on individuals who are external to the market transaction, but for now consider a good that only provides utility to the consumer and only the consumer pays a cost associated with the good.²

Consider Figure 3 which shows a market in equilibrium. The consumer surplus and producer surplus are labeled in the figure, and $W = CS + PS$. Note that the market equilibrium point maximizes W . If society were to produce *more* than q_1 , then in order to sell those units, at p_1 producers would be selling them at a loss and consumers would need be buying them at a price above their value for the unit. If society were to produce *less* than q_1 , then there are units that the producers could make and sell at price p_1 and make a profit, and there are consumers willing to buy those units at price p_1 , so there are beneficial trades that could be made. Thus, producing less than q_1 will lead to a lower W than producing q_1 .

Note that $W = CS + PS$. At times students will ask "But what if the firm could pick and choose who it sold which item to? Couldn't we increase welfare by selling more units, just ensuring that no one purchased or sold a good at a loss?" Consider Figure 4. In this figure, suppose that the firm sold the very first unit it made, which has zero marginal cost, to the person who valued the unit at zero. It then sold the next unit to the person who had a value exactly equal to its cost. When it gets to the unit with a marginal cost of p_M , it sells that unit to the person with a value of p_M . The person who has the highest value, p_H , would buy the very last unit the firm produced at a marginal cost of p_H . If the firm followed that plan, then everyone who wanted a good would get a good, and no one would pay a price above their value or sell a unit below its cost.

There are two problems with that approach. The first is practical - how does the firm know that the person who buys the first (lowest marginal cost) unit has the lowest value? It is very difficult to know that, and I am sure if the firm asked the person who had a value of p_H "What is your value?" then the person with value p_H would say "My value is zero - please give me the good for free!" The second issue is mathematical. Under this approach, each consumer pays exactly what the good is worth to him or her, and the firm sells the good for exactly the marginal cost of the unit. Thus, there is no CS nor is there any PS under that

²Consider the purchase of a car. The consumer receives the benefit of the car and pays the costs associated with purchasing the car and (over time) maintaining the car. The producer receives the benefit of the sales price of the car but incurs the cost of producing the car. However, cars emit exhaust, which can have an effect on individuals who were not part of the transaction. These individuals are ignored here, but economists have studied transactions of this type. We may not cover it, but there should be a chapter on market failures and externalities.

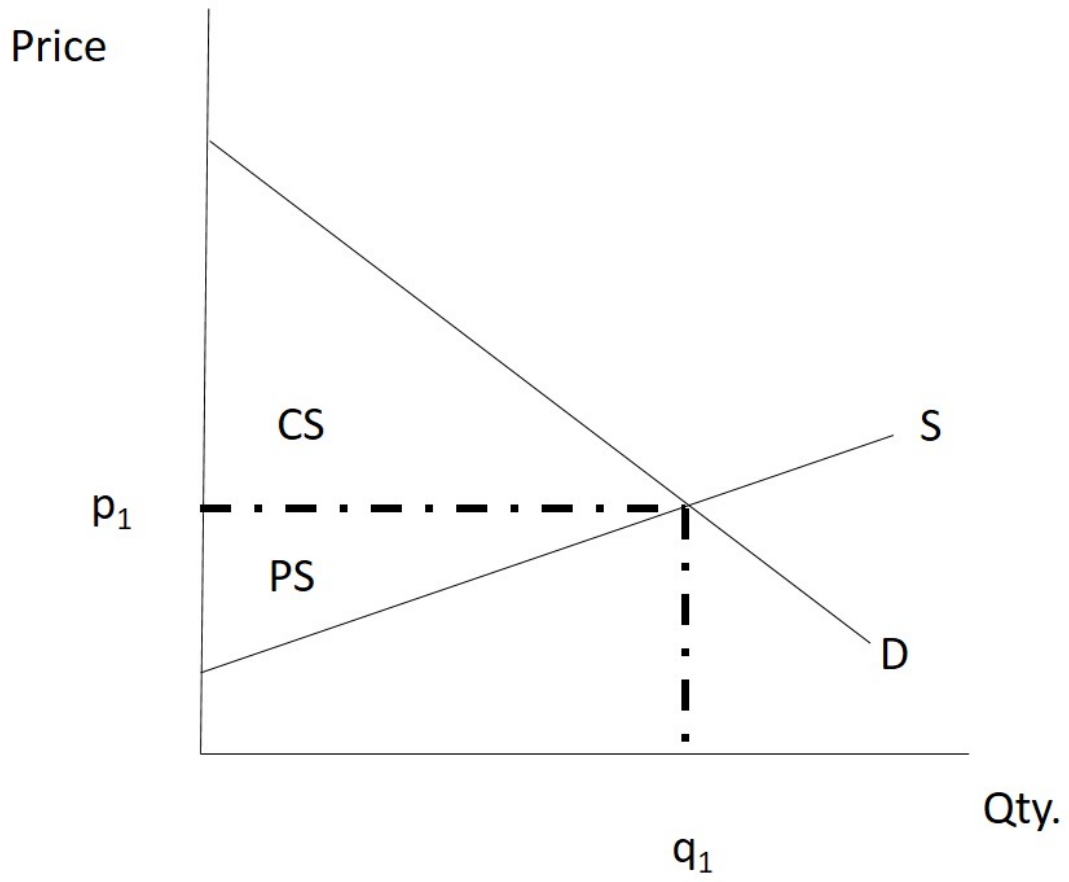


Figure 3: A market in equilibrium.

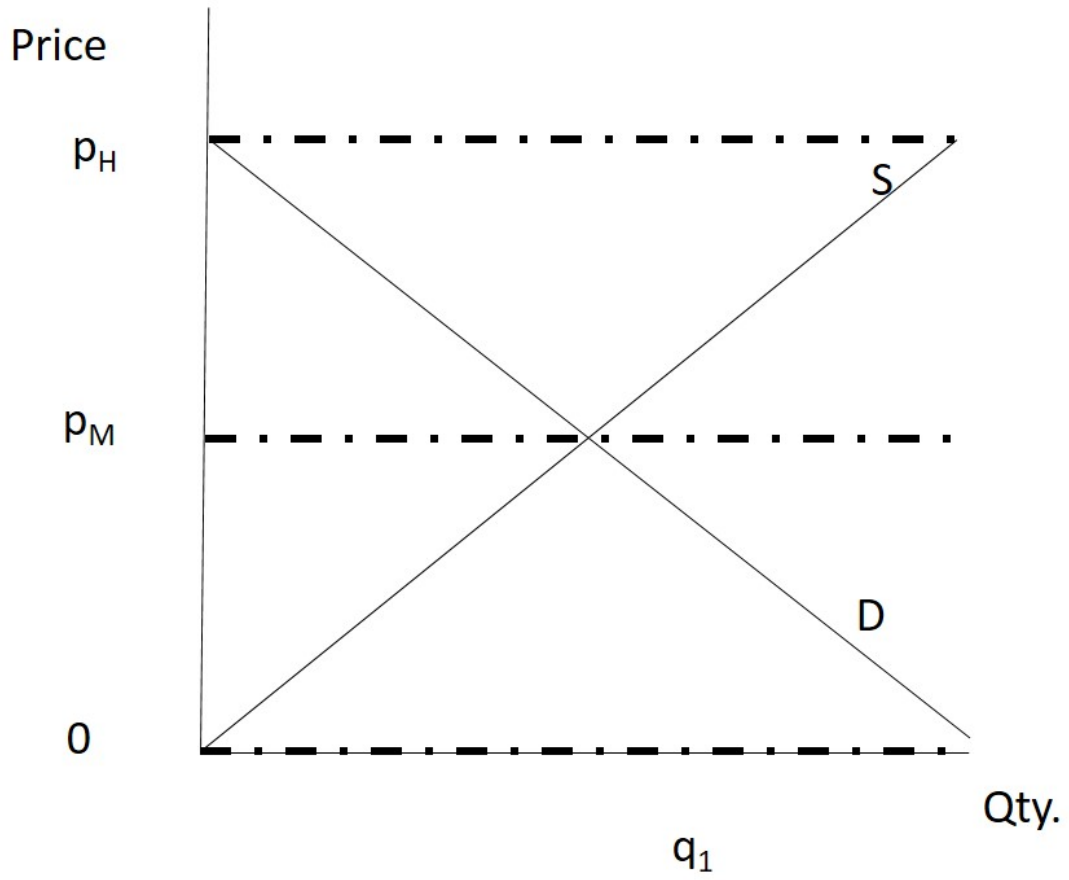


Figure 4: A general market. The firm in this market is selling each unit at marginal cost to the consumer who exactly values that unit at that marginal cost.

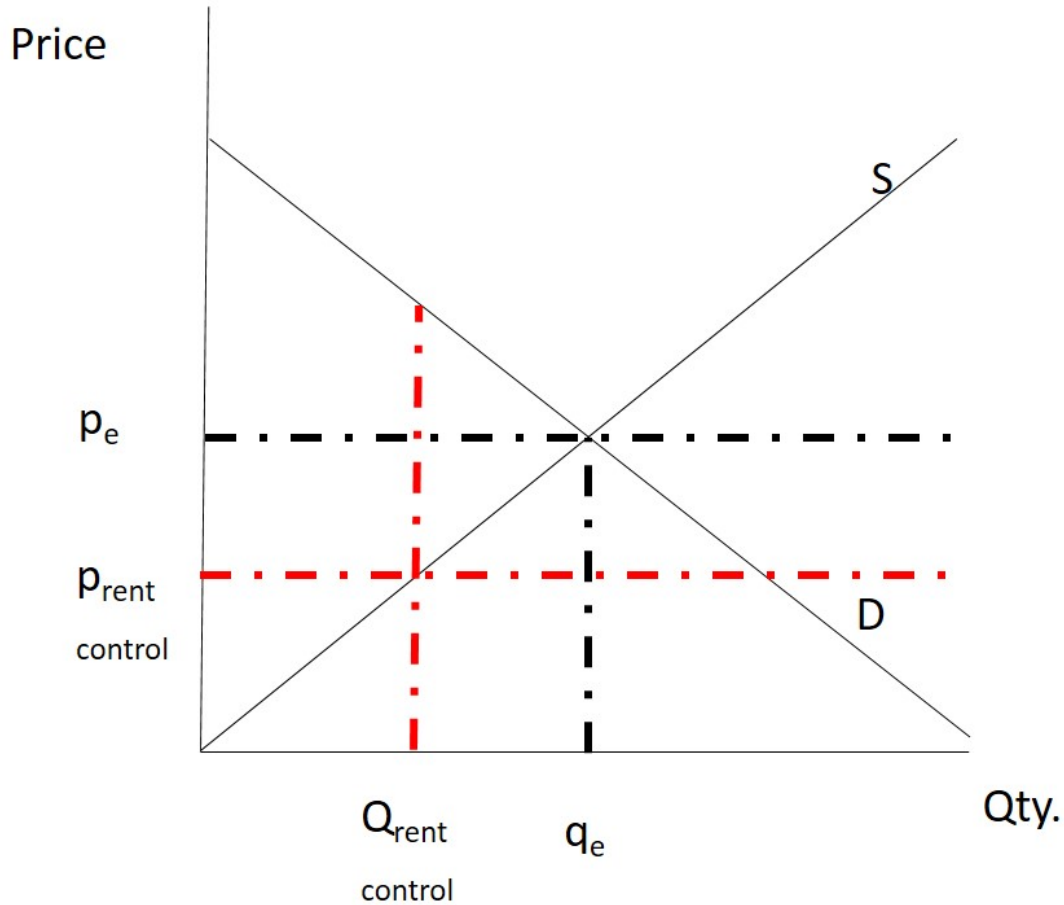


Figure 5: Analysis of a market with rent control.

plan, so $W = 0$! If we just let the market set price at p_M , and had those with a value greater than or equal to p_M purchase the good, and those producers with a marginal cost less than or equal to p_M sell the good, then $W > 0$. That approach of selling to each consumer the unit that has a cost equal to his or her value will maximize the quantity sold, but not welfare as we have defined it. While the firm would really like to know each person's value, they would not follow the system described above. They would sell the first unit to the person with the highest value at p_H , thus extracting all of the surplus from that unit. We will discuss pricing of that type later.

4.1 Reasons markets do not reach maximum social welfare

There are any number of reasons markets do not reach maximum social welfare. Most of these reasons involve some type of restriction in the market. One obvious restriction is a quota. If the equilibrium quantity is q_1 , and there is a sales quota (or an import quota, assuming the good is only produced outside the country) of $q_Q < q_1$, then from the earlier discussion we can see that the market will not maximize social welfare.

A price control is another restriction which does not allow the competitive market to reach optimal social welfare. When rent control is imposed on an area, the market price is set below the equilibrium price, as in Figure 5. As we have seen earlier, the market equilibrium maximizes social welfare. However, when the price is set at $p_{rentcontrol}$, the quantity of the good provided is much lower than market equilibrium. Thus, rent control has a similar effect to imposing a quota. However, the welfare effects could be worse under

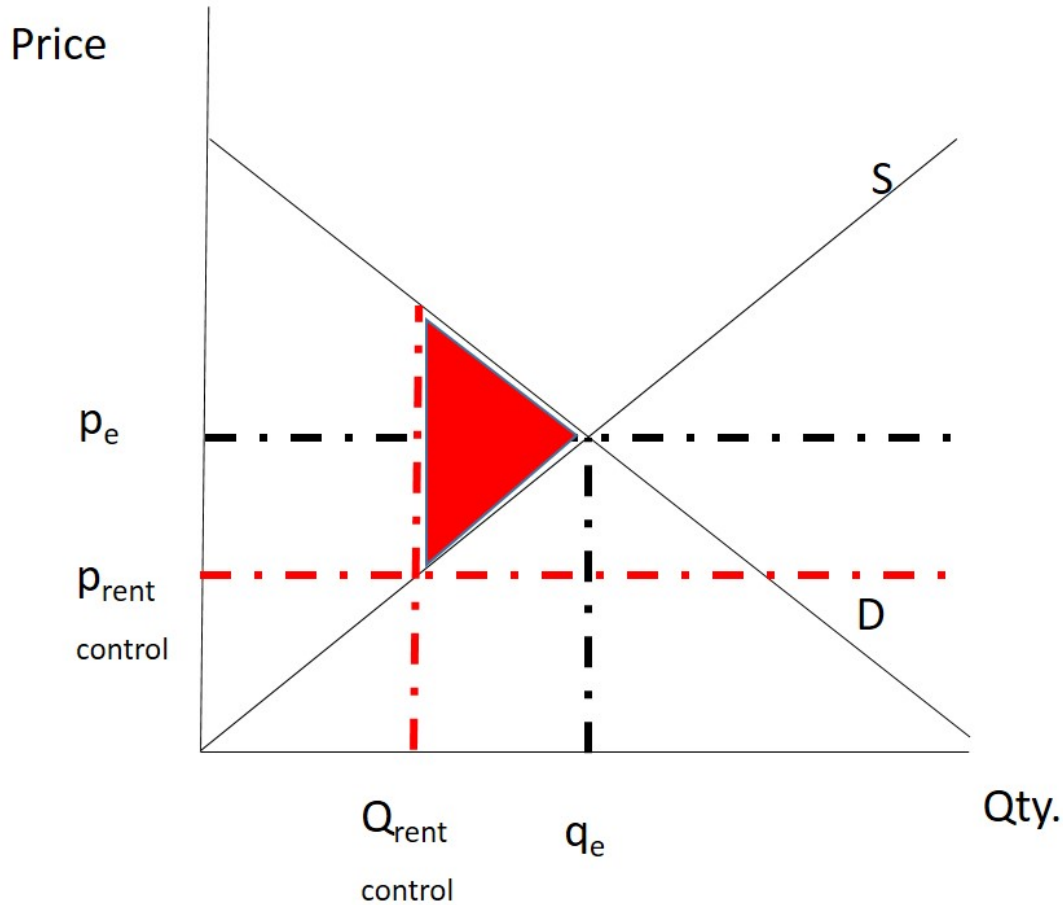


Figure 6: Deadweight loss in this market is illustrated by the red triangle.

a rent control system than under a quota. With a quota (suppose at $Q_{rentcontrol}$) price would be able to adjust to be higher than p_e because there is no restriction on price. Thus, the highest valued users of the good should be the ones who purchase the good because they are the ones who would be willing to pay for it. However, because price is fixed with rent control there is no guarantee that the person who values the unit the most will get the good. Looking at the demand curve, there are many more people who are willing to purchase the good at $p_{rentcontrol}$ than there are units that will be rented. Thus, a low valued user could rent the apartment at the low price, leaving a high valued user without the item. The trapezoid area between $p_{rentcontrol}$, $Q_{rentcontrol}$, and the demand curve is the maximum amount of welfare (W) that could be achieved – it could be much lower if low valued users obtain the good.

Taxes are another policy that can impact welfare. Taxes increase the supply of or demand for the good, depending upon which part of the market the tax is levied. We have discussed analysis of a tax earlier, and discussed the concept of deadweight loss. In all of these markets (quotas, price controls, and taxes), deadweight loss exists. Figure 6 illustrates the deadweight loss in this market with the red triangle. It is the area between the supply and demand curves for the quantities between the equilibrium quantity (q_e) and the quantity traded in the market ($Q_{rentcontrol}$). For linear demand curves it is the triangle with "height" equal to the difference in quantities and "base" equal to the difference in the price consumers are willing to pay at the restricted quantity and the price at which the producers are willing to sell at the restricted quantity.

When we discussed taxes we mentioned that taxes were one method that could shift the supply curve. However, not all reasons for supply curve shifts imply deadweight loss in the market. If resource costs

increase, then that truly changes the underlying production cost of the good and there is no deadweight loss. Also, as discussed above, competitive markets can be operating at market equilibrium but if there are third parties that are affected by the transactions (either positively or negatively), then there will be efficiency loss in the market. But that is a different discussion to have.