

## Chapter 6

### Consumer Surplus and Welfare

In partial equilibrium analysis, it is common to introduce the concept of consumer surplus.<sup>1</sup> This is done to show the approximate effects on consumer wellbeing following a change in price of a good that all consumers pay – the market price. The original idea of a consumer enjoying a surplus over the market price paid for a good was first discussed by a French engineer named Dupuit. It was later fleshed out by English economist Alfred Marshall of Cambridge University around the turn of the 19<sup>th</sup> century. It is now a common tool among economists, but there remain some people who feel the measure is too imprecise to use as a good indicator of changes in consumer welfare for all cases. I tend to agree with this, but it is still a remarkably handy and persuasive tool.

The intuition behind consumer surplus is strong and immediate. We all have experienced the situation where the market price of a product is lower than what we would be willing to pay *given an all-or-nothing choice*. We buy 5 items of good X at the store for \$10 paying \$50 in total, but before this happened we would have been prepared to pay \$12 for the lot, totaling \$60. That \$10 difference is what economists call consumer surplus. Of course, the \$10 is spent on other products or is save, but you nevertheless feel a sense of utility for getting such a “great deal”. The utility you feel from the *extra goods* you can buy (or the future goods you can buy with your extra saving) is precisely the value in utility terms of the consumer surplus.

The notion of consumer surplus can be made clearer still through the use of a demand curve. As is shown in Figure 1 below, at price  $P_o$ , the black triangle represents all the money gained by paying the market price and not paying out what one would be willing to spend *when given an all-or-nothing choice for  $Q_o$* . It is not hard to construct all-or-nothing demand curves using the usual Marshallian demand curves. I will show you how to do it in class. These types of demand curves show what one would be willing and able to pay per unit for any total quantity of the good offered on a take it or leave it basis.

Consumer surplus is sometimes used to show the impact on the welfare of a representative consumer when a price changes. Stop and ask yourself how the typical consumer would feel if the price of beef fell by 20%. Clearly they would be happier. This additional satisfaction is closely related (but not exactly) to changes in the black triangle in Figure 1. Often economic analysis uses consumer surplus to approximate the impact of a policy on prices and thus consumer welfare. This is possible if the market is not too big and important and the price change is not too large.

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<sup>1</sup> Partial equilibrium analysis is the study of a single market without concern for the interaction of other markets. Some markets are relatively small and therefore do not impact other markets much on their own. Think of the market for mustard. Changes in conditions in the mustard market will not be expected to affect the national income or the overall price level. It is true that the macroeconomy can affect the smaller market, but not *vice versa*. This lets us hold conditions constant in the macroeconomy and ignore the impact of changes in the small market on other markets. Thus, partial equilibrium analysis is a quick and easy way of trying to study *small* markets. If we consider the interaction of all markets together, we have general equilibrium analysis, a much more complicated subject.

To make things a little clearer, suppose that we have a demand function given by

$$Q^d = 100 - 4P$$

Now, let's compute consumer surplus when the price is \$10 and again when the price changes to \$8. We can then compute the change in consumer surplus when the price falls and we can see how welfare changes (approximately).

**Figure 1 - The Measurement of Consumer Surplus**

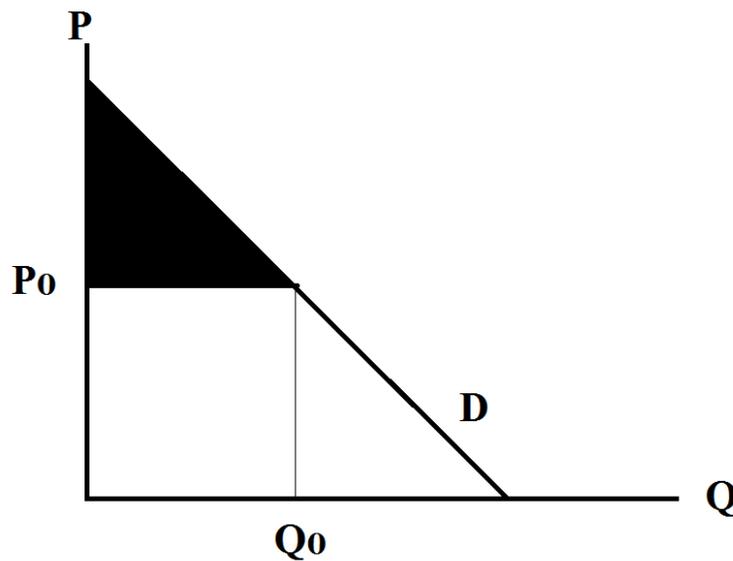


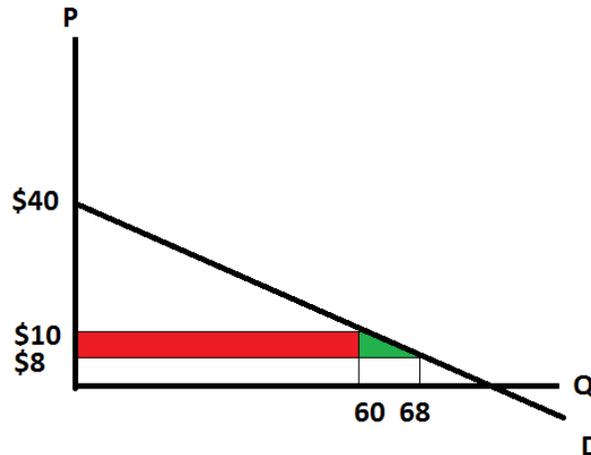
Figure 2 below can be helpful to us in understanding this.

At a price of \$10, the consumer surplus triangle has area equal to  $A_1 = (\$60)(30)/2 = \$900$  while at a price of \$8 the consumer surplus triangle enlarges and become  $A_2 = (\$68)(32)/2 = \$1088$ . Thus, *the change in consumer surplus* in this case is  $\Delta A = A_2 - A_1 = \$1088 - \$900 = \$188$ . In purely monetary terms, we would say that consumer satisfaction has gone up by \$188. To get the utility of this "extra" \$188 we would need to convert this extra money into extra utility. This can be done of course, but it is technically difficult to show this precisely using mathematics.

Figure 2 also lets us breakdown the increase in consumer surplus into two parts. These two parts are shown in red and green. The red part shows the reduce expenditure to buy the same quantity of goods as before but at a lower price. This is just the income we save by not having to pay so much for the original 60 units of the goods. The green part, although smaller in this case, is more interesting. It shows how that the reduction in price allows substitution and income effects to increase the quantity demanded to 68 and these additional 8 units create greater utility for the consumer. The reduced price allows the consumer to buy the same bundle of goods as before, but

now he or she will have *additional* purchasing power that can be spread over ALL goods and services. Across the whole range of goods, some goods will have increased quantities demanded and some goods will have reduced quantities demanded.

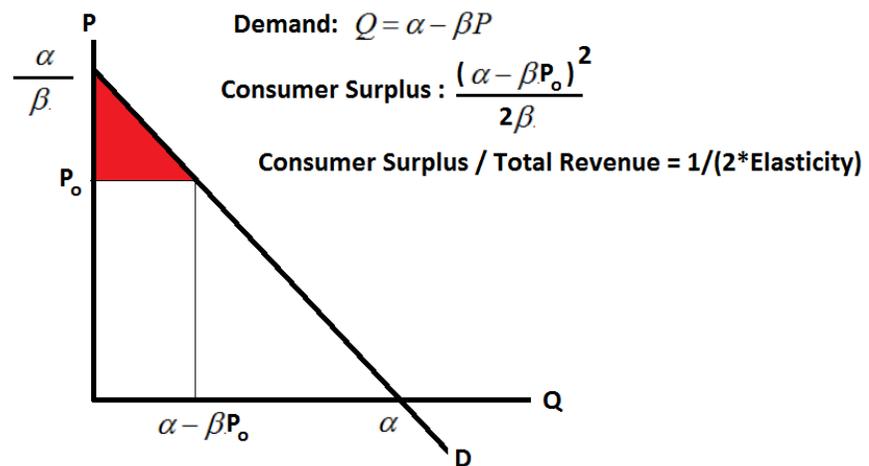
**Figure 2 - Changes in Consumer Surplus**



Consumer surplus can be related to point price elasticity. Let's see how this works.

Consider Figure 3 below. We normalize consumer surplus by dividing by Total Revenue = PQ.

**Figure 3 - Consumer Surplus and Elasticity**



This results in a ratio  $(CS/TR) = 1/2\epsilon$ . Thus, a higher point price demand elasticity is associated with a lower ratio of consumer surplus to total revenue at that price, at least for linear demands. As price rises, elasticity increases and therefore, for linear demands, the ratio of consumer surplus to total revenue falls.

Our analysis of consumer surplus and elasticity shows that the variables that affect elasticity must also affect consumer surplus, assuming linear demands. Therefore, the usual factors such as the number of substitutes, the impact of changes in income, the passage of time, etc. can all be expected to affect consumer surplus, just as they affect point price elasticity.

An interesting question is whether firms selling products to consumers are interested in the level of consumer surplus enjoyed by households. For monopolies, elasticity is an important factor in determining the price of a good to be sold, but this is also true for monopolistically competitive firms. If elasticity is important, then consumer surplus must also be important. The question that is interesting is whether firms might lower their prices in order to win the dedication of consumers to their products. By lowering prices, firms increase the level of consumer surplus enjoyed by households and this may reduce the risk such households go looking for other products to buy. In other words, firms may be able to reduce their sales risk by lowering their prices and winning the support of households. This is especially true of small firms that may experience a tradeoff of profits for lower sales risk<sup>2</sup>.

Questions:

- #1. What is consumer surplus?
- #2. How do we measure consumer surplus?
- #3. What happens to consumer surplus as we lower price with a linear demand?
- #4. What happens to consumer surplus as a linear demand increases (shifts rightward)?
- #5. What factors affect the level of consumer surplus at any particular price?
- #6. Why do we say that an increase of consumer surplus will be spent on other goods or saving?
- #7. For linear demands, what is the relation of normalized consumer surplus and elasticity?
- #8. Why might a firm decide to lower its prices below what would maximize profits?

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<sup>2</sup> For linear demands, if consumer surplus/total revenue reflects the commitment to buy a product at a particular price, then elasticity will vary directly with this commitment. Moreover, it is reasonable to think that this commitment should be closely and inversely related to the risk a consumer will go looking for substitutes. Hence, elasticity will be a good direct measure of the sales risk at any price. A low elasticity will be associated with a low sales risk and a high elasticity will be associated with a high sales risk, at any particular price. It follows that firms *may* decide to reduce their sales risk by lowering prices, lowering profits, reducing elasticity, and increasing the level of consumer surplus enjoyed by the household. Less risk becomes associated with less profit – just as we would expect.