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Evaluating the gains and losses from government policies- consumer and producer surplus

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Annotation: This article is devoted to how consumer and producer surplus can be used to study the *welfare effects* of a government policy—in other words, who gains and who loses from the policy, and by how much.
We also use consumer and producer surplus to demonstrate the *efficiency* of a competitive market—why the equilibrium price and quantity in a competitive market maximizes the aggregate economic welfare of producers and consumers. The consumer surplus refers to the difference between what a consumer is willing to pay and what they paid for a product. The producer surplus is the difference between the market price and the lowest price a producer is willing to accept to produce a good.
Key words: welfare effects, efficiency, producer surplus, consumer surplus, competitive market, deadweight loss.

Introduction

In an unregulated, competitive market, consumers and producers buy and sell at the prevailing market price. But remember, for some consumers the value of the good *exceeds* this market price; they would pay more for the good if they had to. *Consumer surplus* is the total benefit or value that consumers receive beyond what they pay for the good.
For example, suppose the market price is $5 per unit, as in Figure 9.1. Some consumers probably value this good very highly and would pay much more than $5 for it. Consumer *A*, for example, would pay up to $10 for the good. However, because the market price is only $5, he enjoys a net benefit of $5—the $10 value he places on the good, less the $5 he must pay to obtain it. Consumer *B* values the good somewhat less highly. She would be willing to pay $7, and thus enjoys a $2 net benefit. Finally, Consumer *C* values the good at exactly the market price, $5. He is indifferent between buying or not buying the good, and if the market price were one cent higher, he would forgo the purchase.
Consumer *C*, therefore, obtains no net benefit.1
For consumers in the aggregate, consumer surplus is the area between the demand curve and the market price (i.e., the yellow-shaded area in Figure 9.1). Because *consumer surplus measures the total net benefit to consumers*, we can measure the gain or loss to consumers from a government intervention by measuring the resulting change in consumer surplus.
Producer surplus is the analogous measure for producers. Some producers are producing units at a cost just equal to the market price. Other units, however, could be produced for less than the market price and would still be produced

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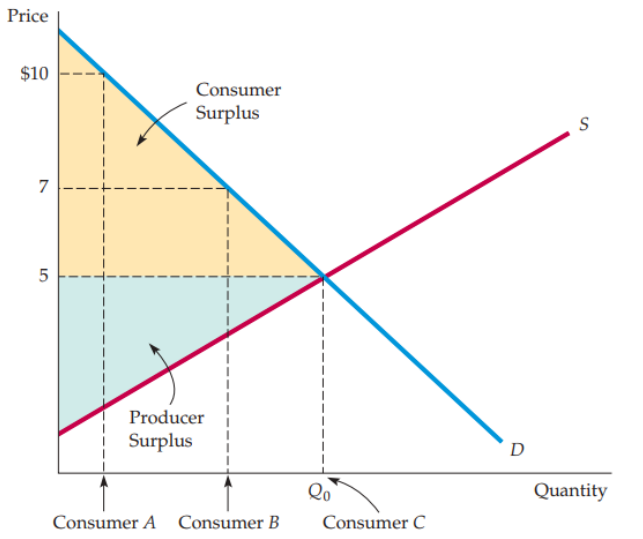
and sold even if the market price were lower. Producers, therefore, enjoy a benefit—a surplus—from selling those units. For each unit, this surplus is the difference between the market price the producer receives and the marginal cost of producing this unit.

For the market as a whole, producer surplus is the area above the supply curve up to the market price; this is *the benefit that lower-cost producers enjoy by selling at the market price.* In Figure 9.1, it is the green triangle. And because producer surplus measures the total net benefit to producers, we can measure the gain or loss to producers from a government intervention by measuring the resulting change in producer surplus.

FIGURE 9.1
CONSUMER AND PRODUCER SURPLUS

Consumer *A* would pay $10 for a good whose market price is $5 and therefore enjoys a benefit of $5. Consumer *B* enjoys a benefit of $2, and Consumer *C*, who values the good at exactly the market price, enjoys no benefit. Consumer surplus, which measures the total benefit to all consumers, is the yellow-shaded area between the demand curve and the market price. Producer surplus measures the total profits of producers, plus rents to factor inputs. It is the green-shaded area between the supply curve and the market price. Together, consumer and producer surplus measure the welfare benefit of a competitive market.



Application of consumer and producer surplus

With consumer and producer surplus, we can evaluate the *welfare effects* of a government intervention in the market. We can determine who gains and who loses from the intervention, and by how much. To see how this is done, let's return to the example of *price controls* that we first encountered toward the end of Chapter 2. The government makes it illegal for producers to charge more than a *ceiling price* set below the market-clearing level. Recall that by decreasing production and increasing the quantity demanded, such a price ceiling creates a shortage (excess demand).

Figure 9.2 replicates Figure 2.24 (page 80), except that it also shows the changes in consumer and producer surplus that result from the government price-control policy. Let's go through these changes step by step.

1. Change in Consumer Surplus: Some consumers are worse off as a result of the policy, and others are better off. The ones who are worse off are those who have been rationed out of the market because of the reduction in production and sales from *Q*0 to *Q*1. Other consumers, however, can still

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purchase the good (perhaps because they are in the right place at the right time or are willing to wait in line). These consumers are better off because they can buy the good at a lower price (*P*max rather than *P*0). *How much* better off or worse off is each group? The consumers who can still buy the good enjoy an *increase* in consumer surplus, which is given by the blue-shaded rectangle *A*. This rectangle measures the reduction of price in each unit times the number of units consumers are able to buy at the lower price. On the other hand, those consumers who can no longer buy the good lose surplus; their *loss* is given by the green-shaded triangle *B*.
This triangle measures the value to consumers, less what they would have had to pay, that is lost because of the reduction in output from *Q*0 to *Q*1. The net change in consumer surplus is therefore *A* - *B*. In Figure 9.2, because rectangle *A* is larger than triangle *B*, we know that the net change in consumer surplus is positive.
It is important to stress that we have assumed that those consumers who are able to buy the good are the ones who value it most highly. If that were not the case—e.g., if the output *Q*1 were rationed randomly—the amount of lost consumer surplus would be larger than triangle *B*. In many cases, there is no reason to expect that those consumers who value the good most highly will be the ones who are able to buy it. As a result, the loss of consumer surplus might greatly exceed triangle *B*, making price controls highly inefficient.2
In addition, we have ignored the opportunity costs that arise with rationing. For example, those people who want the good might have to waitin line to obtain it. In that case, the opportunity cost of their time should be included as part of lost consumer surplus.

2. Change in Producer Surplus: With price controls, some producers (those with relatively lower costs) will stay in the market but will receive a lower price for their output, while other producers will leave the market. Both groups will lose producer surplus. Those who remain in the market and produce quantity *Q*1 are now receiving a lower price. They have lost the producer surplus given by rectangle *A*. However, *total* production has also dropped.
The purple-shaded triangle *C* measures the additional loss of producer surplus for those producers who have left the market and those who have stayed in the market but are producing less. Therefore, the total change in producer surplus is -*A* - *C*. Producers clearly lose as a result of price controls.

3. Deadweight Loss: Is the loss to producers from price controls offsetby the gain to consumers? No. As Figure 9.2 shows, price controls result in a net loss of total surplus, which we call a **deadweight loss**. Recall that the change in consumer surplus is *A* - *B* and that the change in producer surplus is -*A* - *C*. The *total* change in surplus is therefore (*A* - *B*) + (-*A* - *C*) = -*B* - *C*. We thus have a deadweight loss, which is given by the two triangles *B* and *C* in Figure 9.2. This deadweight loss is an inefficiency caused by price controls; the loss in producer surplus exceeds the gain in consumer surplus.

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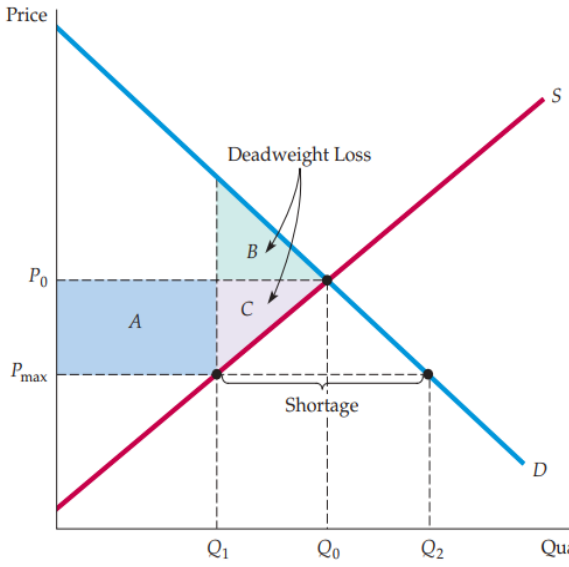
FIGURE 9.2
CHANGE IN CONSUMER AND PRODUCER SURPLUS FROM PRICE CONTROLS

The price of a good has been regulated to be no higher than P_{max}, which is below the market-clearing price P_0. The gain to consumers is the difference between rectangle *A* and triangle *B*. The loss to producers is the sum of rectangle *A* and triangle *C*. Triangles *B* and *C* together measure the deadweight loss from price controls.



Consumer and producer surplus are important concepts in economics because they shed light on the advantages and disadvantages of market transactions. They are crucial instruments for comprehending and analyzing economic behaviour and outcomes because they assist the assessment of consumer welfare, producer profitability, market efficiency, and the effects of policy actions. In each case, consumer and producer surplus are used to evaluate the gains and losses to consumers and producers. Applying the methodology to natural gas price controls, airline regulation, price supports for wheat, and the sugar quota shows that these gains and losses can be quite large.

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