

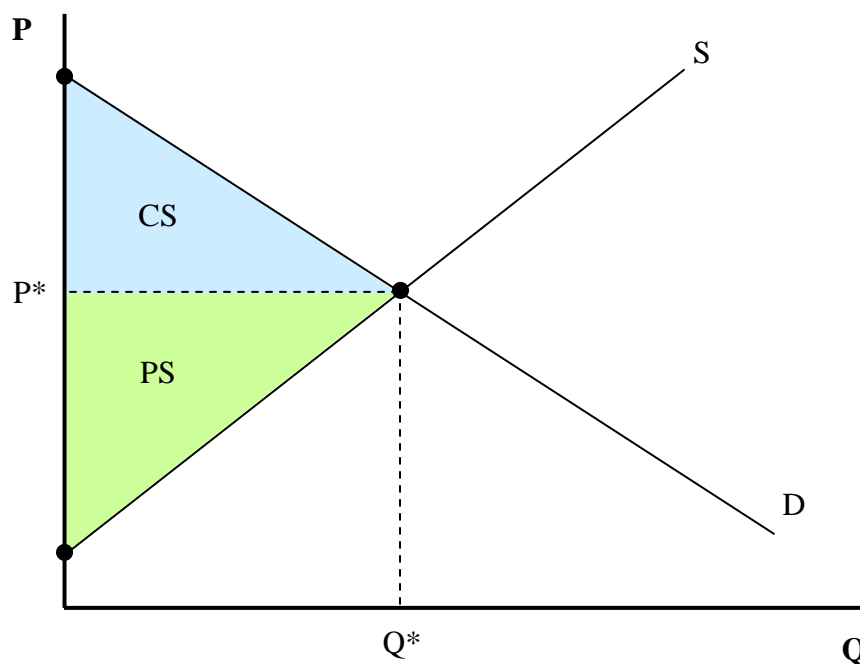
## Net Benefit and Deadweight Loss

Econ 201/Haworth

In the 1970s, when faced with sharp increases in crude oil prices, President Nixon responded to public concerns about high gas prices by imposing a national price ceiling on both crude oil and gasoline sold within the United States. Any gas station setting a price above the ceiling would be charged with fraud.

This handout will analyze the effect of imposing this price ceiling on the gasoline market.

We begin by looking at a graph of demand and supply within a typical gasoline market (below). The demand curve in this market is likely to be relatively steep, but we will assume this is not the case so that we can construct a graph that has the demand curve (and supply curve) hitting the vertical axis on our graph. We'll assume that the supply curve takes on its typical appearance.

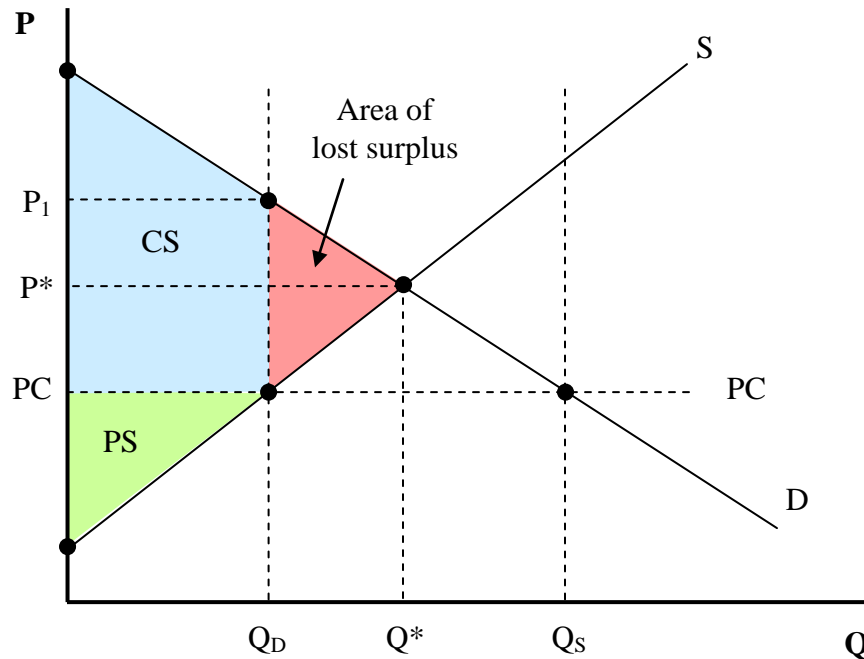


Our graph reveals the areas of net benefit that accrue to demanders (buyers of gasoline) and suppliers (sellers of gasoline), the areas we call Consumer Surplus (CS) and Producer Surplus (PS). CS provides us with an idea of the net benefit accruing to demanders in this market from paying  $P^*$  and buying  $Q^*$  units. Similarly, PS tells us about the net benefit accruing to suppliers from selling  $Q^*$  units at the price  $P^*$ . Of course, we know that the sum of these two areas is Total Surplus (TS), which represents the net benefit of society.

Let's assume that a price control is imposed on gasoline in this example. We'll assume that this price ceiling is below the market price. Note that we could have also imposed a price ceiling at  $P^*$ ,

and then experienced an increase in the demand for gasoline (or decrease in the supply of gasoline, or both), and then end up in the same situation as simply setting the price ceiling below the equilibrium price as we're proposing here.

If a price ceiling is imposed within this market and set below  $P^*$ , then we know that the direct effect is a shortage. That outcome is illustrated below, along with the respective changes in CS and PS.



What do we observe on this graph?

**Consumer Surplus:** there is an increase in CS. Although fewer units are purchased by demanders, it's also true that the price is lower. CS decreases by the area between the original price  $P^*$  and the price identified on the graph as  $P_1$ , below the demand curve, and between  $Q_D$  and  $Q^*$ . This is part of the area we identified as an area of lost surplus. CS increases by the area between  $P^*$  and PC, for all units purchased ( $Q_D$ ). Given that this latter area of increase is greater than the former area of decrease, we know that CS increases overall.

**Producer Surplus:** there is an obvious decrease in PS. We know that when the price falls from  $P^*$  to PC, part of the reduction in PS is the area of increased CS mentioned above. PS is also reduced by the area between  $P^*$  and PC, above the supply curve and between  $Q_D$  and  $Q^*$ .

**Total Surplus:** there is a decrease in TS. TS is reduced by the area we identify as the "area of lost surplus".

What does this analysis reveal? Let's break this down by our areas of net benefit.

**Consumer Surplus:** with CS increasing, demanders are going to be receiving greater net benefit as a result of this price ceiling. This means that demanders are better off. Note that since we have a shortage here, it's appropriate to qualify that statement. The demanders who are able to purchase this good after the price ceiling, those demanders are better off. Demanders who purchased this good before the price ceiling, but who are not able to purchase the good are worse off (note that this is demonstrated by the reduction in CS mentioned above).

**Producer Surplus:** PS decreases, which tells us that suppliers now receive less net benefit, and so the price ceiling has made suppliers worse off.

**Total Surplus:** when there is a reduction in TS, as in this example, we know that society is receiving less net benefit as a result of this price ceiling. Correspondingly, we can argue that society is made worse off by the price ceiling.

What about this reduction of TS identified above as an "area of lost surplus"? When government intervention or market failures prevent a market from setting a price that is the equivalent of what we get with a competitive market, where price is determined by the intersection of demand and supply, we get these areas of lost surplus. Those areas have a name, they are called Deadweight Loss (DWL). DWL is any area of lost surplus, again that arises from situations where government causes the market price to deviate from what would occur when price is set where  $Q_D = Q_S$  (our equilibrium condition for the Demand and Supply model), or when there is a market failure (which we will discuss when we get to the regulation section of this class).

When DWL arises within a market, we can argue that TS must have decreased, and that the cause of the decrease (e.g. in this case a price ceiling) makes society worse off.