Market Interventions in Supply & Demand Frameworks

Consider the following market: $Q_s = P - 2$ and $Q_D = 20 - P$

In equilibrium for a competitive free market, we have $Q_D = Q_s = q^*$ and we have $P_b = P_s = p^*$
because there is one price that all buyers pay and that is the same price that sellers receive.

Solving this system, we obtain $q_0^* = 9$ and $p_0^* = \$11$ as the original unregulated equilibrium outcomes.

Producer surplus = 0.5 [(11-2)* 9]= \$40.5
Consumer surplus = 0.5 [(20-11)* 9]= \$40.5

Now let's consider a \$4 tax <u>at the point of transaction</u>. Mathematically, we still have $Q_s = Q_D$ with a tax or subsidy (a negative tax) but the price that buyers pay equals the price that sellers receive plus the amount of the tax, which goes to the government and not the seller. Mathematically, this is described by $P_b = P_s + t$ with the quantity transacted under taxation still being the same, which we usually write as q_t. Taxes will reduce the market quantity from the original equilibrium quantity and subsidies will increase the market quantity.
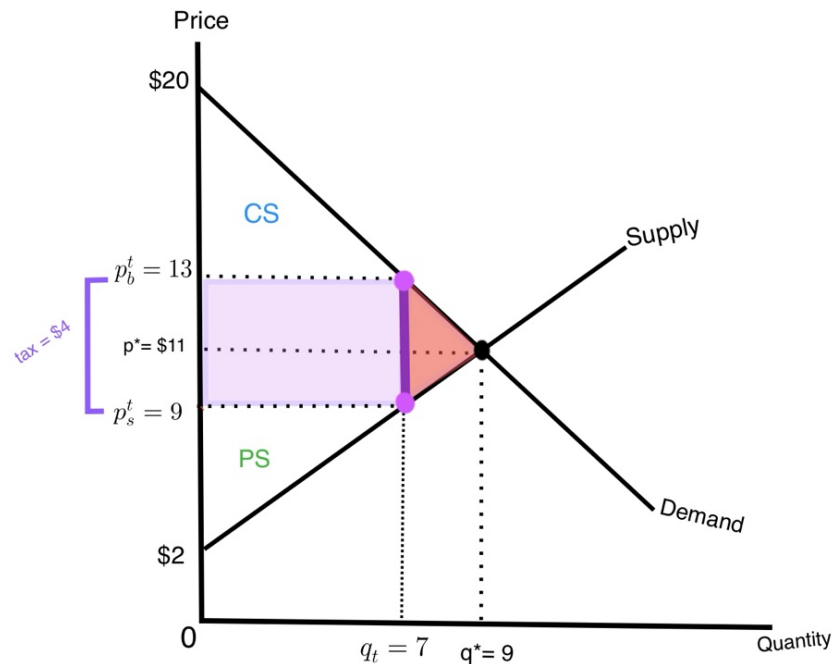
$P_b = 20 - q_D$ and $(P_s) + t = (2 + q_s) + 4$, so setting these equal, we get
$$20 - q_t = q_t + 6$$
$$q_t^* = 7$$
Now if we plug this into our the demand and supply equations for price, we obtain
$$P_b = 20 - q_t = 20 - 7 = \$13$$
$$P_s = q_t + 2 = 7 + 2 = \$9$$

Notice that the \$4 tax is the difference between the price buyers pay and the price sellers receive.
With market quantity now at 7 units and the tax at \$4, we can see the tax revenue is 7* 4 = \$28
and the triangular deadweight loss resulting from the tax is 0.5[(9-7)* (13-9)]= \$4.

Producer surplus with taxation is now 0.5[(9-2)* 7]= \$24.5
Consumer surplus with taxation is now 0.5[(20-13)* 7]= \$24.5

Mathematically, we still have $Q_s = Q_D$ with a tax or subsidy (a negative tax) but $P_b = P_S + t$ so taxes will reduce equilibrium quantity and subsidies will increase equilibrium quantity. Notice that the size of the deadweight loss is always increasing as the tax rate increases, but the amount of tax revenue is not. A really high tax results in a narrow vertical rectangle as shown below: obviously there is an inverse parabolic relationship between total tax revenue and consumption tax rate with an underlying reasoning similar to that of the Laffer curve for income taxes.

High Tax Rate

Larger Deadweight Loss

P_b

P_m

P_s

Low Tax Rate

Smaller Deadweight Loss

P_b

P_m

P_s
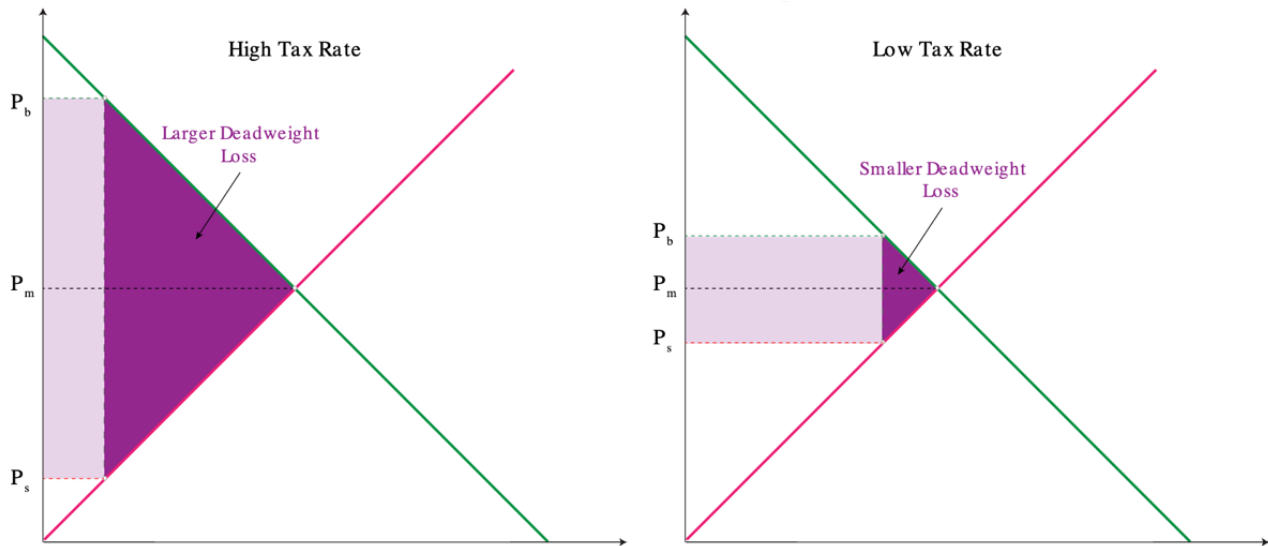
Surplus Reductions & Deadweight Loss depend on tax size & relative elasticities:
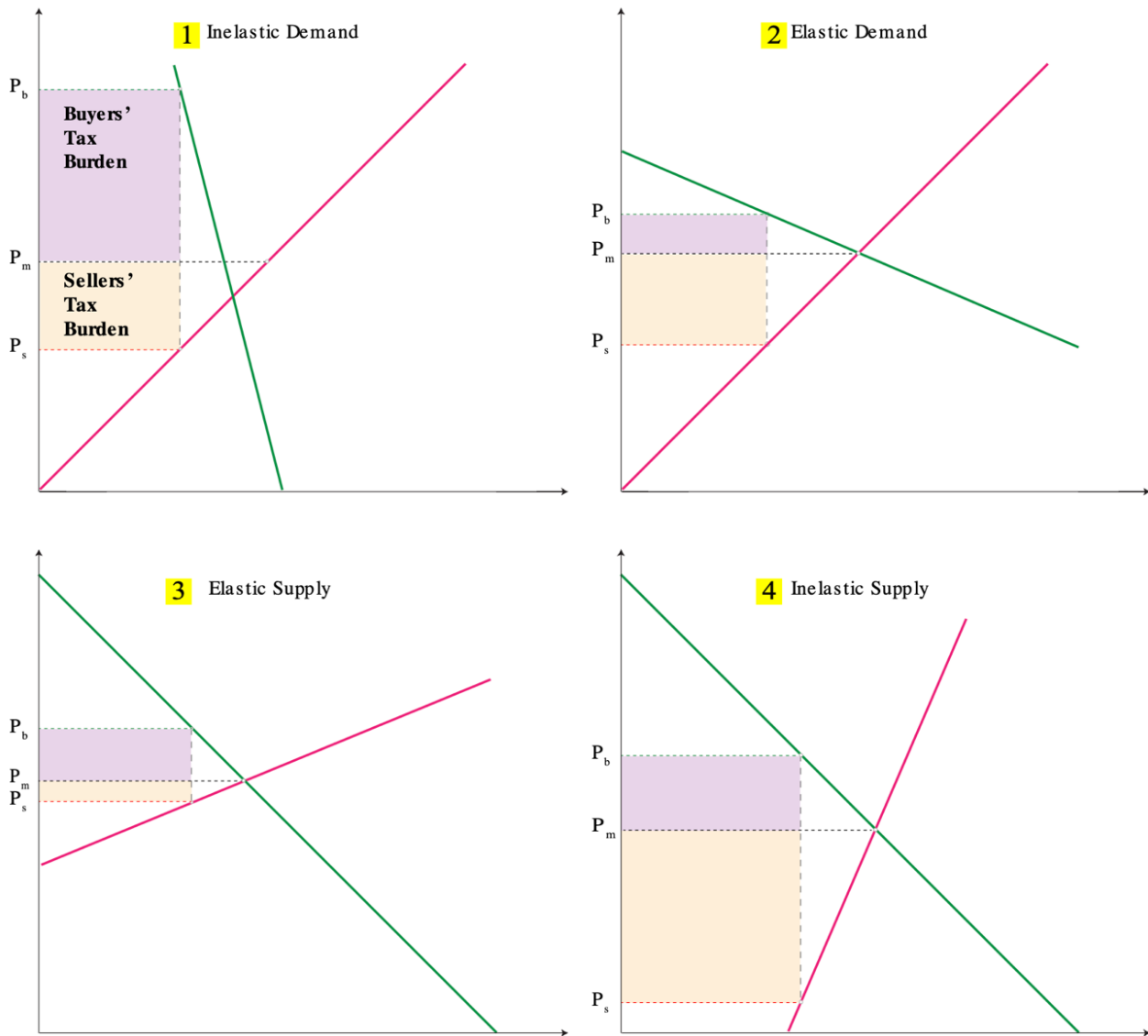

A larger tax obviously results in more tax revenue [1] but also more DWL and reductions in surplus. More of the tax burden (lost surplus) falls on whichever side of the market is more inelastic (more "inflexible") because making changes or switching to alternative options are not as easily available or manageable. A *subsidy* is a negative tax, meaning the government pays for a portion of a purchase. The details of how and where this is implemented can affect the outcome, but the standard way to graphically demonstrate a subsidy at the "point of purchase" is to construct a new supply curve to the right ("shifted out") where the value of the subsidy is the vertical distance (similar to tax line) between the old and new supply curve. Governments generally want to tax things that they wish to discourage (due to negative externalities or strategic or political reasons) and subsidize things that have positive externalities or strategic benefits.

1. to a certain degree – see the Laffer Curve logic from the income/substitution effects handout to understand that eventually a very high level of taxation can reduce initial surplus (shrink the market size) so much that revenue would eventually decline

<u>Subsidies:</u> Point of Transaction vs. Point of Production

A subsidy at the *point of transaction* works exactly like a tax, except with the opposite effect: this will be a vertical wedge on the right side instead of the left side where a consumption tax would be shown. The amount of the subsidy S equals the difference between P_P (the price producers receive) and P_C (the price consumers pay). A subsidy at the *point of production* would shift the cost curve for the firms, which would shift the supply curve out to the right. Since firms directly receive government money to produce the product with this type of subsidy, their costs are reduced and the overall supply to the market will increase.
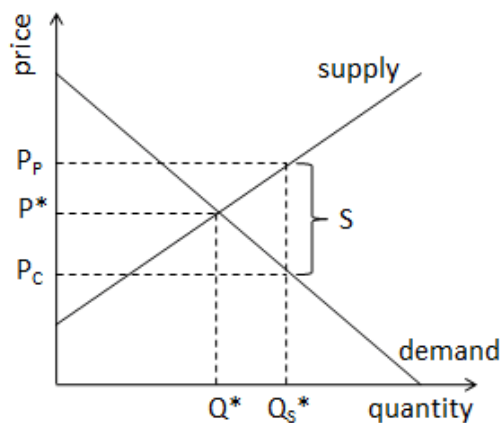
<u>Subsidy at the Point of Transaction</u>   <u>Subsidy at the Point of Production</u>
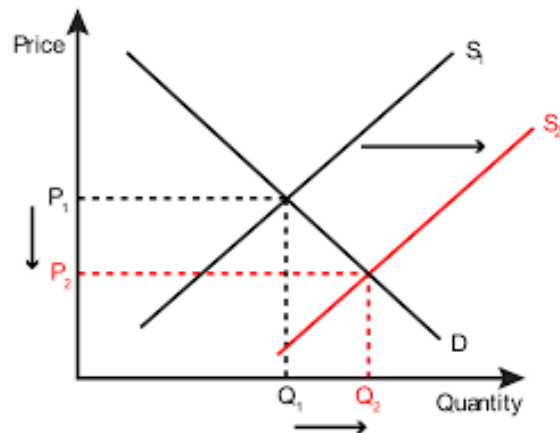
Government Price Restrictions:

A price floor is a minimum price allowed in the market and a price ceiling is a maximum price allowed in the market. Price floors are generally advantageous for the producers, while price ceilings are generally advantageous for the consumers. In both cases, the government intervention in the market causes the quantity demanded by the consumers to no longer equal the quantity supplied by the producers.