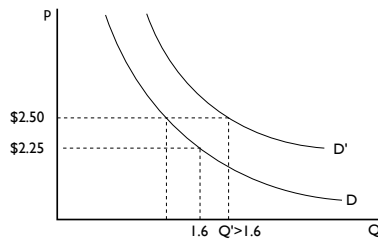ECON 110, Professor Hogendorn

Problem Set 2 Answers

1. *MTA_a.*

   (a) This function is convex (also called "concave up") since the
   second derivative is positive.

   (b) This demand curve is called a constant-elasticity demand
   curve, and it has the property that the exponent of -0.4 is
   the price elasticity everywhere along the curve. To prove it,
   use the definition of elasticity:

$$E_d = \frac{dQ}{dp}\frac{p}{Q} \quad = \quad -0.884p^{-1.4}\frac{p}{2.21p^{-0.4}}$$
$$= \quad -0.4\frac{p^{-1.4} \times p}{p^{-0.4}}$$
$$= \quad -0.4$$

   (c) From (b) we know that demand is inelastic since elasticity
   is less than 1. That means that the 11% increase in fare will
   cause a less-than-11% decrease in quantity demanded. Rev-
   enue will therefore go up. This makes sense because the sub-
   stitutes for subways rides are quite poor in a congested city.

   (d) This is not surprising, because the fare increase is only one
   change affecting the market. Another important change is

demand, which is likely to shift right because the economic recovery means more people commuting to work than before. As shown in the graph to part (a), a new demand curve D' could easily result in a new quantity Q' that is greater than 1.6, even at the higher fare.

2. *UAW_a.*

   (a) For $S(p)$ it's super easy – the equation for a line through the origin with slope 1 is just $S(p) = p$. For demand, we know that the form of the equation is $Q(p) = a - bp$. Parameter b just give the slope, which we know is -1. So we just need to make sure it goes through the point $(30, 30)$, which requires $a = 60$. Thus, $Q(p) = 60 - p$.

   (b) The supply curve goes through the origin, so $\epsilon_S = 1$. The equilibrium point is half-way along the demand curve, so $\epsilon = -1$. (You could also just calculate using the formula.)

   (c) Total spending, equal to total revenue, is just price times quantity: $30 \times 30 = 900$. The rectangle of total spending is exactly cut in half by the supply curve. The top half is producer surplus of 450, the bottom half is total variable costs of 450.

   (d) CS increases by $B + C + D$. PS increases by $F + G - B$. Total variable costs decrease by $C + F - H$. Note that there is in fact some increase in TVC (area H) indicating that the concessions could lead to some new jobs even if they still decrease overall union pay.
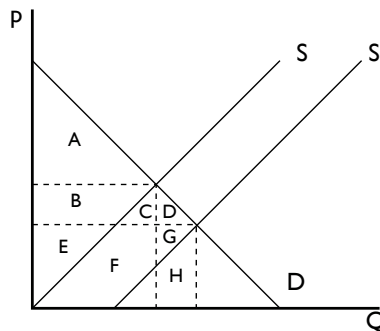
3. *JFK_a.*

(a) Equilibrium must be on the upper half of the demand curve, and the supply curve must intercept the horizontal axis.
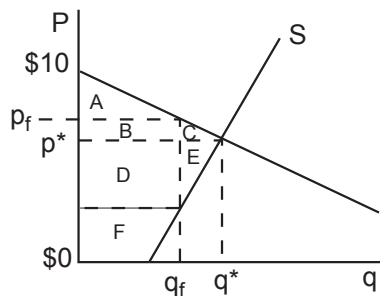
(b) Demand must be the governing curve because it is not possible to sell more than people are willing to buy. CS is reduced by $B + C$ and PS is reduced by E but increased by B. $C + E$ is the deadweight loss.

(c) First, note that we are talking about just your firm, while the curves represent all firms. *Some* firm(s) will lose customers under the price floor, since the quantity sold falls. If you are concerned that your firm will suffer a disproportionate share of this reduction, you might not favor the price control.

Also, these curves are probably short-run curves. In the long run, elasticity of demand is likely to rise, as consumers find new airports and new alternatives for shipping air freight.

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Thus the gains today may be smaller or even turn to losses in the future.

4. *Juvenor_a.*

(a) Amherst Guy (AG) added the *inverse* demand curves, which means he added a price plus a price. This makes no sense. The right way to do it is to add quantities:

$$
\begin{aligned}
Q_d^{men} &= 5000 - 50p \\
Q_d^{women} &= 4000p^{-1} \\
Q_d^{market} &= 5000 - 50p + 4000p^{-1}
\end{aligned}
$$

(b) AG set supply in terms of quantity equal to demand in terms of price. Now that we have demand in terms of quantity from (a), we can find the correct equilibrium price:

$$
\begin{aligned}
Q_s(p) &= Q_d(p) \\
1000 &= 5000 - 50p + 4000p^{-1} \\
0 &= 4000 - 50p + 4000p^{-1} \\
0 &= 4000p - 50p^2 + 4000 \\
p &= 81
\end{aligned}
$$

(c) AG's graph was wrong for three reasons. First, it was based on his incorrect demand curve. Second, we know that supply is perfectly inelastic, but he drew it as elastic. And third, he put CS in completeky the wrong place! The correct graph is:

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