Chapter 8 - Problem 12

EC 110-001
SUMMER I, 2007

We're given: $Q^S = 2P$

$Q^D = 300 - P$

(a) Solve for equilibrium.

At equilibrium: $Q^S = Q^D \iff 2P = 300 - P \Rightarrow 3P = 300$

$\Rightarrow \boxed{P_1 = 100} \Rightarrow \boxed{Q_1 = 200}$

(b) A tax T is placed on buyers: $Q^D = 300 - (P+T)$

Solve for the new equilibrium.

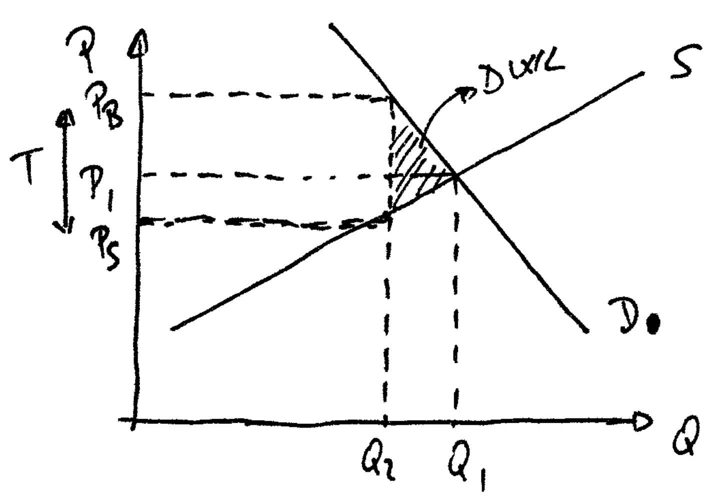
$Q^D = Q^S \iff 300 - P - T = 2P \Rightarrow 3P = 300 - T$

$\Rightarrow \boxed{P_S = 100 - \frac{T}{3}}$ price received by sellers

$P_B = P_S + T = 100 - \frac{T}{3} + T = 100 + \frac{2T}{3} \Rightarrow \boxed{P_B = 100 + \frac{2T}{3}}$

price paid by buyers

$Q_2 = Q_{sold} = 2 \cdot P_S = 2 \cdot \left(100 - \frac{T}{3}\right) = 200 - \frac{2T}{3}$

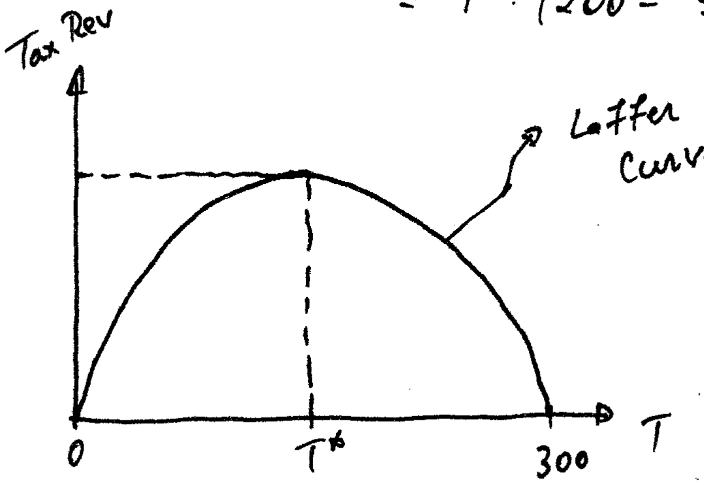


Compared to P_1, price paid by buyers (P_B) increases and the price received by sellers (P_S) decreases.

Quantity sold (Q_2) also decreases.

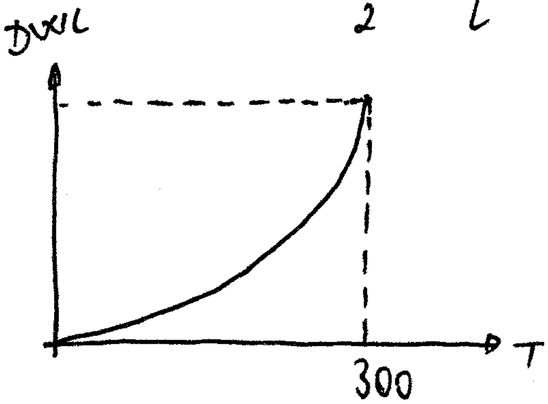
(c) Tax Revenue $= T \cdot Q_2$

$$= T \cdot \left(200 - \frac{2T}{3}\right) = 200\,T - \frac{2T^2}{3}$$



(d) $DWL = \frac{1}{2} \cdot T \cdot (Q_1 - Q_2)$ where $T =$ base, $Q_1 - Q_2 =$ height } of the DWL triangle

$$= \frac{1}{2} T \left[200 - 200 + \frac{2T}{3}\right] = \frac{1}{2} \cdot T \cdot \frac{2T}{3} = \frac{T^2}{3}$$



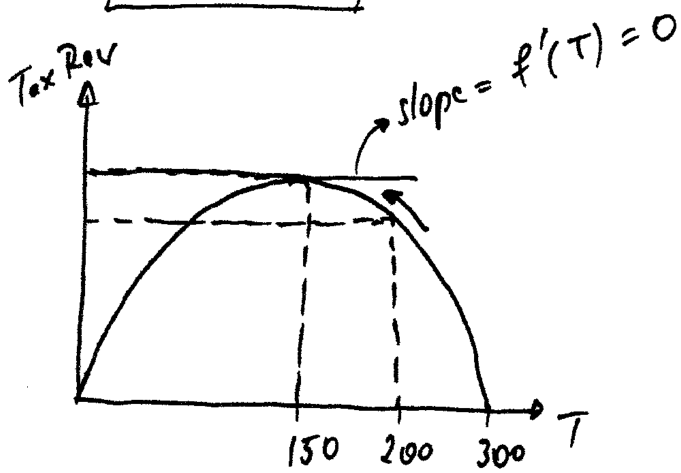
(e) A tax of \$200 is levied. Is this a good policy?

To answer the question, we have to decide whether $T = 200$ is to the right, left or actually coincides to the level T^* that maximizes tax revenue. Now, the slope of the tangent to the Laffer curve that corresponds to T^* must be 0. The slope at any point is given by the first derivative of the function that describes the tax revenue: $f(T) = \text{Tax Rev} = 200T - \frac{2T^2}{3}$

The first derivative is: $f'(T) = 200 - \frac{4T}{3}$. If we set this equal to zero, we will be able to find T^* (i.e., the level of the tax that maximizes the tax revenue).

We have: $f'(T) = 0 \Rightarrow 200 - \frac{4T}{3} = 0 \Rightarrow \frac{4T}{3} = 200$

$\Rightarrow \boxed{T^* = 150}$



Now since $200 > 150$, we are on the "wrong" side of the Laffer curve. Decreasing this tax level to 150, would actually increase the total tax revenue.