1. Going to school now for 4 years will cost (direct & indirect) $40,000 per year & will add to your earnings by $20,000 per year. If r = 4% & you will work for 40 years, what is the net PV of this investment?

2. a) Using Figure 1, what are CS & PS when the market clears?
   b) If there is a price ceiling of $P_0$ & $P$ can not implicitly increase, what are CS & PS?
   c) If there is a price ceiling of $P_0$ & $P$ can implicitly increase, what are CS & PS? How does this answer depend on the manner in which $P$ implicitly increased?

3. Start with the following supply & demand schedules: $P = 200 - 2Q$ & $P = 20 + 4Q$.
   a) Find the market-clearing $P$ & $Q$ and the $E^D$ & $E^S$ at the equilibrium $P$ & $Q$.
   b) If there is a $30 tax on sellers, find the equilibrium $P$ & $Q$.
   c) With no tax on sellers, but a $30 tax on buyers, find the equilibrium $P$ & $Q$. 

![Figure One](image-url)
Answers

1. We must find the \( PV \) of a $1 per year for 4 years \( (d_{0.4, 4}) \), the present value of a $1 per year for 40 years \( (d_{0.4, 40}) \), & \( 1/(1.04)^4 \) since the individual receives the benefits starting 5 years (& not 1 year) from now.

\[ d_{0.4, 4} = 3.63, \quad d_{0.4, 40} = 19.8, \quad \text{&} \quad 1/(1.04)^4 = .855. \]

Thus, \( PV \text{(benefits)} = (.855)(19.8)(20,000) = 338,580. \) \( PV \text{(cost)} = (3.63)(40,000) = 145,200. \) Net \( PV = 193,380. \)

2. a) At market clearing, \( CS = U + V + Y, \) & \( PS = W + X + Z. \)

b) With a price ceiling = \( P_0 \) & no implicit \( P \) increase, \( CS = U + V + W, \) \( PS = X. \)

c) With a price ceiling = \( P_0 \) & an implicit \( P \) increase via tied sales or quality reductions, the implicit \( P \) increase = \( P_2 - P_0 \), so the total \( P \) is effectively \( P_2. \) \( CS = U \) & \( PS = V + W + X. \)

If \( P \) increases implicitly by \( P_2 - P_0 \) due to queues, producers get only \( P_0 \) per unit, but consumers effectively pay \( P_2. \) \( CS = U \) & \( PS = X. \)

3. a) Set demand & supply (D & S) equal, find \( Q, \) & then insert into either D or S to find \( P: \)

\[ 200 - 2Q = 20 + 4Q, \Rightarrow Q = 30 \quad \& \quad P = 140 \]

\[ E_P = \frac{1}{slope} \frac{P}{Q} \quad \Rightarrow E_P^D = -\frac{1}{2} \frac{140}{30} \approx -2.33, \quad \& \quad E_P^S = \frac{1}{4} \frac{140}{30} \approx 1.17. \]

b) A $30 tax on sellers \( \Rightarrow S \) is now \( P = 50 + 4Q---\) each seller now sells the same \( Q \) only if \( P \) is $30 higher. Now solving D & S yields \( Q = 25 \) & \( P = 150. \) \( \Delta P = 10---1/3 \) of the tax. Each seller gets to keep $120--$20 less than before, so sellers bear 2/3 of the burden of the tax. Sellers bear a larger tax burden because they are less responsive to \( P \) than are buyers:

\[ |E_P^D| > E_P^S. \]

c) With a $30 tax on buyer, each buyer is willing to pay $30 less, so D is: \( P = 170 - 2Q; \) solving D & S yields \( P = 120 \) & \( Q = 25. \) Buyers again end up paying $10 more, & sellers keep $20 less per unit compared to the case with no tax.