Exercise MY-101

Computing an equilibrium quantity with a subsidy

The Economic Skills Project

1 Problem

Problem

Given the market willingness to pay and willingness to accept curves below, compute the equilibrium quantity when a subsidy of $200 per unit is imposed.

- $WTP = 1500 - 2Q^D$
- $WTA = 3Q^S$

2 Answer

Answer

Here's the numerical solution:

- $Q = 340$

3 Method

Solution method

Here's one approach:

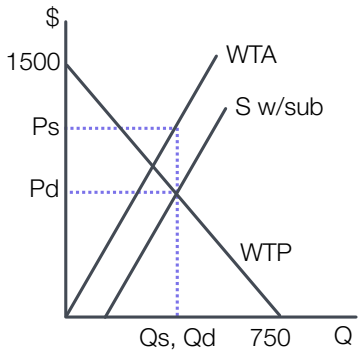
1. Draw the graph.
2. Solve for the demand and supply equations.
3. Solve for the equilibrium Q using $P^d + S = P^s$.
4. Check the result.

4 Solution

4.1 Step 1

Draw the graph

Here's how it looks:



4.2 Step 2

Solve for the demand and supply equations

Solving for demand, Q^D, as a function of the buyer price P^d:

- $P^d = WTP = 1500 - 2Q^D$
- $2Q^D = 1500 - P^d$
- $Q^D = \frac{1}{2}\left(1500 - P^d\right) = 750 - \frac{1}{2}P^d$

Solving for supply, Q^S, as a function of the seller price P^s:

- $P^s = WTA = 3Q^S$
- $Q^S = \frac{1}{3}P^s$

4.3 Step 3

Solve for the equilibrium Q using $P^d + S = P^s$

The equilibrium has $Q^D = Q^S$ and $P^d + S = P^s$. Using those two equations and setting $S = \$200$:

- $Q^D = Q^S$
- $750\text{-}\frac{1}{2}P^d = \frac{1}{3}P^s$
- $750\text{-}\frac{1}{2}P^d = \frac{1}{3}\left(P^d + S\right)$
- $750\text{-}\frac{1}{3}S = \frac{5}{6}P^d$
- $P^d = \frac{6}{5}\left(750 - \frac{1}{3} \cdot 200\right) = 820$
- $Q^D = 750 - \frac{1}{2}P^d = 340$

4.4 Step 4

Check the result

To check the result, compute P^s and use the supply equation. The quantity should be the same.

- $P^s = P^d + S$
- $P^s = 820 + 200 = 1020$
- $Q^S = \frac{1}{3}P^s$
- $Q^S = \frac{1}{3} \cdot 1020$
- $Q^S = 340$

Everything checks - done!