Example: Negative External Costs

PMB = SMB = 12 – Q

PMC = Q

EMC = Q

SMC = PMC + EMC = 2Q

Note: A negative externality is like a "public bad" $\Rightarrow$ vertically sum PMC and EMC.

Private market equilibrium:

PMB = PMC
12 - Q = Q
Q* = 6

P* = PMB* = PMC* = 6

Social Welfare Maximization with Negative Externality:

SMB = SMC
12 – Q = 2Q
Q** = 4

SMB** = 12 – 4
= 8

P** = PMC** = 4

Market Participants' Welfare at Market Equilibrium:

Buyers: Consumer Surplus = CS = total benefit – total expenditure

CS = 0.5 (6 x (12 – 6)) + (6 x 6) – (6 x 6)
= 18

Sellers: Producer Surplus = PS = total revenue – total cost

PS = (6 x 6) – 0.5 (6 x 6)
= 18

Buyer Welfare + Seller Welfare = CS + PS

CS + PS = 18 + 18 = 36

Society's Welfare at Market Equilibrium:

Buyers: Unchanged $\Rightarrow$ CS = 18

Sellers: Unchanged $\Rightarrow$ PS = 18

Non-Participants: External Costs = total social cost – seller cost (already included in PS)

SMC at market equilibrium = $2Q^*$ = 12

External Costs = 0.5 (6 x 12) – 0.5 (6 x 6)
= 18

Social Welfare = CS + PS – External Cost
= 18 + 18 – 18
= 18

Market Participants' Welfare at Social Maximum:

Buyers: Consumer Surplus = CS = total benefit – total expenditure

CS = 0.5 (4 x (12 – 8)) + (8 x 4) – (4 x 4)
= 24

Sellers: Producer Surplus = PS = total revenue – total cost

PS = (4 x 4) – 0.5 (4 x 4)
= 8

Buyer Welfare + Seller Welfare = CS + PS

CS + PS = 24 + 8 = 32

Society's Welfare at Social Maximum:

Buyers: Unchanged $\Rightarrow$ CS = 24

Sellers: Unchanged $\Rightarrow$ PS = 8

Non-Participants: External Costs = total social cost – seller cost (already included in PS)

SMC at social maximum = SMB = 8

External Costs = 0.5 (4 x 8) – 0.5 (4 x 4)
= 8

Social Welfare = CS + PS – External Cost
= 24 + 8 – 8
= 24

What else might I ask?

(1) Is it necessarily true that buyers are better off at the social maximum? Under what circumstances would both buyers and sellers prefer the market equilibrium?

SOCIAL AND MARKET EQUILIBRIUM WITH NEGATIVE EXTERNALITY