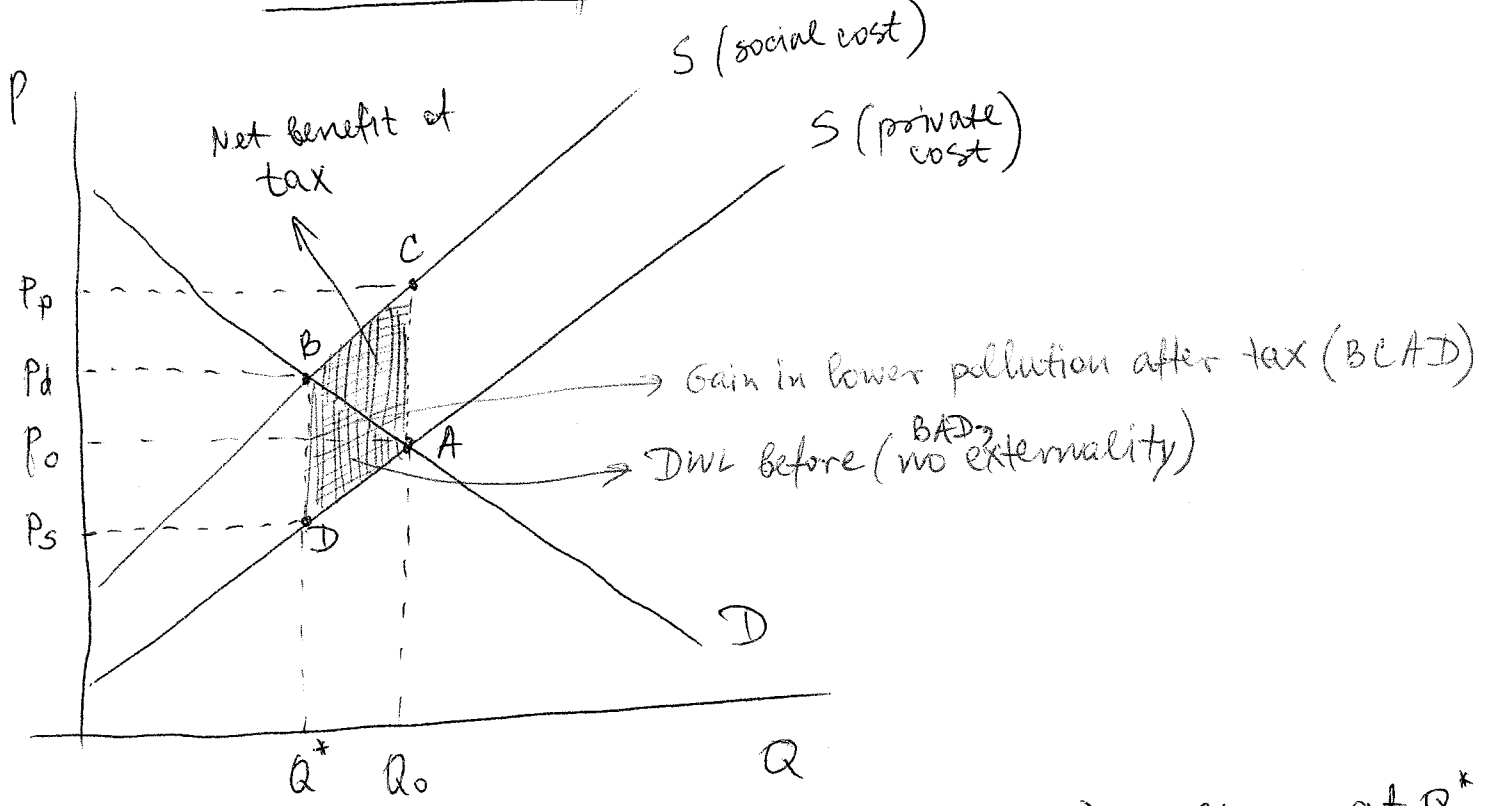
DWL with pollution (negative externality)



Q_o is inefficient, Q^* is efficient. Total surplus (TS) is bigger at Q^* than Q_o.

After tax:

① $\Delta CS = P_d B A P_o$ (loss)
② $\Delta PS = P_o A D P_s$ (loss)
③ Δ Govt Revenue (GR) $= P_d B D P_s$ (gain)

Adding those up $\Rightarrow$ BAD (loss)

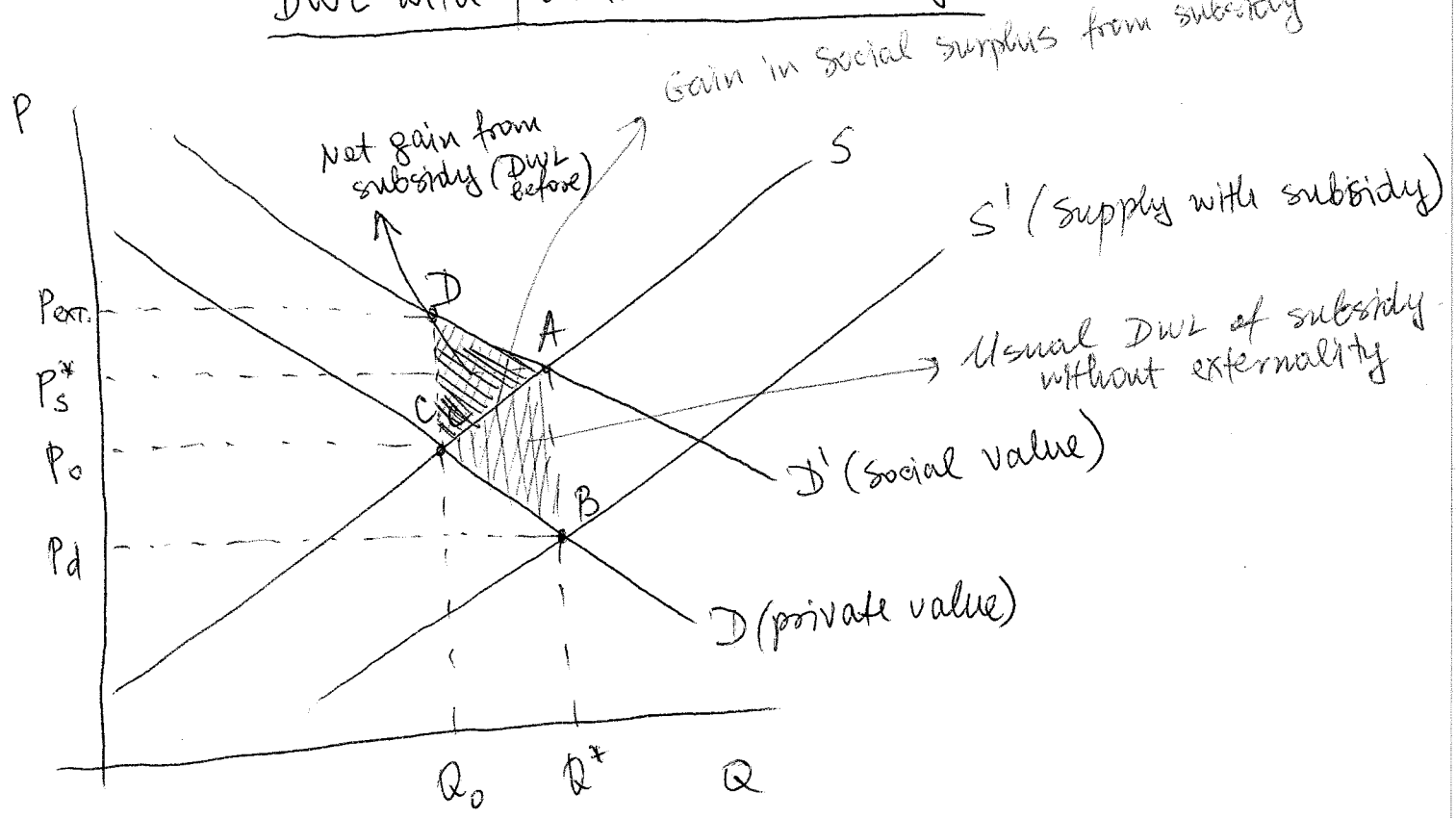
④ Δ Pollution Cost $=$ BCAD (lower cost, gain)

BAD loss + BCAD (gain in lower pollution) $\Rightarrow$ Total gain is BCA

So, Total surplus is bigger at Q^* than at Q_o by BCA

$\Rightarrow$ BCA was the inefficiency (DWL) before the tax.

DWL with positive externality



Q_o is 'inefficient', Q^* is efficient.

With subsidy:

$\Delta CS = P_o C B P_d$ (+)

$\Delta PS = P_o C A P_s^*$ (+)

$\Delta GR = P_s^* A B P_d$ (−) → cost of subsidy

Δ Social Surplus = DABC (+)

ΔTS (Total Surplus) = DAC (+)

So, with subsidy the total surplus at Q^* is bigger than at Q_o by DAC (DWL before subsidy).