Example 3.J: Excess burden *formula under linear model & Tax-Revenue-maxizing tax rate*

Demand: $p^d = a - bQ^d \quad ; \quad a \geq 0, \quad b \leq 0.$

Supply : $p^s = c + dQ^s \quad ; \quad d \geq 0.$

- Solve for quantity and prices equilibrium when the unit tax is imposed. Analyze the result

slove Q^* = $a - bQ = c + dQ$

$a - c = bQ + dQ$

$a - c = (b + d)Q$

$\frac{a-c}{b-d} = Q^*$

Slove P^* $P^* = c + d\left(\frac{a-c}{b+d}\right)$

New S $p = c + dQ + t$

$a - bQ = c + dQ + t$

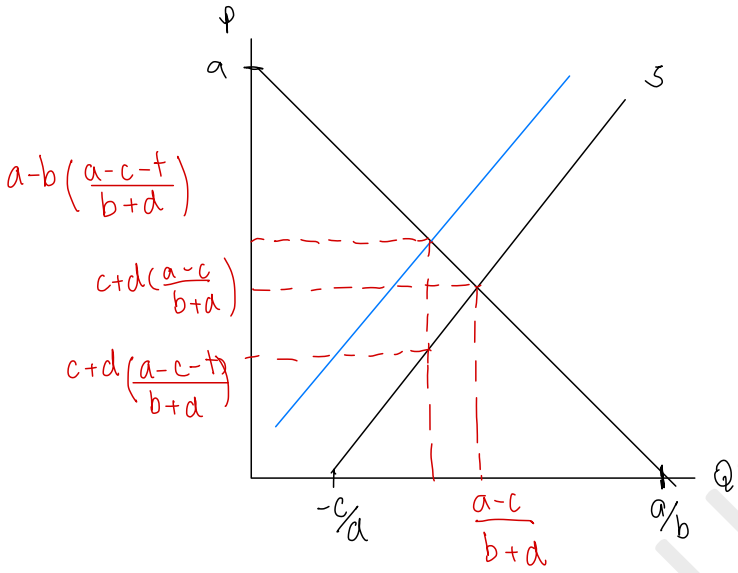
$a - c - t = bQ + dQ$

$a - c - t = (b + d)Q$

$Q_{tax} = \frac{a-c-t}{b+d} = Q^*$

$P_{tax} = P = a - b\left(\frac{a-c-t}{b+d}\right)$

- Derive the excess burden formula for buyers and sellers



$P = c + dQ$

$= c + d\left(\frac{a-c-t}{b+d}\right)$

Excess burden formula

$$\frac{1}{2}\left(\left(a-b\left(\frac{a-c-t}{b+d}\right)\right)-\left(c+d\left(\frac{a-c-t}{b+d}\right)\right)\right)\times\left(\frac{a-c}{b+d}-\frac{a-c-t}{b+d}\right)$$

- Calculate the tax rate that maximizes the tax revenue of government.

tax revenue = tax per unit $\times Q^*_{tax}$

$= t \times \frac{a-c-t}{b+d}$

To maximize tax revenue of govt

tax rate = $a - b\left(\frac{a-c-t}{b+d}\right) - cd\left(\frac{a-c-t}{b+d}\right)$