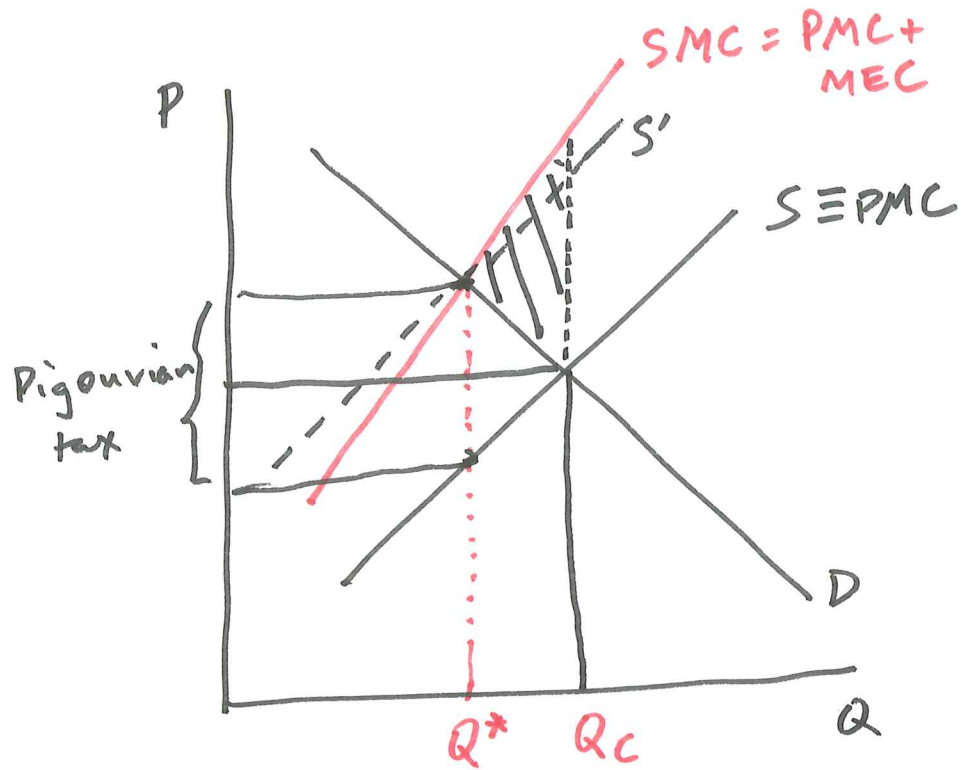


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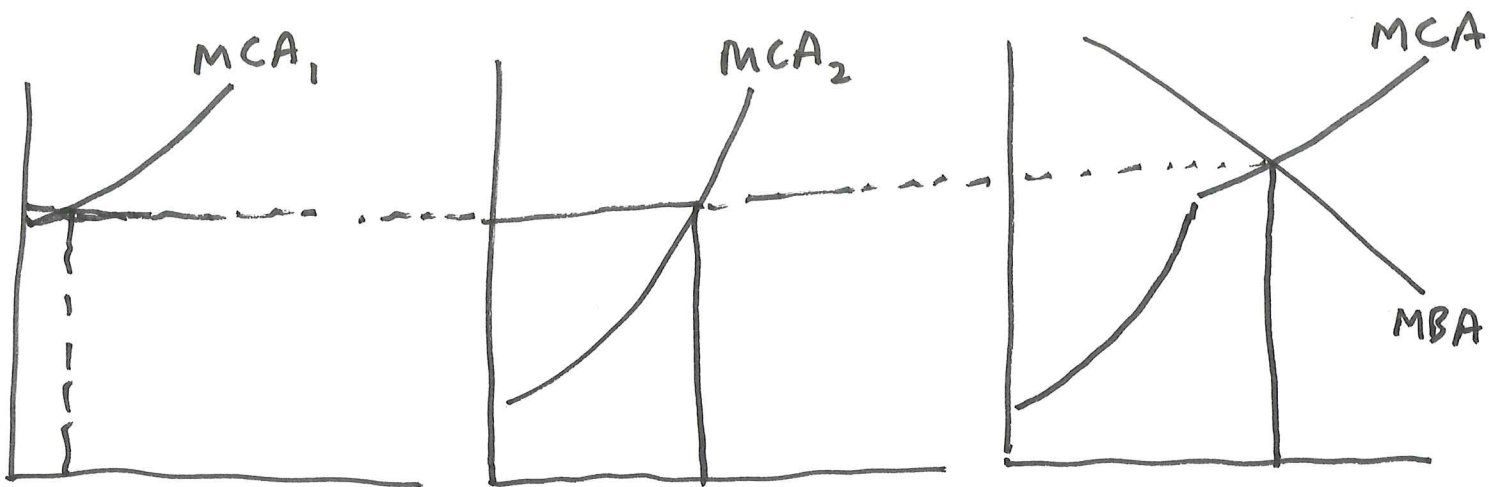
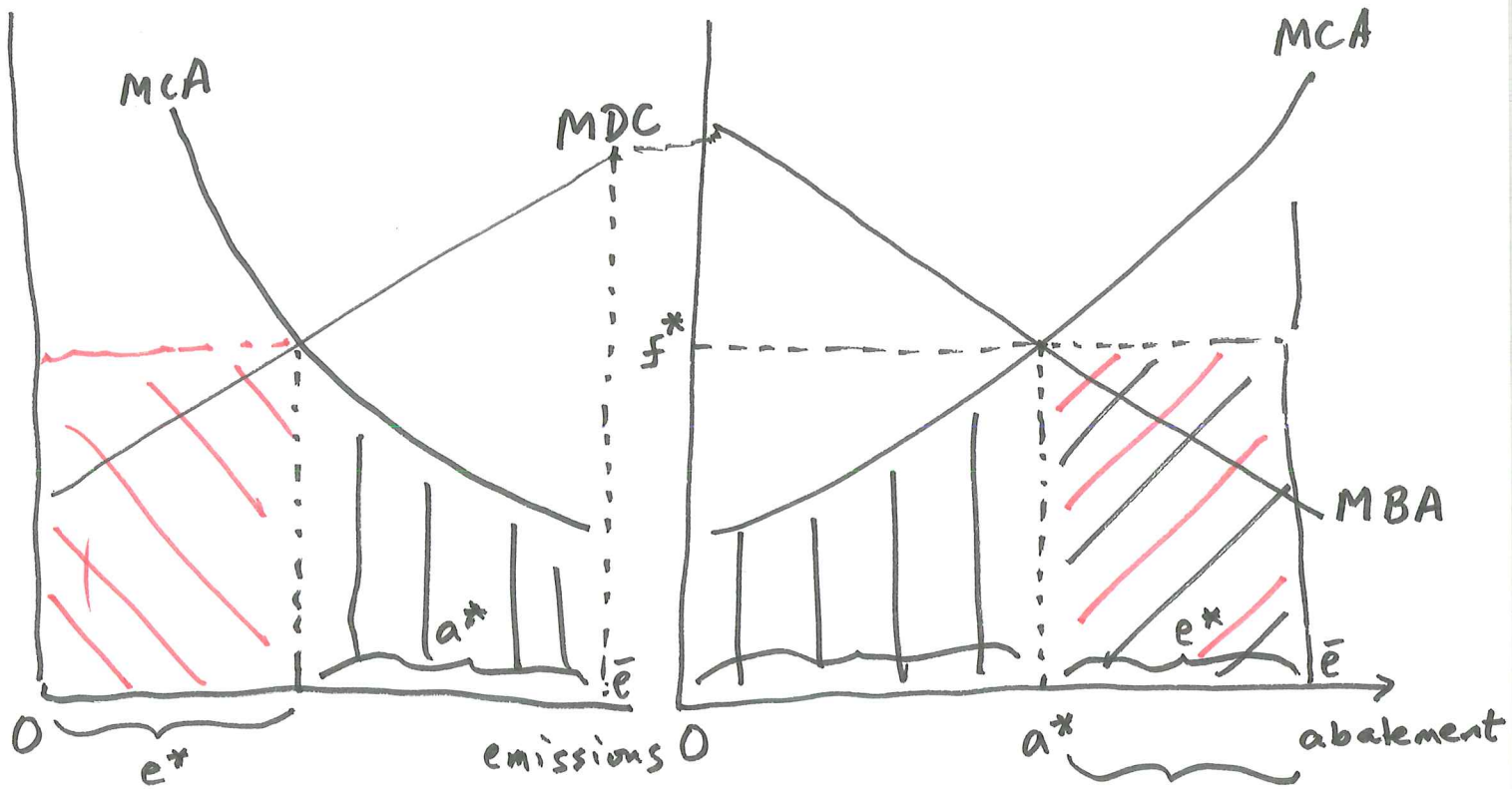
FINAL EXAM SUN DEC 15 3-5 pm  
STO B50

$$t^* = MEC^*$$



Marginal External Cost





$$(1) W = CS(Q) + pQ - C(Q)$$

$$\frac{dW}{dQ} = -Q \cdot \frac{dp}{dQ} + p \frac{dQ}{dQ} + Q \frac{dp}{dQ} - C' = 0$$

$$p = C'$$

$$(2) W = CS(Q) + pQ - C(Q) - D[e(Q)]$$

$$\frac{dW}{dQ} = p - C' - D'e' = 0$$

$$p = \underset{\substack{\uparrow \\ \text{PMC}}}{C'} + \underset{\substack{\uparrow \\ \text{MEC}}}{D'e'}$$

(3) With Abatement:

$$W = CS(Q) + pQ - C(Q) - D[e(Q) - a] - A(a)$$

$$\frac{dW}{dQ} = p - C' - D'e' = 0$$

$$\frac{\partial W}{\partial a} = +D'(1) - A' = 0 \rightarrow D'[e-a] = A'$$

$$p = c' + \underbrace{D'e'}_{\substack{\text{Effective} \\ \text{Pigouvian} \\ \text{tax}}}$$

### MEC

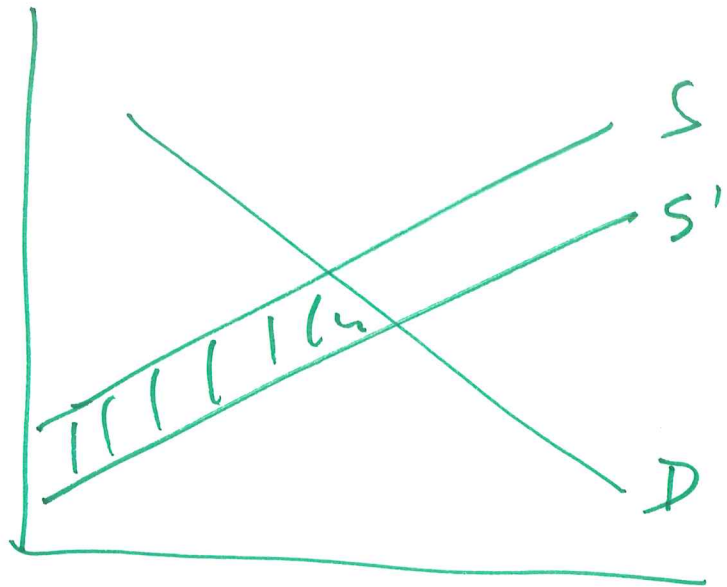
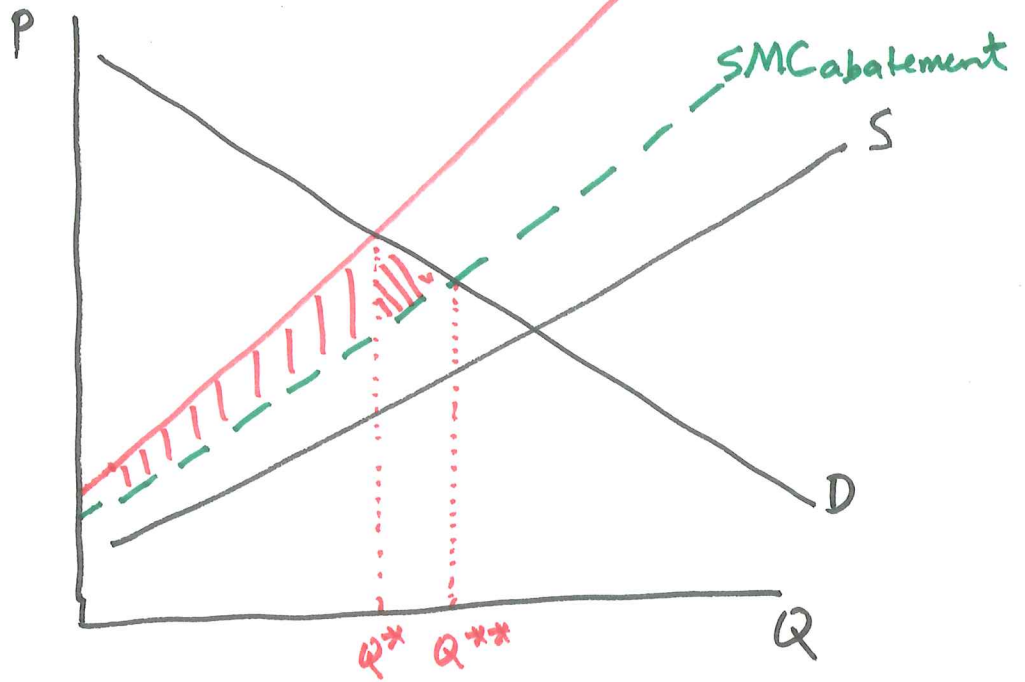
units of emission	MDC
1	0.25 ✓
2	0.75 ✓
3	1.25 ✓
4	1.75 ✓
5	2.25 ✓
6	2.75
7	3.25
8	3.75
9	4.25
10	4.75

units of abatement	MCA
1	1 ✓
2	2 ✓
3	3
4	4
5	5
6	6
7	7
8	8
9	9
10	10

units of effluent	emit or discharge	MEC
1	emit ✓	0.25
2	emit ✓	0.75
3	abate ✓	1
4	emit ✓	1.25
5	emit ✓	1.75
6	abate ✓	2
7	emit	2.25
8	emit	2.75
9	abate	3
10	emit	3.25

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$SMC = PMC + MEC$



# Coase Theorem.

- (a) Property Rights are poorly defined  
 (b) Transactions costs are high

