

University of Toronto
Economics 336Y – Public Economics

Problem Set on Externalities

1. $(\hat{y}_s, y_s^*, t^*) = (1, 3/4, 1/4)$
2. Suppose the permit price is p . Since polluters will abate if the marginal cost is less than the permit price, the demand for permit is

$$100 - A_1 - A_2 = 120 + (10 - p) + (20 - p) = 150 - 2p$$

Since there are 70 permits supplied, the equilibrium price is $p^* = 40$, so $A_1^* = 30$ and $A_2^* = 20$.

3. Answers:

- (a) $I^* = 2 - A, P^* = 2(A - 1)$.
- (b) $C = IP$.
- (c) If $C = IP$ then Victor solves $\max_I I(2 - I)$ implying $\hat{I} = 1$. Pollux then solves

$$\max_P AP - \frac{1}{2}P^2 - \hat{I}P$$

so $\hat{P} = A - 1$. Notice $\hat{P} < P^*$ and $\hat{I} > I^*$.

4. (a) Build if $B > C$. This occurs with probability $3/4$ in terms of the prior beliefs, i.e. as long as it is not the case that $(B, C) = (1, 2)$.
- (b) Set a tax rate on the plant $t = 2$ if it built. Then the steel company builds iff $B = 3 > 2 = t$ which is efficient.
- (c) Observe that the steel plant is a discrete public good, although one agent's willingness to pay for this public good is known to be negative. So we now that a Groves–Clarke tax scheme can be used to elicit truthful revelation of private preferences for this public good. In one such scheme, both parties are asked to report their willingness to pay for the plant, say b for the steel company and $-c$ for the laundry. The plant is built if $b - c > 0$. Truthful revelation is supported by charging a tax of c to the steel company if the plant is built and a subsidy of b to the laundry if the plant is built. (Students might also discuss the mechanism in which the laundry is charged a tax if the plant is *not* built. A general description of Groves–Clarke mechanisms – the key being that one's tax bill is independent of one's report – and an explanation of why they work in this case is sufficient. Up to 5 bonus points for the math and a proof that truth-telling is a dominant strategy.)