EC 501: Problem Set 12
(Due in class on Thursday, December 5)

1. The Johnsville Co. produces pipe insulation at a cost of $10 per ton. It is also known that for every ton of insulation it produces it also vents into the air one ounce of asbestos fibers, which are a very hazardous substance. Johnsville could contain these fibers at a cost of $4 per ounce. The demand for pipe insulation is given by:

    $$Q = 2640 - 120 \, P$$

    and Johnsville is the sole producer.
    (a) In the absence of any regulation, how much insulation would Johnsville produce, and how much profit would it make, if it sought to maximize profits?
    (b) Suppose the pipe insulation industry were perfectly competitive, with every firm able to manufacture pipe insulation at a cost of $10 per ton. What would be the level of production now?
    (c) What is the socially efficient level of production of pipe insulation, assuming that the damage caused by the asbestos fibers is greater than the $4 cost of abatement? Under this assumption, can you say which situation (monopoly or competition) is better from the social point of view? (Hint: Set the external damage caused by an ounce of asbestos fibers to x, then calculate the difference in deadweight loss between the monopoly and the competitive solutions, as a function of x.)

2. The Filthy Chemical Company dumps 100 tons of pollutants every year in the Pristine Lake. The Trout Fishing Co., the only other user of the lake, estimates that if Q tons of pollution were cleaned up every year its profits would rise according to the relation

    $$\Delta \pi = 10 \, Q - \frac{1}{10} \, Q^2$$

    Filthy estimates it can clean the pollutants at a constant average cost of $2 per ton.
    (a) In the interest of efficiency, how much pollution should be cleaned up every year?
    (b) Suppose Filthy bought the Trout Co. How much would it clean up? What if Trout bought Filthy?
    (c) State the Coase Theorem. Does your answer to (b) confirm or deny the theorem? Explain briefly.

3. The country of Petrolia has two oil-fields, A and B. The Government has licensed a total of 30 firms to drill wells in the field. Drilling is costless, and the firms can choose whichever field they like. Each licensed firm can drill one well only. No other firm can enter. Each well will produce exactly as much as other wells in the same field, although production could differ between the two fields. The total output from fields A and B is given by

    $$Q_A = 39 \, N_A - \frac{1}{2} \, N_A^2 \quad and \quad Q_B = 30 \, N_B - N_B^2$$

    where N_A and N_B are the number of wells in A and B respectively.
    (a) What will be the total output of oil, and how many wells will there be in each of the two fields, in competitive equilibrium?
    (b) What allocation of wells would maximize oil production?

(c) Government could achieve the allocation required by (ii) by charging a flat license fee. What should the fee be and on whom should it be levied?

(d) Explain briefly how this example reflects the difficulties of communal ownership.