Resource Economics – Seminar 5

Thursday, November 5, 2015

Room HH201, 16:15-18:00

Problem 1

Consider a resource with zero extraction costs and a total initial stock equal to A_0. The utility function (in terms of the numeraire good) is $u(x)$, with the properties $u(0) = b$ and $u' > 0$ and $u'' < 0$ for $x > 0$. Greenhouse gases in the atmosphere are assumed to develop according to

$$\dot{S} = x(t) \tag{1}$$

With the initial greenhouse gas stock equal to zero (by choice of measurement).

1. Describe the properties of the optimal extraction path under the following alternative assumptions about climate damages (assume the discount rate is positive and constant):

   a) There are no climate costs for $S \leq \overline{S}$, but S is not allowed to exceed $\overline{S}$. Discuss how the optimum depends on the size of $\overline{S}$.

   b) There is a climate cost function given by $D(S) = kS$ where k is a positive parameter.

2. Assume that a tax θ is used to achieve the social optimum. Describe the time path of this tax, as well as the consumer and producer price, for the cases above.

Problem 2

Do the same as above but assume now that unit extraction costs are given by $c(A_t)$, where A_t is the resource stock remaining at time t. This function is assumed to have the following properties: $c' < 0$ and $c(A_0) < b < c(0)$.