ECON4910 Environmental Economics — Seminar 3

February 26, 2015

This seminar is based on the classical study of Harrison and Rubinfeld (1978)

The department of air pollution control evaluates a policy that reduces sulfur dioxide concentrations by 1 pphm (parts per hundred million) from its initial level. This policy would cost 1 million USD. A consultant to the department suggests to measure the willingness to pay by comparing housing prices across different areas with different NOX concentrations. Specifically, the consultant proposes to do two steps:

First regress the "hedonic housing value function":

$$\ln(mv) = \beta_0 + \beta_1 age + \beta_2 (rm)^2 + \beta_3 (nox)^2 + \beta_4 dis + \varepsilon \tag{1}$$

The unit of observation is census tract (CT, an administrative area used in US population censuses). Here, mv is the CT median house value, age is the proportion of houses in the CT built prior to 1940, rm is the average number of rooms of houses in the CT, nox is the CT nitrogen oxide concentrations in pphm (annual average), and dis is (weighted) distance to the 5 biggest employment centers in the region.

Then back out the willingness to pay for NOX reduction in a given census tract with median income inc by estimating:

$$w = \beta_0 + \beta_1 nox + \beta_2 inc + \varepsilon \tag{2}$$

where w is the marginal change in house price when nox changes by 1 pphm.

1. Starting from an economic model according to which households maximize utility (which is a function of consumption goods and housing attributes) subject to a budget constraint, use economic theory to argue why this procedure would lead to an estimate of the average willingness to pay for a reduction in air pollution. (*Hint: Read section II of Harrison and Rubinfeld (1978)*)

2. Discuss the regression equation (1). Are there any econometric issues with estimating our coefficient of interest, β_3?

3. Download the dataset "hedonic_econ4910.dta" or "hedonic_econ4910.xlsx" from the course web page and load it into an econometrics software of your choice (we will use Stata 13 in class).

   (a) Estimate equation (1) or any variant thereof that you may find suitable.

(b) Then use the predicted marginal price of NOX from this estimation to estimate equation (2).

(c) The policy that reduces NOX by 1 pphm costs 1 million USD to implement. Suppose your estimate of equation (2) is $\hat{w} = 608.01 + 90.12nox + 6.95inc$, where $\hat{w}$ is the estimated marginal willingness to pay for reduction in NOX for a census tract with a given NOX concentration and median income. Suppose also that each census tract contains only one household, for simplicity. Is the policy desirable from an economic point of view?

4. Suppose that we instead of the two-step procedure above estimate the willingness to pay by estimating the linear model

$$mv = \beta_0 + \beta_1 age + \beta_2 (rm)^2 + \beta_3 nox + \beta_4 dis + \varepsilon \qquad (3)$$

(a) What assumptions are required for this to give a meaningful estimate of the willingness to pay for *NOX* reduction?

(b) Estimate this model. Is the policy desirable from an economic point of view with this econometric specification (still assuming that there is only 1 household per census tract)?

5. Write a short essay (2-3 pages) commenting on the consultant's way of evaluating an environmental policy, i.e. the two-step procedure with hedonic valuation of benefits, considering both conceptual and econometric points. *Send a scanned copy or typewritten essay in pdf-format to e.h.olsen@econ.uio.no at least two (2) days before the seminar if you want it to be reviewed by Florian. We will spend the last part of the seminar to discuss the essays and give feedback.*

References

HARRISON, D. AND D. L. RUBINFELD (1978): "Hedonic housing prices and the demand for clean air," *Journal of Environmental Economics and Management*, 5, 81–102.