UNIVERSITÉ TOULOUSE 1 CAPITOLE

TSE
Toulouse School of Economics
École d'économie de Toulouse

Année Universitaire 2012-2013
SESSION 1

MASTER 2 - TSE

ENVIRONMENTAL ECONOMICS
(durée 3h00)

Monday December 17th 2012 ~ 14h00 –17h00

S. AMBEC

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Answer to the short questions and two problems. You have 3 hours. Please read carefully, be brief and precise. Good luck!

Short Questions (60 points: 20 points each question): Answer each of the three questions with few sentences.

(a) Economists tend to see climate change mitigation as a public good provision for countries or as common-pool resource extraction by countries. Explain the main difference and similarity between the two problems.

(b) The king of Pandora suspects that the unobtanium mine is not complying with the current pollution emissions regulation. He asks you to advice him some policies that would increase compliance. In the lights of what we have seen in class, explain what are those policies and their limit.

(c) In the model safety regulation analyzed in class, explain what determines the choice between a safety norm and ex post liability?

Problem 1 (60 points)
Grönenergi is producing electricity and emitting air pollutants. Its technology is described by the production function $C(q,e) = \frac{(c+q-e)^2}{2}$ where q is the amount of electricity produced in kWh, e are pollutant emissions in tonnes and $c > 0$ is a cost parameter. The demand for electricity is $P(q) = a - bq$. The surplus enjoyed by consumers with q units is $S(q) = \int_0^q P(x)dx = aq - \frac{b}{2}q^2$. The damage due to pollution is evaluated to δ euros per ton of emissions with $\delta > 0$.

(a) What are the uncontrolled (laisser-faire) level of emissions for a given amount of kWh produced? The optimal levels of electricity production and pollutant emissions? Comment the first-order conditions.

(b) Grönenergi is a monopoly on the electricity market. How much does it pollute and produce?

(c) Compare the monopoly solution with the optimal one both in terms of pollution and production (or price). Illustrate and comment your analysis.

(d) Posit a regulation that implements the optimal production and pollution levels with monopoly producers like Grönenergi.

(e) Suppose that the regulator can only tax emissions. Explain in words (No algebra) why the tax rate is lower than the marginal damage. What determines this second-best tax?

Problem 2 (60 points)
In a recent paper (Price vs Quantities with Increasing Marginal Benefits), Goodkind and his coauthors argue that the marginal benefit of abatement is sometime increasing for some pollutants at some concentration levels. They depart from the standard assumption of decreasing marginal benefit of abatement and reexamine Weitzmann's analysis on price vs quantities. Assume that the marginal benefit of a units of pollution abatement is $MB(a) = \alpha + \beta a$ with $\alpha > 0$ and $\beta > 0$. Marginal abatement costs are $MC(a, u) = ca + u$ with $c > 0$. The magnitude of marginal cost u is uncertain for the regulator with $E[u] = 0$. It is known by the firm. Assume further $c > \beta$. The benefit from abatement is $B(a) = \alpha a + \beta \frac{a^2}{2}$ while the cost is $C(a, u) = c\frac{a^2}{2} + ua$.

1. Explain in economic terms what increasing marginal benefit from abatement means.
2. Find the first-best abatement levels.
3. Find the abatement norm and emission tax that maximizes ex ante expected welfare.
4. Illustrate with a graph. What does the graph tell you about the abatement levels under each instrument compared to the first-best? About the welfare loss with each instrument?
5. Which instrument dominates? Why? Show numerically that the abatement levels with the tax are always closer to the first-best ones than with the norm.