STUDY QUESTIONS

MAST/ECON 676: Environmental Economics

Spring 2014

1. Using our simple model for an efficient level of environmental protection from Lecture 1 notes, show why a national uniform standard (as apposed to regionally- or locally-based standards) is likely to be inefficient. Explain and show the relevant welfare losses with a uniform national standard.

2. See **Figure 1**. In each diagram show the efficient level of environmental quality. Explain the economics underlying each case. (Hint: In diagram D, damages are realized by other firms. At pollution level D_S damages are so large that the harmed firm shuts down.) These are sometimes called non-convex damage curves.

3. Explain pecuniary and Parteo-relevant externalities.

4. Using the concepts of rivalry and excludability, define and classify the following types of goods: private good, club good, open access resource, and pure public good. Use a box diagram and give examples other than those in KO.

5. In the context of nonrenewable resource use, what is user cost or scarcity rent?

6. How do changes in harvest costs, externalities, interest rates, and the price of timber affect the Faustmann rotation.

7. The Faustmann and Wicksell rotation are shorter than a biologic rotation that maximizes timber volume overtime. This seems short sighted. The market result seems to be too anxious to cut. Explain why the shorter rotation makes economic sense and is good for social efficiency.

8. Using the Yield-Effort function described in class, show the areas of biological and economic overfishing. Explain each.

9. Consider a technological advancement in a fishing industry. Show how it changes the results laid out in the simple fishery model laid out in class. What happens to the MEY? What happens to size of rents (net benefits) at MEY? What happens to the MSY? What happens to the size of rents at the MSY. What happens to OA (open access) harvest? What happens to rents at the OA harvest? Finally, show dynamically how the stock of fish moves to its new OA equilibrium.

10. On page 102, KO says "[t]he Wicksell Rule like the Hotelling Rule, is a no-arbitrage condition". Explain what they mean.

11. Livernois (from our readings) finds ".. overall one cannot conclude that the Hotelling Rule has been a significant force governing the evolution of observed prices paths for nonrenewable resources." Why? He claims there are many other factors at work. What are these other factors? Do you think there is some Hotelling-like pressure on prices?

12. Compensating victims for external harm sounds good, but can lead to unintended inefficiencies. Explain. (Baumol and Oates)

13. A Pigouvian tax in a Coasian setting can lead to misallocation of resources. Explain. (Baumol and Oates)

14. See Figure 1. (a.) Show the Pigouvian tax for each diagram. Discuss. (b.) Now, suppose these diagrams apply to a Coasian world (small numbers case). Would an efficient level of pollution prevail after bargaining? Discuss.

15. Show the implications of a monopolistic market in the presence of an externality on the selection of a Pigouvian Tax. Show the welfare loss due a monopoly alone. Then show the added welfare loss due the presence of the externality. Then, show the implications for an efficient environmental tax policy. (See Kolstad reading on Monopoly.)

16. Show the short and long run effects of a subsidy (instead of a tax) per unit of pollutant. (See Kolstad reading on subsidies.)

17. What are the long run incentives for firms to innovate (adopt new pollution control technology) under an emissions tax policy if the government makes "Pigouvian" adjustments to the tax as improvements are made? Show graphically (or mathematically).

18. Keohane and Olmstead devote four pages to the issue of pollution "hot spots." Discuss the context in which hot spots arise and why they are important.

19. Using **Figure 2**, discuss whether a "quantity instrument" or a "price instrument" is preferred. The location of the true MAC is somehwere in between MAC-A and MAC-B in the figure but its exact location is unknown. Show why you prefer one instrument over the other using the figure.

20. Assume we are designing a marketable emission permit policy for water pollution on the Delaware River. Assume there are 4 polluters located on the river and that damage caused by a unit of pollution is the same for each firm. Assume the firms have the marginal value (or marginal abatement cost) functions shown in **Figure 3**.

A total of 7000 permits are initially issued only to Firm A.

(a) Allow the firms to trade permits. Who buys? Who sells? What is the initial and final distribution of permits? What is the equilibrium price after trading?

Who buys? _____ Who sells? _____

	Initial Allocation (number of permits)	Allocation after trading (number of permits)
FIRM A		
FIRM B		
FIRM C		
FIRM D		

Label the new equilibrium price as "Pa" in the diagram.

(b) Suppose the event in (a) has taken place. What happens if an environmental group decides to purchase 3500 permits from the stock of permits on the market? Who buys? Who sells? What is the initial and final distribution of permits? What is the equilibrium price after trading?

Who buys? _____ Who sells? _____

	Initial Allocation (number of permits)	Allocation after trading (number of permits)
FIRM A		
FIRM B		
FIRM C		
FIRM D		
Environmental Group		

Label the new equilibrium price as “Pb” in the diagram.

(c) Suppose the event in (b) has NOT taken place. So we are back to the equilibrium after trading in event (a). What happens if Firm B experiences a technological advancement such that its MAC curve becomes identical to Firm C’s MAC curve? Allow the firms to trade permits. Who buys? Who sells? What is the initial and final distribution of permits? What is the equilibrium price after trading?

Who buys? _____ Who sells? _____

	Initial Allocation (number of permits)	Allocation after trading (number of permits)
FIRM A		
FIRM B		
FIRM C		
FIRM D		

Label the new equilibrium price as “Pc” in the diagram.

21. Show the welfare loss associated with each marginal damage function if a flat tax per unit of emission as shown in **Figure 4** is imposed.

22. Consider **Figure 5** with non-constant external cost. (a) Assume a competitive market. Show the efficiency of implications (total welfare loss) of not regulating the market. (b) Assume a monopolistic market. Show the efficiency implications (total welfare loss) of not regulating the market. (c) From an efficiency perspective, is a tax a good idea in either the competitive or monopolistic setting? If so, how high would you set it in each case?

23. What is the double dividend associated with a pollution tax? Is a double dividend possible with a marketable permit scheme?

24. What is a club good and where does it fit on our rivalry/excludability diagram for defining public and private goods? Give come examples and discuss need for collection action to allocate club goods.

25. What is an Environmental Kuznet's Curve? What is its relevance for policies vis-a-vis developing countries?

26. Describe how a Individual Transferable Quota system works and why it allows for capture of economic rents.

27. What is Wetlands Mitigation Banking? What are its "efficiency enhancing" properties?

28. Consider the regulation of air emissions for some municipality. The more heterogenous the polluters (in terms of their MAC curves), the greater the cost savings from using a tax or tradable permit scheme versus a uniform rollback of emissions. Explain and show graphically.

29. Give some examples of Information-Based approaches to environmental regulation. According to Keohane and Olmstead these approaches provide a different set of incentives and fill a different gap in the market than externalities and public goods. Explain.

30. Consider the two MAC curves in **Figure 6,** one for a victim and one for a polluter. The victim's MAC curve reflects her ability to undertake defensive actions to prevent damage from pollution. What happens in this world in the absence of a Pigovian Tax or Quantity contorl on the polluter? Assume the MAC_{victim} and $MAC_{polluter}$ are independent. Assume no Coasian bargaining. (a) Show how much pollution is removed by the polluter. (b) Show how much pollution is removed by the victim. (c) Briefly discuss the inefficiencies present and show the welfare loss.