

Resource & Environmental Economics Field Examination

January 10, 2013

Instructions:

- You have 4 hours to complete the exam. This time commences at the end of the 15-minute reading period during which no writing is allowed.
- Please use your assigned "alpha letter" on every page to identify your exam. Do not use your name or social security number. Write on only one side of the page leaving at least one inch margins. Number each page, and make sure the pages are in order.
- You have four questions to answer.

Answer four of the five questions.

1. The environmental Kuznets curve (EKC) is a phenomenon that has been used by some economists to support the notion that economic growth may occur without long-term, negative, environmental consequences. However, an economist (we'll call her Emma) has collected data on emissions (E) of a pollutant for one year, across many countries, including developing ones, along with estimates of gross domestic product (Y), and she has run a regression of E as a function of Y. Emma finds no evidence of the curve holding true for the sample, even though she allows for the desired curvature in her selected functional form.
 - a. What are the theoretical reasons why an EKC might exist?
 - b. Comment on what you conclude from Emma's regression analysis. Are there additional details you would want to know before reaching your conclusions and how might these be influential?
 - c. What, if anything, would you do differently in your modeling than what Emma did? Justify your response.

2. Fresh scientific findings have identified an indisputable link between greenhouse gas emissions and ocean acidification. Small changes in the acidity of oceans can affect marine life either directly, such as when coral or shellfish (oysters, clams) cannot maintain their protective structures, or indirectly, such as when the marine habitat provided by coral reefs is injured.

Given that marine species are affected by acidification, we can expect a wide range of humanly experienced results. Some species may even be positively affected, but commercial fisheries are expected to be harmed. Recreational experiences are expected to be degraded, including such things as recreational fishing, scuba diving, and snorkeling. Also, initial projections are that biodiversity as a whole will be diminished.

Suppose you are expected to develop empirical information on the value of damages to a particular ocean as a function of its acidity. Assume that you have been given excellent technical information on every physical connection, such as species populations as a function of acidity.

Give an overview of the work you would need to carry out for your report, defining and characterizing the values that would be important, explaining the techniques you would employ, and describing the data that you would gather. Would it be better to estimate a single, integrated model, or a part-by-part analysis and why?

3. Consider a fishery in which the fish stock has been decreasing, but the total value of the harvests has been increasing (after adjusting for inflation).
 - a. Explain how declining catch and increasing total revenue could occur in an unregulated fishery.
 - b. Assume policy makers are interested in maximizing the present value of consumer and producer surplus. Provide the dynamic optimization problem that would be solved by a planner and state the resulting first-order conditions. Explain whether

socially optimal choices would be made in the absence of regulation and why or why not.

- c. If the fishing industry is suitably organized, it could maximize the present value of profits. How would this optimization problem and the resulting optimal choices differ from those established in part b?
4. In many watersheds of the U.S. there are two main sources of water pollution: a small number of large waste water treatment plants serving cities, and many agricultural sources throughout the watershed. While it is possible to monitor the pollution discharged by the waste water treatment plants, it is very difficult and costly to monitor the discharges from the agricultural sources. In many cases, the marginal cost of abatement from agricultural sources is lower than for the waste water treatment plants.
 - a. Formulate an economic model of the problem of reducing water pollution in such a watershed, taking into account the two main sources of pollution and discuss what would be meant by the optimal allocation of abatement. How do monitoring costs affect the optimum?
 - b. One policy proposal that has received substantial attention in recent years is to use tradable permits as a way to address this environmental problem. Discuss the theoretical advantages of using water quality trading relative to a standard traditional regulatory approach.
 - c. Discuss two theoretical challenges that should be considered in this situation, explaining how in this situation the theoretical optimum is unlikely to be achieved.
 5. In a rural region of India, ground water levels have been in slow decline because pumping exceeds natural recharge. The dominant use is irrigation on very small farms. Wells are hand dug; pumping regulations are absent; and electricity for irrigation pumping is publicly subsidized.

Recently, Coca Cola (Coke) has worsened ground water conditions by building a bottling plant that produces Coke for the regional market. A investigative study has found that for each liter of Coke, about 3 liters of water is needed for production. Because Coke is pumping water from drilled wells drawing from the local aquifer, farmers are digging deeper to obtain water, sometimes under dangerous conditions, and pumping costs are rising for farmers. Consequently, the media is characterizing Coke as an unnecessary luxury good that is displacing the production of food and harming farmers.

Describe the content of your forthcoming report on the "economics and policy" of this issue by answering the following questions.

- a. Develop the crucial economic concepts and theory of your report. Include attention to the selected social goal(s) of your work and why.
- b. Assuming your report is suitably funded, what empirical work would you conduct and what results do you anticipate?
- c. What policy recommendations would you expect to make, and what would be the justifications for these recommendations?