

**RESOURCE ECONOMICS PRELIMINARY EXAMINATION**  
**August 16, 1993**

You have until 12:00 (four hours) to complete this examination. Exams will be collected promptly. Pace yourself in responding to questions so that you do not spend an undue amount of time on any one question at the expense of other questions. Do not write your name on the exam, rather use the last four digits of your social security number.

**Part I: Answer all of the following three questions**

1. The average individual in a 100-person community has the following Marshallian demand for a local recreational good:

$$x_1 = p_1^{-2} p_2 I^2$$

where the good  $x_1$  has price  $p_1$ ,  $I$  is annual income (in thousands of dollars), and  $p_2$  is the price of some other good. Currently,  $p_1 = 2$ ,  $p_2 = 1/3$ , and average per capita income is \$2,000. City leaders are contemplating the desirability of increasing  $p_1$  from 2 to 8 in order to cover increased production costs.

Calculate the appropriate Hicksian measure corresponding to the "status quo ante" test for the community impact of this policy change.

2. You have been commissioned as the economic analyst for a new kind of water project – dam busting. During the past century, federal agencies of the U.S. government have constructed large numbers of multipurpose water reservoirs. A typical reservoir provides some degree of flood control, domestic water supply, agricultural water supply, hydropower, and lake-related habitat and recreation. The costs of these projects involve construction costs and the loss of natural, river-related habitat and recreation.

During the past 30 years, these projects have become increasingly controversial – primarily due to loss of natural habitats. No where is this more true than in the northwestern U.S. Because of absent or ineffective means for allowing salmon to pass dams, some northwestern rivers have lost their salmon runs completely, and other runs are threatened or greatly diminished. Salmon are ocean-going fish that

must migrate to shallow, fresh water streams to reproduce. They spawn at the location where they were hatched or they die trying.

Several dams are now under consideration for destruction in order to restore salmon runs. Your job is to formulate responses to the following, equally important policy issues.

- a. Prior to construction, a reservoir must pass a benefit-cost test that requires positive net present value. Should the government impose a similar test before allowing a reservoir to be demolished?
  - b. How should a benefit-cost analysis for dam busting be performed? What should be counted? What methods should be employed?
  - c. Should the analysis for dam busting differ in any noteworthy respects from current benefit-cost procedures applicable to dam construction?
3. After consulting with medical, economic, and agricultural experts, the government has determined that the marginal damage inflicted by sulfur dioxide (SO<sub>2</sub>) emissions, measured in dollar terms, is \$X per ton. The government wishes to reduce SO<sub>2</sub> pollution, but realizes that it is very expensive for industry to control pollution. In addition, it realizes that reduction of pollution is more expensive for some industries than for others. In this case, the government knows with certainty the marginal social benefit function but it has no precise or detailed information regarding the marginal social costs of reducing pollution.
- a. What policy can the government introduce to reduce pollution to its "optimal" level? Explain what is meant by an "optimal" level of pollution. Why isn't the optimal level of pollution zero?
  - b. Explain why the policy you recommend in part (a) is superior to the policy of simply telling each firm how much pollution it is allowed to emit, and strictly penalizing any violations of these regulations.
  - c. Is the policy you recommend in part (a) superior to a policy where the government subsidizes the purchase of pollution control equipment? Why or why not?

**Part II: Answer one of the following two questions**

4. Environmental groups in the United States have mounted a campaign against the approval of the North American Free Trade Agreement (NAFTA) between the United States, Mexico, and Canada. According to these groups, NAFTA does not "adequately address environmental concerns along the U.S.-Mexico border." In response, the Clinton Administration has proposed what are popularly known as "side agreements" to address the environmental concerns. You have been invited to participate in drawing up these "side agreements." As a Resource Economist:
  - a. Please identify and discuss three specific environmental problems that ought to be the subject of an international agreement (you may want to contrast your choices with an environmental problem that need not be the subject of an international agreement).
  - b. Select one of the problems you discussed in (a) above and develop a "simple" side agreement to address the problem (more than a paragraph may be overkill).
  - c. What are the pros and cons of the side agreement you have proposed in (b)?
  
5. In environmental and natural resource economics the following concepts are very important; open-access, public goods, externalities, congestion, and common pool resources. In many cases, these concepts are related to some form of misallocation.
  - a. Discuss each of these five concepts and provide an empirical example for each.
  - b. For each concept, identify its relation to resource misallocation problems.
  - c. Is it always advisable to suggest that the government should intervene to solve these resource misallocation problems? Why or why not?