Economics 3250 Dr. Lozada
Spring 2014 Final Exam

This exam has 50 points. There are ten questions on the exam, worth 5 points each.

Put your answers to the exam in a blue book or on blank sheets of paper.

You have until **12:30pm** to take this test.

Answer the questions using as much precision and detail as the time allows. Correct answers which are unsupported by explanations will not be awarded points.

Answer all of the following ten questions.

1. **[5 points]** Define Kenneth Boulding's "Spaceship Earth" analogy and discuss its implications.
2. **[5 points]** How would the "Deep Ecology" school define the moral reference class?
3. **[5 points]** Under what circumstances might Contingent Valuation:
   (a) Overstate willingness to pay?
   (b) Understate willingness to pay?
4. **[5 points]** Discuss the "substitute sites" difficulty with the Travel Cost Method.
5. **[5 points]** Public goods are said to be neither "exclusive" nor "rival." Give an example of a public good and explain why it is neither "exclusive" nor "rival."
6. **[5 points]** Discuss the relationship between:
   (a) "tradable permits" in environmental economics; and
   (b) "individual transferable quotas" in natural resource economics.
7. **[5 points]** Is the McKelvey Box primarily "Ricardian" or "Malthusian"? Why?
8. **[5 points]** Your textbook has a table which includes the following:

	Deaths per million people exposed
Radionulcides in drinking water	6,300
Benzene occupational exposure	39,600
Acrylonitrile occupational exposure	42,300
Arsenic/copper exposure	63,000

   Does it follow that society's first priority, from among these four hazards, should be to take measures reducing "arsenic/copper exposure"? Why or why not?

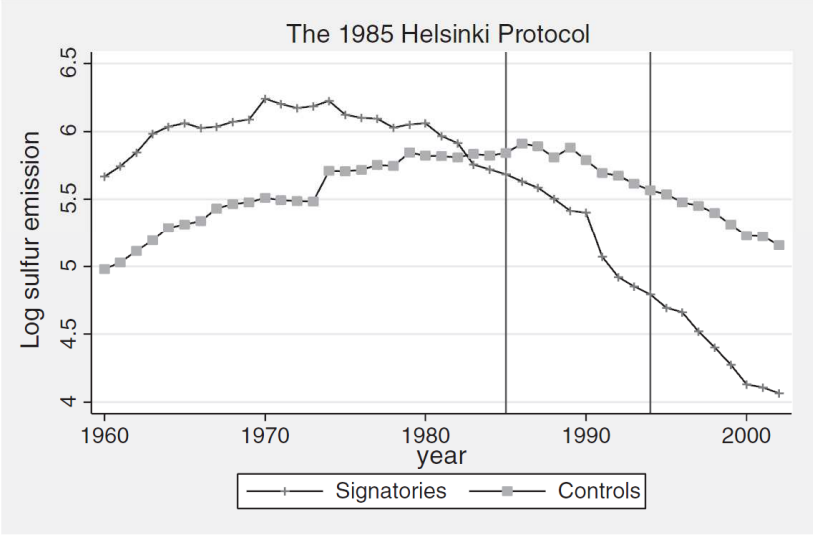
9. **[5 points]** An April 2014 posting on the web site of the U.S.'s "National Aeronautics and Space Administration" (NASA) (`http://climate.nasa.gov/400ppmquotes/`) states in part:

> The global concentration of carbon dioxide in the atmosphere—the primary driver of recent climate change—has reached 400 parts per million (ppm) for the first time in recorded history, according to data from the Mauna Loa Observatory in Hawaii.
>
> Since 1958, the Mauna Loa Observatory has been gathering data on how much carbon dioxide is in the atmosphere. Carbon dioxide has increased by about 24 percent since the beginning of this record. (Source: NOAA)
>
> We rounded up a few scientists here at NASA and asked them what passing 400 ppm means to them.
>
> [. . .]
>
> > "Current [atmospheric] CO_2 values are more than 100 ppm higher than at any time in the last one million years (and maybe higher than any time in the last 25 million years). This new record represents an increase of 85 ppm in the 55 years since David Keeling began making measurements at Mauna Loa. Even more disturbing than the magnitude of this change is the fact that the rate of CO_2 accumulation in the atmosphere has been steadily increasing over the last few decades, meaning that future increases will happen faster. When averaged over 55 years, the increase has been about 1.55 ppm CO_2 per year. However, the most recent data suggest that the annual increase is more than 2.75 ppm CO_2 per year.
> >
> > "These increases in atmospheric CO_2 are causing real, significant changes in the Earth system now, not in some distant future climate, and will continue to be felt for centuries to come. We can study these impacts to better understand the way the Earth will respond to future changes, but unless serious actions are taken immediately, we risk the next threshold being a point of no return in mankind's unintended global-scale geoengineering experiment." –Dr. Charles Miller, Researcher specializing in the remote sensing of carbon dioxide and other greenhouse gases; Principal investigator, Carbon in Arctic Reservoirs Vulnerability Experiment (CARVE) mission

Discuss how effective the Kyoto Protocol has been in light of this news, and how the rate of CO_2 emissions would need to change in order to eliminate this problem.

10. **[5 points]** Figure 1 shows an excerpt from a recent article about the "First Sulfur Protocol" (more formally known as the "1985 Helsinki Protocol") and the "Second Sulfur Protocol" (more formally known as the "1994 Oslo Protocol"). "Signatories" means countries who signed and ratified the protocols; "controls" means countries who did not sign the protocols.

    Defend or attack the proposition that these Protocols were and are a success. Be sure you define which environmental problem these Protocols address.



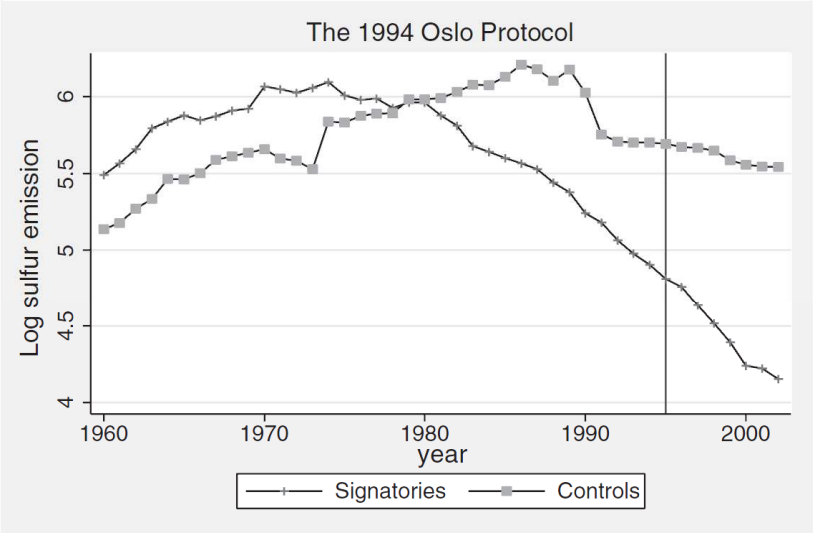


Fig. 1. Mean log sulphur emissions for signatories of the 1985 Helsinki and 1994 Oslo Protocols and their respective control groups. Vertical lines mark the period (start of period) of potential effect of protocols.

Figure 1

Answers to Econ. 3250 Final Exam,

Spring 2014

(1)

"Spaceship Earth" refers to the Earth being a small, isolated, self-reliant part of the universe. (The first photos of Earth taken from outer space were made shortly before the essay was written.) As such, the Earth's physical limits loom large. The economy cannot physically grow to an unlimited extent. The Earth's resources are finite.* As on a real spaceship, recycling is extremely valuable. This perspective contrasts with the earlier "Cowboy Economy" perspective of the Earth as vast and limitless, as a 19th century cowboy on the Great Plains might have seen it.

* and should be conservatively used

② The "Deep Ecology" school would define the moral reference class in a broader manner than other schools of thought. It would include not only humans (present and future) but also non-human life, as well as some abiotic parts of the environment (for example, a famous rock). Being in the moral reference class means having intrinsic value, that is, value above and beyond what value humans give to it.

(3)

a) If the Contingent Valuation survey is anonymous, respondents who approved of an action would have an incentive to overstate their willingness to pay for it, because that:

1) makes it more likely the action will occur; and

2) has no adverse consequences on the respondent (besides the psychological discomfort of not being truthful).

b) If the Contingent Valuation survey is not anonymous, and respondents claiming a certain willingness to pay for an action will in fact have to pay it if the action is undertaken, then respondents have an incentive to understate their true willingness to pay, because:

1) that means they will pay less if the action is undertaken; and

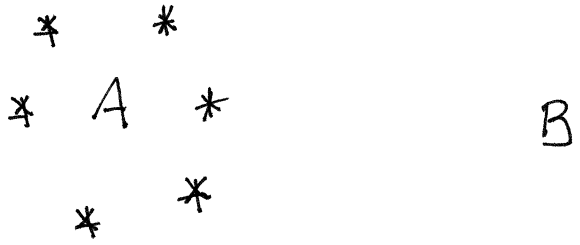
2) it won't decrease by much — only by a little bit — the likelihood of the action being undertaken, because

(thinks the respondent) "other people will report high willingness to pay." (The respondent "free rides" on other people.)

④ Let A and B be national parks whose value will be measured using the Travel Cost Method.

Let * be other national parks. (These are "substitute sites.")

Suppose a map looks like this:



Suppose for sake of argument that the Travel Cost Method valued A and B equally. Then it's likely that in reality, A is worth more than B, because people who went to A did so even when they had other easily available alternatives, whereas people who went to B did not (they might not really like B very much, but had few alternatives).

In general, the Travel Cost Method will understate the value of a site which has many nearby substitutes.

(5)

Exclusive: One can prevent some people from consuming the good.

Example: Clean air is not exclusive because everyone in a city will be able to consume it if it exists.

Rival: If one person consumes the good, someone else cannot consume it.

Example: Clean air is not rival because one person's consumption of it does not prevent someone else from consuming it.

(6)

These are basically the same thing, just in different settings.

	Limit	licenses	license distribution
tradable permits	cap on pollution	can be traded	auction or grandfathering
ITQ's	quota on fish catch	can be traded	" " "

(7)

The McKelvey Box shows how natural resource deposits (such as copper deposits) vary by

a) the likelihood of their existence; and

b) the (high or low) cost of their extraction.

This resembles Ricardo's notion that arable land is not subject to a simple, fixed limit, but instead has a range of qualities and accessibility.

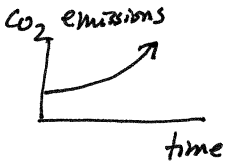
The "Malthusian school" stresses fixed and definite, inflexible limits to natural resources.

(8)

No, because this leaves out the economic cost of reducing each of these pollutants. For example, given a fixed amount of money for pollution control, more lives might be saved reducing one of the other pollutants. We need a "cost to reduce 1 death" column, then reduce pollutants that rank low on that scale.

Another issue is that the table has "deaths per million people exposed" rather than "deaths per million people." Arsenic/copper has a high "deaths per million people exposed," but if almost no one is ever exposed to it, it is not a serious problem.

(9)

The Kyoto Protocol may have been an improvement over what would have happened without it, but this report means that CO_2 emissions are increasing at an increasing rate 

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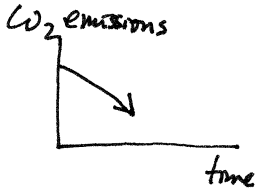
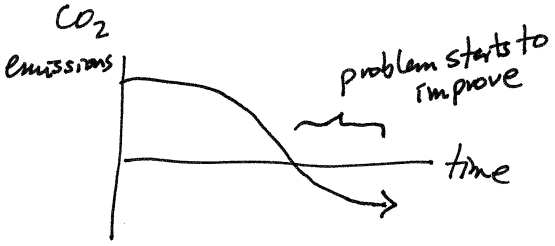
In order to solve the problem, CO_2 emissions would have to look like 

, and only when this curve became negative — net CO_2 withdrawals from the ecosystem — would the problem start to get better. 

The problem is caused by the <u>stock</u> of CO_2 in the atmosphere. CO_2 emissions are the <u>flow</u> which adds to that stock.

Sulfur emissions, in the form of SO_2, cause acid rain, a regional problem. These protocols are European international agreements to reduce sulfur emissions.

Clearly, sulfur emissions in Europe are declining, which is good. The signatories' emissions are declining more than the control group's, so the Protocols might be working; or the signatories' emissions were going to decline more anyway, even if the Protocols had not been signed.* (The authors use econometrics to try to resolve this question.) In any case, the acid rain problem in Europe is getting much better.

* both because their emissions were declining before the Protocols went into effect, and because the control groups' emissions fell too.