

ECN 275/375 – Natural resource and environmental economics
12:15-15:15 March 7, 2023

All help aids allowed except assistance from others.

This test consists of 3 questions, for a total score of 100 points.

All questions are to be answered. You may answer in English or Norwegian.

In the case that you find a question unclear, or you are uncertain about what is meant, state the extra assumptions you need to be able to answer the question.

This test has been made to reduce the usefulness of ChatGPT. For this test using ChatGPT is not considered a violation of the independent work condition for tests/exams.

**When I submit my answers on this test, I confirm that I have worked alone on my answers and not cooperated with others. I am aware that cooperation with others is to be considered an attempt or a contribution to cheat.
I am aware of the consequences of cheating (Ch. 39, Academic regulations for NMBU).**

Your name: NN (+ ECN 275 or ECN 375)

Question 1 (30 points)

Supplying environmental goods and services under varying technologies when there is absence of environmental stock effects. Assume a standard marginal benefit function from increased production of the environmental good, Q .

- (a) (i) Draw a graph that shows the optimal level to produce of an environmental good, Q , with the technology A. Label all axes and curves, and mark the optimal amount Q^A .
(ii) Explain verbally and mathematically the condition for the optimal allocation.
(10 points)

Answer: (i) write here

(ii) write here

- (b) A new production technology, B, is voluntarily* adopted by producers. (i) Draw a curve representing this new technology in the graph for (a), and explain the new curve's relation to the curve you drew in (a). (ii) Mark the optimal amount Q^B , and mark the welfare gains from adopting the new technology. **(10 points)**

* Voluntary adoption in this case: Firms choose to adopt the new technology without the influence of additional governmental regulations or requirements.

Answer: (i) write here

(ii) write here

- (c) (i) Explain verbally how you would calculate the welfare gains in (b). (ii) Set up a mathematical expression that calculates the welfare gains shown in the graph you drew in (b).
(10 points)

Answer: (i) write here

(ii) write here

Question 2 (30 points)

Uniform price procurement auctions opens for truthful revelation of producers' costs of supplying environmental goods like biodiversity or conservation habitat. Such auctions and how they are applied still need to be carefully designed to get *truthful revelation*. There are also some concerns related to uniform price auctions leading to the possible excessive rents to bidders in uniform price auctions. The European Union has even gone further, requiring that in association with payments for environmental contracts, there should be no (extra) rents.

- (a) For procurement auctions: (i) Define truthful revelation. (ii) Define the N^{th} bid, and explain how the price is determined in N -price uniform price auctions and $(N+1)$ -price uniform price auctions. (5 points)

Answer: (i) write here

(ii) write here

- (b) (i) Draw a graph showing that producer rents decline when using the N -price rule over the $(N+1)$ -price rule in a uniform price procurement auction. Explain briefly why you have drawn your graph the way you have. (ii) Explain what the rents to winning bidders are for the two price rules. (iii) Explain verbally why the incentives for truthful bidding are less disputed for an $(N+1)$ -price rule than for an N -price rule auction. (15 points)

Answer: (i) insert graph and write here

(ii) write here

(iii) write here

- (c) Why is the EU's "no extra rent rule" problematic for the truthful revelation properties of policies to supply environmental goods or services? (10 points)

Answer: write here

Question 3 (40 points)

Increasing the share of electric vehicles (EVs) is an important part of Norwegian policies to reduce domestic climate gas emissions. Many economists are highly critical of this EV policy, arguing that one of the faults of these regulations is that the subsidies and other benefits to EV owners are excessive. Non-governmental organizations (NGOs) like Bellona and Zero argue that subsidies and other benefits are necessary compliments to carbon emission taxes or tradable carbon emission permits to achieve sufficiently large reductions in carbon emissions.

Comment on the validity and weaknesses of the following two views:

- (a) The mainstream economic position is that for negative externalities like carbon emissions, environmental regulations should primarily focus on pricing, i.e., taxing, the externality. (10 points)

Answer: write here

- (b) The NGO's position that targeted supports to reward consumers for adopting environmentally more friendly technologies are needed to reach the targets for reduced carbon emissions. (10 points)

Answer: write here

EVs have less emissions over the lifetime of the vehicle compared to fossil fuel powered vehicles (FVs) of similar size provided that the distance driven is sufficiently large. The "life-

time profile” of emissions of EVs and FVs differ, with a high share of EV emissions occurring during the construction phase, while for FVs a large share of emissions occurs from using the vehicle.

- (c) (i) How does this difference in lifetime emission profiles matter from an economic efficiency perspective? (ii) How could you make the efficiency properties of the lifetime emission profiles (life cycle analysis) more comparable to ordinary economic effectiveness analyses? Please justify your answers. **(10 points)**

Answer:

(i) Write here

(ii) Write here

On a wider climate policy scale, there are trade-offs between the expected cost savings from technological progress over time, and the expected gains of early reductions in climate gas emissions.

- (d) How do the above trade-offs influence the extent (strictness) of climate policy over time? Please justify your answer. **(10 points)**

Answer: write here

Jon Olaf Olausen (sign.)
(external controller)

Eirik Romstad (sign.)
(course responsible)