

Name_____

Vorname_____

Matrikel-Nr.:_____

Studiengang:_____

☐ Regulärer Versuch

☐ 1. Whlg.

☐ 2. Whlg.

Universität Rostock

Wirtschafts- und Sozialwissenschaftliche Fakultät

Lehrstuhl für VWL – Außenwirtschaft –

Klausur

Introduction to Environmental and Resource Economics (BSc Wirtschaftswissenschaften)

SoSe 2023, 20. Juli 2023

- Beantworten Sie **zwei der drei** gestellten! Unterschreiben Sie die Klausur auf der letzten Seite. Alle Aufgaben sind gleich gewichtet.
- Erlaubte Hilfsmittel: keine.
- *Please answer **two out of three** questions! All questions are equally weighted.*
- *Additional materials allowed: none.*

Bearbeitungszeit: 90 Minuten

Time limit: 90 minutes

Two (and only two) out of three questions! If you adopt the notation used in the lectures, you do not have to explain the symbols you use.

1. Resource Dynamics / Open-Access Fishery

Use the **predator-prey model** to explain the dynamics of a fishery. The fish is the prey and the fishing fleet is the predator. Without fishing, the stock of fish, $S(t)$, grows exponentially at a rate n . It is diminished by fishing, and the catch is determined by the Shaeffer function, $aF(t)S(t)$, where $F(t)$ is the fishing effort (e.g. the number of ships) and a is a parameter. Let us drop (t) to simplify notation, such that $S = S(t)$ and $F = F(t)$. The fishing fleet grows if the profits, $paFS - cF$, are positive, where p is the constant price and c is the marginal cost of fishing. If profits are negative, some firms leave the market and the fishing fleet shrinks. The resulting change in the size of the fishing fleet is $\dot{F} = paFS - cF$.

Proceed in the following steps:

- Write down the \dot{S} equation.
- Determine the equilibrium conditions $\dot{F} = 0$ and $\dot{S} = 0$ and draw them into a diagram with S on the horizontal and F on the vertical axis.
- Use arrows to show the directions of change of the variables in the four segments of the diagram and then draw closed orbits that show the dynamics of the system.
- Interpret the dynamics verbally.

2. Instruments of Environmental Policy

Draw a **price-quantity diagram** with demand and supply and determine the market equilibrium. In the next step, consider negative environmental externalities of production and assume that the marginal environmental damage is increasing. Determine the optimum and the corresponding Pigouvian tax graphically. Why is the emission tax revenue larger than the environmental damage in this case? In the next step, do a welfare analysis in this diagram for the cases of an emission tax, a command-and-control approach (a limit on production) and an abatement subsidy. Who gains and who loses if we move from taxes to command and control and then to subsidies?

3. Exhaustible Resources

Draw a **four-quadrants diagram** of a market in which competitive resource owners extract an exhaustible resource at constant marginal extraction cost. Demand is downward-sloping and has a choke price at which demand becomes zero. Explain the diagram briefly.

Show what is going to happen if there is an anticipated downward shift in demand at some future date θ before the resource is exhausted ("green paradox"). Draw this into the diagram and explain briefly why there is no price jump at θ .