

Exam - Retake

Adv. PSE I: Systems Competition

Wirtschaftswissenschaftliche Fakultät der Friedrich-Schiller-Universität Jena

Prof. Dr. Silke Übelmesser

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First name:		Last name:	
Student ID:		Course of study:	

Please note:

- (a) The exam consists of 11 pages including this one. Please check whether your copy of the exam is complete.
- (b) The exam consists of 3 questions. The maximum number of points is 60. You have 60 minutes to complete the exam.
- (c) Please answer the questions by writing into the boxes provided after each question. **Do not use your own paper!** Fill your name and student ID number into the form at the top of each page.
- (d) If not defined otherwise, variables have the same meaning as in class. Please make sure that your answers are clearly legible and without any ambiguity. Your answers have to be tractable. If you use diagrams, make sure to label and explain them.
- (e) You may use a calculator, but it must not have a text storage function.
- (f) It is your own responsibility to hand in your copy of the exam to the supervisory staff at the end of the exam.

Question	1	2	3	Sum	Grade
Max. no. of points	20	20	20	60	
No. of points received					

Question 1: Tax Competition (20 Points)

Consider the following model of tax competition between n countries: A representative firm in country i faces the maximization problem (1). All firms produce a single homogeneous good according to the production function $f(k, l)$. The factors of production are capital k and labor l . The first and second derivatives of the production function satisfy the usual conditions: $f_k > 0$, $f_l > 0$, $f_{kk} < 0$, $f_{ll} < 0$, $f_{kl} > 0$. The marginal cost of capital r is considered fixed because of international competition for capital. Labor is immobile and earns the return w . The government levies a tax with tax rate τ on each unit of capital employed.

$$\max_{k,l} \pi = f(k, l) - (r + \tau)k - wl \quad (1)$$

The amount of capital employed by firms depends on the tax rate in their home country i and on the tax rates in the other countries j . These relationships are represented by equations (2) and (3).

$$\frac{\partial k^i}{\partial \tau^i} = \frac{n-1}{n} \frac{1}{f_{kk}^i} \quad (2)$$

$$\frac{\partial k^j}{\partial \tau^i} = -\frac{1}{n} \frac{1}{f_{kk}^j} \quad (3)$$

Question 1(a) (6 Points)

Briefly explain the effect that is described by equations (2) and (3). What role does the number of countries play and why?

Question 1(b) (6 Points)

Now consider the part of the model that deals with the actions of the government in the face of systems competition. The government sets the tax rate τ in order to maximize the utility of its citizens. Utility is obtained from the consumption of a private good c and from the consumption of a tax-financed public good g . The formal representation of this maximization problem is given by (4). Taking the first-order derivative and rearranging yields (5).

$$\max_{\tau} u \left[\underbrace{f(k) - f_k k + r\bar{k}}_c, \underbrace{\tau k}_g \right] \quad (4)$$

$$u_g = u_c \frac{1}{1 + \frac{\partial k}{\partial \tau} \frac{\tau}{k}} \quad (5)$$

- (b1) Do you have to substitute equation (2) or equation (3) into (5) to assess whether the government makes an efficient decision?

- (b2) The decision of the government does not lead to an efficient result. Where can we see that formally?

- (b3) Why does the decision of the government not lead to an efficient result? Explain the economic intuition of this result.

- (b4) Which kind of international agreement would change the maximization problem of the government in such a way that the government arrives at an efficient decision? (There are several correct answers. Please provide only one of them.)

Question 1(c) (8 Points)

We also discussed a different model of tax competition in class. In this other model the maximization problem of the government is given by (6). All symbols have the same meaning as before. However, the public good g enters the maximization problem of the representative firm directly. The function $c(k, g)$ describes the usage cost of capital. We assume $c_k > 0$ and $c_g < 0$.

$$\max_{k, g} \quad \pi = f(k, l) - rk - c(k, g)k - \tau k - wl \quad (6)$$

The government now levies two kinds of taxes to finance public good expenditures: a capital tax with tax rate τ and a labor tax with tax rate τ^L . The government budget is described by (7), where ρ represents the constant marginal cost of providing the public good.

$$\tau^L l + \tau k = \rho g \quad (7)$$

The government still maximizes the welfare of its citizens. From the government's maximization problem we get (8). (We skip the formal representation of the maximization problem itself.)

$$\tau = c_k k \quad (8)$$

In addition it can be shown that equation (9) holds regarding the revenue from the capital tax τk .

$$\tau k = \rho g + \lambda c(k, g)k \quad (9)$$

(c1) Explain the economic intuition of (8).

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(c2) Why can the result (9) be problematic from an economic point of view? Explain the role played by the degree of homogeneity λ in this context.

Question 2: Banking Regulation (20 Points)

Consider the following model of banking regulation which was discussed in class. For now we will assume that we are in a closed economy. Banks act as financial intermediaries. Their customers buy bank bonds which pay an interest rate of $r - 1$. The demand for bank bonds F is completely inelastic to the interest rate.

Banks can invest in safe assets, which yield the certain return $s - 1$, and in firms. The amount of money invested in safe assets is C . The government can force banks to invest at least $C = \varepsilon$ in safe assets. For investments in firms banks can decide about the amount of risk they want to take on: higher risk is associated with a greater return $q - 1$, but also with a greater probability of failure $1 - p(q)$.

Question 2(a) (9 Points)

$$\max_q E\pi = (p(q)q - r)F \quad (10)$$

$$p'(q)q + p(q) = 0 \quad (11)$$

$$\max_{q,C} E\pi = p(q)[sC + (q - r)F] + (1 - p(q))\max(sC - rF, 0) - sC \quad \text{s.t.} \quad C \geq \varepsilon \quad (12)$$

$$\max_{q,C} E\pi = (p(q)q - r)F + (rF - sC)(1 - p(q)) \quad \text{s.t.} \quad C \geq \varepsilon \quad (13)$$

$$(p'(q)q + p(q))F - p'(q)(rF - sC) = 0 \quad (14)$$

$$s(1 - p(q)) = \lambda \quad (15)$$

$$\lambda(C - \varepsilon) = 0 \quad (16)$$

Consider the maximization problem of the bank. A very simple maximization problem is given by (10). This problem yields the first-order condition (11). A more realistic maximization problem is given by (12). Assuming $sC < rF$ we can rearrange the problem to (13). The resulting first-order conditions are (14), (15), and (16).

- (a1) Which form of liability is described by (10)? Which form of liability is described by (12)?

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(a2) Briefly explain (12).

Hints: Why the structure $p(q) \cdot \dots + (1 - p(q)) \cdot \dots$? Why $\max(sC - rF, 0)$? Why $-sC$?

(a3) What is the economic intuition of assuming $sC < rF$?

(a4) Which value of C will banks choose if they decide according to (12) (still assuming $sC < rF$)? Explain the economic intuition of your answer.

Question 2(b) (5 Points)

(b1) How would a risk-neutral social planner calculate the optimal investment risk, i.e. the optimal return q .

Hint: Write down the formal maximization problem of the social planner and explain it.

Question 2(c) (6 Points)

Now consider an open economy. The government sets the minimum equity requirement ε in order to maximize the welfare of its own citizens. Of course, the government in country i can only set the requirement for the banks which are based in country i . The government's maximization problem (17) contains the expected utility of the owners of EU and the expected profits of bank owners $E\pi$. Both groups consist of nationals and foreigners. The share of nationals among the bond owners is given by α . The share of nationals among the owners of the banks is given by β . The maximization problem yields the first-order condition (18).

$$\max_{\varepsilon} W = \alpha EU + \beta E\pi \quad (17)$$

$$\frac{\partial W}{\partial \varepsilon} = (\alpha - \beta)(1 - p(q))s + \alpha \frac{dq}{d\varepsilon} p'(q)(rF - s\varepsilon) \quad (18)$$

Two effects can be distinguished in this first-order condition. Name and briefly explain each effect.

Question 3: Multiple-Choice Questions (20 Points)

You will be **awarded one point** for every statement that is marked correctly. **One point will be subtracted** for every statement that is marked incorrectly. Unmarked answers will be ignored. The minimum total number of points for question 3 is zero.

Question 3(a) Welfare states (5 Points)

In the model by Poutvaara (2008) the young generation of workers becomes internationally mobile upon completing their education. It holds that ...

True False

- | | | |
|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | A government that selectively taxes the income of highly educated workers is unlikely to provide the efficient amount of education. |
| <input type="checkbox"/> | <input type="checkbox"/> | Governments tend to provide an amount of education that is closer to the efficient amount if the weight of the consumption of emigrants in the government's welfare function is higher. |

In the model by Thum and Übelmesser (2002) the old generation decides about the extent of redistribution from the young generation to the old and also about the degree to which the education of the young generation will be applicable internationally. It holds that ...

True False

- | | | |
|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | The old generation can reduce the hold-up problem related to taxing the young generation by providing an education that is applicable internationally to a high degree. |
| <input type="checkbox"/> | <input type="checkbox"/> | The young generation will invest more into its education if its labor productivity abroad is higher. This is true for any degree of international applicability of education. |
| <input type="checkbox"/> | <input type="checkbox"/> | The optimal tax from the point of view of the old generation is an increasing function of the degree of international applicability of education. |

Question 3(b) Regulatory competition (5 Points)

This section refers to the series of models of emissions and spillovers that was discussed in class.

True False

- | | | |
|--------------------------|--------------------------|---|
| <input type="checkbox"/> | <input type="checkbox"/> | In a closed economy without spillovers governments can achieve allocative efficiency by levying a Pigovian tax on emissions. |
| <input type="checkbox"/> | <input type="checkbox"/> | If the damage of all emissions spreads evenly across the world, governments will set a tax rate that leads to an efficient result. |
| <input type="checkbox"/> | <input type="checkbox"/> | The regulatory decision of the government of country i is affected by the extent of the damage that other countries' emissions cause in country i . |

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Now assume that there are no spillovers, but polluting firms are jointly owned by natives and foreigners. Governments only care about the welfare of their own citizens. Governments are likely to regulate in a way that leads to allocative efficiency if they agree to only use . . .

True False

Tradeable Emission Permits

Environmental Standards

Question 3(c) Product standards (5 Points)

Consider the market for machines that are used in the construction industry. Manufacturers offer machines of different qualities. Safer machines are more expensive to manufacture. Buyers cannot assess the quality of a machine before they buy it.

True False

This is a case of ex-post moral hazard.

A selection process will set in. It will end when only machines of medium and lower quality are left on the market.

A government that aims to maximize the total welfare of all market participants will enact safety standards that satisfy the following condition: the marginal cost of an increase in quality equals the marginal utility of an increase in quality.

Assume that regulation is justified by the selection principle in a closed economy. It is likely that buyers will be able to tell whether or not governments are overregulating if borders are open and governments engage in systems competition.

Governments that are engaged in systems competition can no longer enact regulation that affects the profits of machine manufacturers in their own country.

Question 3(d) Competition of competition rules (5 Points)

True False

A transition from a Cournot oligopoly to a Stackelberg oligopoly would lead to a redistribution of rents from consumers to producers.

Ceteris paribus a Stackelberg oligopoly is characterized by higher welfare than a Cournot oligopoly.

Assume that governments are engaged in systems competition. It can only be an equilibrium to uphold national ordo-liberal antitrust laws if no firm can credibly commit to an output quantity.

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At the end of the deregulation race described by Hans-Werner Sinn it holds that ...

True False

 Overall welfare is larger than in a situation where all governments stick to ordo-liberal antitrust laws.

 The situation at the end of the race is a Pareto improvement over a situation where all governments stick to ordo-liberal antitrust laws.
