

UNIVERSITY OF OSLO
DEPARTMENT OF ECONOMICS

Exam: **ECON4622 – Public Economics II**

Date of exam: Wednesday, December 7, 2016 **Grades are given:** December 22, 2016

Time for exam: 09.00 a.m. – 12.00 noon

The problem set covers 3 pages (incl. cover sheet)

Resources allowed:

- No written or printed resources – or calculator - is allowed (except if you have been granted use of a dictionary from the Faculty of Social Sciences)

The grades given: A-F, with A as the best and E as the weakest passing grade. F is fail.

Problem 1. (20% weight)

- a) Devereux & Griffith (2003) define the effective marginal tax rate (EMTR) as

$$\text{EMTR} = \frac{\tilde{p} - r}{\tilde{p}}$$

where r is the after-tax rate of return and \tilde{p} is the before-tax rate of return.

- a1) Why is the EMTR a relevant measure to evaluate a tax system?
a2) If a tax system implies an EMTR of zero, what does this mean?
- b) The effective average tax rate (EATR) is another measure of tax distortion.
What does it measure and under which circumstances is it a more appropriate measure than the EMTR?
- c) A main element of the Norwegian shareholder income tax of 2006 is to tax only the “above-normal” return to shares. Explain briefly what this means and state the main reasoning for this tax design.

Problem 2. (60% weight)

As in Hoyt (1991) there are J identical countries indexed $j \in \{1, \dots, J\}$. Each country j consists of a unit mass of identical households and firms. The representative firm in country j produces a homogenous good using capital K_j as the unique input factor. The rate of return on capital is ρ . The production function is $F(K_j)$ with $\frac{dF}{dK_j} > 0$ and $\frac{d^2F}{dK_j^2} < 0$. The firm maximizes its profits. Output can be used for private consumption x_j or can be (without additional costs) transformed one-to-one into a public good g_j . The public good is financed by a source-based tax on capital, i.e. the tax is levied on capital input. The tax rate is denoted by τ_j . The budget constraint of the government in country j , therefore, reads $g_j \leq \tau_j K_j$. The representative household in country j realizes utility due to the consumption of the private good and the public good. The quasi-concave utility function is $u(x_j, g_j)$ with $\frac{du}{dx_j}, \frac{du}{dg_j} > 0$. The household is exogenously endowed with capital \bar{K}_j that is invested on the capital market. Capital supply on the capital market, therefore, is $\bar{K} = \sum_j \bar{K}_j$.

- a) Write down the profit function of the firm in country j , derive the first-order condition for capital demand K_j , and interpret your solution.
- b) Write down the capital market equilibrium and show how the rate of return on capital ρ is affected by a change in a single country’s tax rate τ_i with $i \in \{1, \dots, J\}$. You are asked to derive $\frac{d\rho}{d\tau_i}$ formally. Interpret your result and explain how $\frac{d\rho}{d\tau_i}$ depends on the number of countries J .

- c) The governments of all countries choose their capital tax τ_j competitively in order to maximize the utility of their representative household taking the budget constraint into account. The symmetric Nash equilibrium is characterized by

$$MRS \equiv \frac{\frac{du}{dg_j}}{\frac{du}{dx_j}} > 1.$$

Interpret the result and explain the basic mechanism leading to the result. You are not asked to prove the result.

- d) Explain (verbally) why a coordinated equal increase of the capital tax rates in all countries enhances welfare in all countries.
- e) Explain (verbally) why asymmetries in the countries' population sizes can make coordination difficult.

Problem 3. (20% weight)

- a) Briefly discuss why governments should care about profit shifting.
- b) Give an example how profit shifting can affect the optimal design of a tax system.