

Written Exam for the B.Sc. or M.Sc. in Economics summer 2012

**Public Finance**

Final Exam

June 25, 2012

(3-hour closed book exam)

Please note that the language used in your exam paper must correspond to the language of the title for which you registered during exam registration. I.e. if you registered for the English title of the course, you must write your exam paper in English. Likewise, if you registered for the Danish title of the course or if you registered for the English title which was followed by “eksamen på dansk” in brackets, you must write your exam paper in Danish.

If you are in doubt about which title you registered for, please see the print of your exam registration from the students’ self-service system.

You are supposed to answer ALL questions. The assignments (1A)–(3C) carry all the same weight in the assessment.

### Part 1: Challenges in achieving a social optimum

(1A) Describe the implications of Arrows impossibility theorem for the construction of social welfare functions.

(1B) Discuss the potential problem of country-specific regulation policies in dealing with a global externality (e.g. Greenhouse gas emissions) when global regulation policies do not exist.

(1C) Discuss why it may be socially optimal to delegate the provision of local public goods to local policy makers, and discuss also potential problems of this delegation.

### Part 2: Responses to taxation and taxes on high incomes

Consider an individual with preferences represented by the utility function

$$u = \mu c - \frac{\varepsilon}{1 + \varepsilon} z^{\frac{1+\varepsilon}{\varepsilon}},$$

where  $c$  is consumption and  $z$  is taxable income, while  $\mu$  and  $\varepsilon$  are positive parameters. The budget constraint of the individual is given by

$$c \leq z - T(z),$$

where  $T(z)$  is a tax function.

(2A) Show that the optimum of the individual is characterized by  $z^* = [\mu(1 - m)]^\varepsilon$ , where  $m \equiv T'(z^*)$  is the marginal tax rate. Derive the elasticity of taxable income with respect to the after-tax rate  $(1 - m)$ .

Assume that the tax function is described by

$$T(z) = m_L \hat{z} + m_H (z - \hat{z}),$$

where  $\hat{z}$  is a threshold, which is below the individual's optimal choice  $z^*$ , while  $m_L$  and  $m_H$  are tax rates fulfilling  $m_H > m_L$ .

(2B) Illustrate the budget set, indifference curves and the optimal choice of the individual in a diagram with income  $z$  out of the first axis and consumption  $c$  out of the second axis.

**(2C)** Illustrate in diagrams similar to above how an increase in  $m_L$  and  $m_H$ , respectively, change the optimum of the individual. Provide an economic interpretation of the results.

**(2D)** Derive the impact on household utility and government tax revenue of a marginal change in  $m_L$  and  $m_H$ , respectively. Provide an economic interpretation of the results and discuss the importance of the behavioral response of the individual for the result obtained.

The revenue-maximizing tax rate for  $m_H$  is equal to

$$\tilde{m}_H = \frac{1}{1 + \varepsilon \cdot \alpha}, \quad (1)$$

where  $\alpha = z^*/(z^* - \hat{z})$ . The table below reports the size of  $\tilde{m}_H$  for different values of the two parameters.

$\alpha :$	3.4	3.4	3.4	1.8	1.8	1.8
$\varepsilon :$	0.1	0.2	0.3	0.1	0.2	0.3
$\tilde{m}_H :$	74.6%	59.5%	49.5%	84.7%	73.5%	64.9%

**(2E)** Provide a thorough discussion of the importance of  $\varepsilon$  and  $\alpha$  for the size of the revenue-maximizing tax rate.

### Part 3: Incidence and empirical measurement

Consider a perfectly competitive labor market with many firms who demand labor and many workers who supply labor. The cost per hour of work of firms is denoted by  $w_F = w_W + t$ , where  $w_W$  is the wage rate paid to workers while  $t$  is a tax per hour of work paid by the firm.

**3A)** Who has the formal tax incidence in this case? Describe the difference between the definition of formal/legal tax incidence and the definition of economic incidence.

Consider an increase in the tax rate  $t$ , which raises the aggregate tax burden of workers and firms. The share of the extra tax burden born by workers ( $I_W$ ) and firms ( $I_F$ ), respectively, may approximately be written as

$$I_W \approx \frac{\varepsilon_F}{\varepsilon_F + \varepsilon_W}, \quad I_F \approx \frac{\varepsilon_W}{\varepsilon_F + \varepsilon_W},$$

where  $\varepsilon_W$  is the elasticity of labor supply with respect to wage rate  $w_W$ , while  $\varepsilon_F$  is the (numerical) elasticity of labor demand with respect to the wage rate  $w_F$ .

**3B)** Describe how the economic incidence depends on the elasticities and the economic intuition behind these relationships. Describe in what case(s) the economic incidence would coincide with the formal incidence.

The article "The Incidence of Mandated Maternity Benefits" in the American Economic Review (1994) by Jonathan Gruber studies the incidence of mandated maternity benefits paid by employers through health insurances for their employees. Below is a copy of Table 3 from the article.

TABLE 3—DDD ESTIMATES OF THE IMPACT OF STATE MANDATES ON HOURLY WAGES

Location/year	Before law change	After law change	Time difference for location
<i>A. Treatment Individuals: Married Women, 20–40 Years Old:</i>			
Experimental states	1.547 (0.012) [1,400]	1.513 (0.012) [1,496]	–0.034 (0.017)
Nonexperimental states	1.369 (0.010) [1,480]	1.397 (0.010) [1,640]	0.028 (0.014)
Location difference at a point in time:	0.178 (0.016)	0.116 (0.015)	
Difference-in-difference:	–0.062 (0.022)		
<i>B. Control Group: Over 40 and Single Males 20–40:</i>			
Experimental states	1.759 (0.007) [5,624]	1.748 (0.007) [5,407]	–0.011 (0.010)
Nonexperimental states	1.630 (0.007) [4,959]	1.627 (0.007) [4,928]	–0.003 (0.010)
Location difference at a point in time:	0.129 (0.010)	0.121 (0.010)	
Difference-in-difference:	–0.008: (0.014)		
<b>DDD:</b>	<b>–0.054</b> <b>(0.026)</b>		

*Notes:* Cells contain mean log hourly wage for the group identified. Standard errors are given in parentheses; sample sizes are given in square brackets. Years before/after law change, and experimental/nonexperimental states, are defined in the text. Difference-in-difference-in-difference (DDD) is the difference-in-difference from the upper panel minus that in the lower panel.

**3C)** Describe the main conclusion concerning economic incidence in Gruber (1994), and describe carefully the identification strategy behind the empirical analysis.