Written Exam at the Department of Economics summer 2018

Public Finance

Final Exam

June 16, 2018
(3-hour closed book exam)

Answers only in English.

This exam question consists of 4 pages in total (excluding this front page)

NB: If you fall ill during an examination at Peter Bangsvej, you must contact an invigilator in order to be registered as having fallen ill. In this connection, you must complete a form. Then you submit a blank exam paper and leave the examination. When you arrive home, you must contact your GP and submit a medical report to the Faculty of Social Sciences no later than seven (7) days from the date of the exam.

Be careful not to cheat at exams!

- You cheat at an exam, if during the exam, you:
  - Make use of exam aids that are not allowed
  - Communicate with or otherwise receive help from other people
  - Copy other people's texts without making use of quotation marks and source referencing, so that it may appear to be your own text
  - Use the ideas or thoughts of others without making use of source referencing, so it may appear to be your own idea or your thoughts
  - Or if you otherwise violate the rules that apply to the exam

You are supposed to answer ALL questions. The assignments (1A)-(3D) all carry the same weight in the assessment. The end of each question is marked by #.

Part 1: Social welfare and redistribution

Consider an economy consisting of two individuals (low skilled denoted L and high skilled denoted H). Both individuals maximize the following utility function

$$U_i(c_i, h_i) = u(c_i) - v(h_i), \tag{1}$$

subject to the budget constraint

$$c_i = w_i h_i - T_i, \tag{2}$$

where c_i is consumption, h_i is labor supply, T_i is an individual lump sum tax and w_i is the individual wage rate where $w_H > w_L$.

(1A) Show that the individuals' utility maximization implies the following first order condition

$$w_i u'(c_i) = v'(h_i) \tag{3}$$

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The government sets lump sum taxes in order to maximize social welfare given by

$$W = \sum_i U_i(c_i, h_i) \tag{4}$$

subject to the budget constraint

$$T_L + (1-q)T_H = 0, \tag{5}$$

where $0 \leq q \leq 1$ is a revenue loss when collecting taxes from the high skilled.

(1B) Show that at the social optimum, the government will set lump taxes such that $(1-q)u'(c_L) = u'(c_H)$. Discuss how q affects the amount of redistribution and the implications for the utility levels of the two individuals.

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(1C) How does the level of redistribution in (1B) change if the goverment weights the utility of the low skilled individual higher than the utility of the high skilled. That is, if the social welfare function is given by $W = gU_L(c_L, h_L) + U_H(c_H, h_H)$ with $g > 1$?

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Part 2: Taxation of high income earners

Consider a large number of individuals who face a two-bracket tax system with a marginal tax rate t_1 on pre-tax income (z) below a threshold K and a marginal tax rate $t_2 > t_1$ on the income exceeding K.

(2A) Illustrate in a diagram with pre-tax income (z) on the x-axis and after-tax income (c) on the y-axis, the budget set created by the tax system, and show how the budget set changes, when the top tax rate (t_2) is increased. Discuss how the labor supply of the individuals is affected by income and substitution effects depending on their initial pre-tax income.
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The revenue from the top tax is given by:

$$R = t_2(\bar{z} - K)N, \tag{6}$$

where $\bar{z}$ is the average pre-tax income for the individuals above the threshold K and N is the number of top tax payers. Assume that $\bar{z}$ depends positively on the after-tax rate $(1 - t_2)$ with a constant elasticity ε.

(2B) Show that the effect of a marginal increase in t_2 on the government's revenue can be written as:

$$\frac{dR}{dt_2} = \left(\frac{1}{\alpha} - \frac{t_2}{1 - t_2}\varepsilon\right) N\bar{z}, \quad where\ \alpha = \frac{\bar{z}}{\bar{z} - K}. \tag{7}$$

Provide an interpretation of α and comment on how $\frac{dR}{dt_2}$ depends on α.
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(2C) Show that the revenue maximizing top tax rate ($\hat{t}$) is given by:

$$\hat{t} = \frac{1}{1 + \varepsilon\alpha} \tag{8}$$

Comment on the expression and describe how it differs from the revenue maximizing tax rate in a tax system with a constant marginal tax rate on all income (a proportional tax system).
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Part 3: Tax incidence and empirical measurement

Consider a perfectly competitive labor market with many firms who demand labor and many workers who supply labor. The government levies a unit tax (t) on labor, so that the cost per unit of labor for firms is given by $w_F = w_W + t$, where w_W is the wage rate paid to workers. Given a marginal increase in t, the share of the extra tax burden born by workers (I_W) and firms (I_F), respectively, may approximately be written as

$$I_W \approx \frac{\varepsilon_F}{\varepsilon_F + \varepsilon_W}, \quad I_F \approx \frac{\varepsilon_W}{\varepsilon_F + \varepsilon_W}, \tag{9}$$

where ε_W is the elasticity of labor supply with respect to wage rate w_W, while ε_F is the (numerical) elasticity of labor demand with respect to the wage cost w_F.

(3A) Describe how the economic incidence depends on the elasticities and the economic intuition behind these relationships.

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The article "The Incidence of Mandated Maternity Benefitts" 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 (next page) is a copy of Table 3 from the article.

(3B) Describe the empirical analysis and explain, using Table 3 in Gruber (1994), how the author arrives at his estimate.

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(3C) What is the main identifying assumption needed in (3B) for the estimate to be the causal effect of mandated maternity benefits on the hourly wages of fertile women? Describe how you could validate the main identifying assumption and what kind of data you would need to do so.

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Imagine that employers shifted the costs of the mandated maternity benefits to all workers within a given state and not just to fertile women.

(3D) How would this effect be captured in Gruber's empirical analysis in Table 3? That is, what would you expect the DDD estimate to be in this case?

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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
A. *Treatment Individuals: Married Women, 20–40 Years Old:*			
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)		
B. *Control Group: Over 40 and Single Males 20–40:*			
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)		
DDD:	**−0.054** **(0.026)**		

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.