

Written Exam at the Department of Economics winter 2019-20

**Public Finance**

Final Exam

January 20, 2020

(3-hour closed book exam)

Answers only in English.

**This exam question consists of 6 pages in total including this front page.**

**Falling ill during the exam**

If you fall ill during an examination at Peter Bangs Vej, you must:

- contact an invigilator who will show you how to register and submit a blank exam paper.
- leave the examination.
- contact your GP and submit a medical report to the Faculty of Social Sciences no later than five (5) 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. All of the questions (1A)-(3E) will carry the same weight in the assessment.

### **Part 1: Intergenerational mobility**

The article “Where Is the Land of Opportunity? The Geography of Intergenerational Mobility in the United States” by Chetty et al. (2014) provides empirical evidence on the degree of intergenerational mobility.

(1A) Describe the concept of intergenerational mobility and describe why it may be relevant for a society to care about the degree of intergenerational mobility.

It is common in studies of intergenerational mobility to estimate the equation

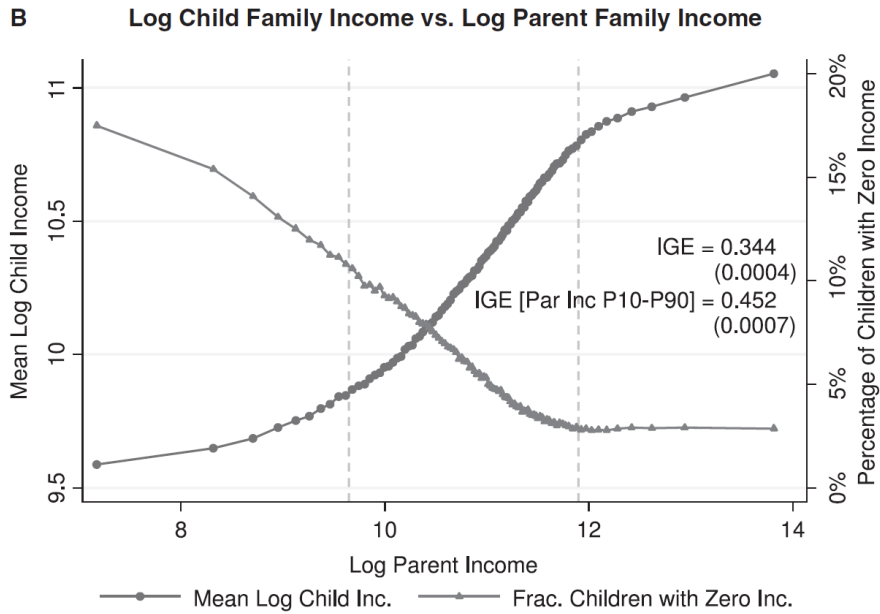
$$\log y_g = \beta_0 + \beta_1 \log y_{g-1} + \varepsilon, \quad (1)$$

where  $y_g$  denotes the income of individuals in generation  $g$ ,  $y_{g-1}$  denotes the income of the parents (generation  $g-1$ ) and  $\varepsilon$  is an error term.

(1B) What does the coefficient  $\beta_1$  measure? Describe the empirical results shown in Figure 1 on the next page and why this evidence suggests that it may be problematic to use the regression (1) in studies of intergenerational mobility.

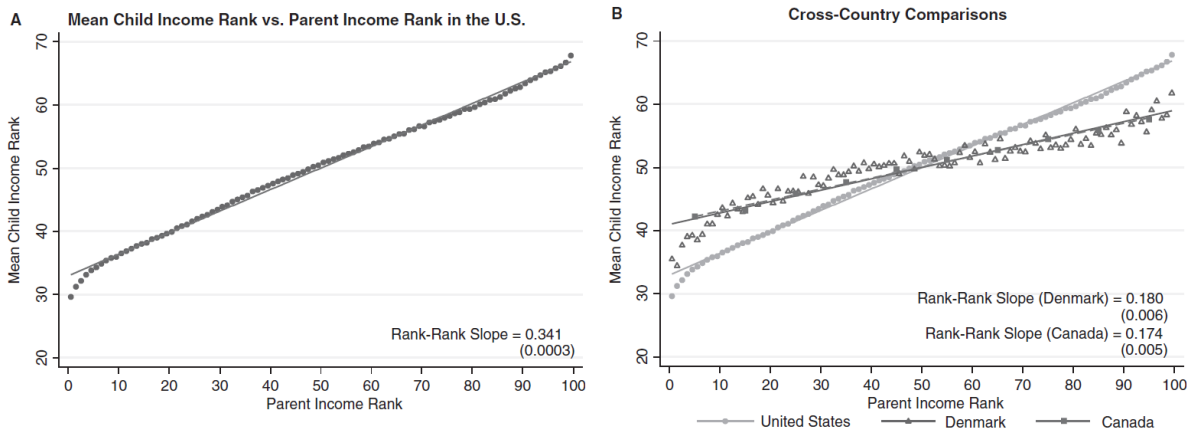
(1C) Describe the empirical results in Figure 2 on the next page and how it is informative about the degree of intergenerational mobility.

Figure 1: Relationship between child income and parental income in the US



Note: Reprinted from Chetty et al. (2014). “Where Is the Land of Opportunity? The Geography of Intergenerational Mobility in the United States.” Quarterly Journal of Economics 129(4).

Figure 2: Relationship between child income and parental income in the US, Denmark and Canada



Note: Reprinted from Chetty et al. (2014). “Where Is the Land of Opportunity? The Geography of Intergenerational Mobility in the United States.” Quarterly Journal of Economics 129(4).

## Part 2: Breakdown of the second welfare theorem

Consider a society with two individuals: A high ability type (H) with a high hourly wage rate  $w_H$  in the labor market and a low ability type (L) with a low hourly wage rate  $w_L$  in the labor market. They have the same utility function given by

$$U(c, h) = u(c) - v(h), \quad (2)$$

where  $c$  is consumption,  $h$  is hours of work,  $u(\cdot)$  is a strictly concave function with standard properties, while  $v(\cdot)$  is a strictly convex function with standard properties. The budget constraint for type  $i = H, L$  is given by

$$c_i = w_i h_i - T_i, \quad (3)$$

where  $T_i$  is an individual lump sum tax. The optimal number of hours of the two individuals is characterized by

$$w_i u'(c_i) = v'(h_i). \quad (4)$$

The social planner has a utilitarian objective function:

$$W = U(c_H, h_H) + U(c_L, h_L). \quad (5)$$

The social planner maximizes equation (5) with respect to  $T_H$  and  $T_L$  subject to the decision rules of the two individuals (4) and subject to

$$T_L + T_H = 0. \quad (6)$$

**(2A)** Provide an economic interpretation of equation (6).

**(2B)** Show how to derive equation (4) and provide an economic interpretation of this equation.

**(2C)** Show that the allocation preferred by the social planner, as described above, is characterized by

$$c_H = c_L \text{ and } h_H > h_L.$$

**(2D)** Argue why it is possible or not possible for the social planner to implement this solution depending on whether the social planner can observe (a) the hourly wage rates  $w_i$  or (b) only the income levels  $z_i = w_i h_i$ .

### Part 3: Estimation of the elasticity of taxable income

In November 2007, the business man and politician Lars Kolind suggested a major reduction in the top tax rate for people living on Fyn (the large island in the middle of Denmark) for a five-year period as an experiment to study behavioral effects of income taxes. The experiment was never carried out in practice, but Table 1 below shows some hypothetical results from the suggested experiment/reform. The reform reduced the effective top tax rate on Fyn from 70 percent to 61 percent corresponding to a change in the net-of-tax rate,  $1 - t$ , by 30 percent, while tax rates for the rest of Denmark and non-top tax payers on Fyn remained unchanged.

Table 1 shows the average, logarithmic wage income for different income groups living on Fyn and living in the rest of Denmark before the reform (Pre) and after the reform (Post). The goal is to get an estimate of the income response to a lower top tax rate, which may be used to compute the elasticity of taxable income. The bottom panel in Table 1 provides different estimates of income response (the table does not provide standard errors, but we assume that E1-E9 are precisely estimated statistically).

<b>Table 1: Wage income across groups and time</b>		
	2008	2010
Location/year	Pre	Post
<b>Fyn, average log wage income</b>		
A. Top tax payers	12,912	12,971
B. Other tax payers	12,612	12,626
<b>Rest of Denmark, average log wage income</b>		
C. Top tax payers	13,412	13,446
D. Other tax payers	13,122	13,141
<b>Estimates of earnings responses</b>		
E1 = $A^{pre} - B^{pre}$ :		0,300
E2 = $C^{pre} - D^{pre}$ :		0,290
E3 = $A^{post} - A^{pre}$ :		0,059
E4 = $B^{post} - B^{pre}$ :		0,014
E5 = $(A^{post} - A^{pre}) - (B^{post} - B^{pre})$ :		0,045
E6 = $(C^{post} - C^{pre}) - (D^{post} - D^{pre})$ :		0,015
E7 = $(A^{post} - A^{pre}) - (C^{post} - C^{pre})$ :		0,025
E8 = $(B^{post} - B^{pre}) - (D^{post} - D^{pre})$ :		-0,005
E9 = E5 - E6 :		0,030

**(3A)** Provide a definition of the elasticity of taxable income.

**(3B)** Advisor #1 believes the best estimate of the income response to a lower top tax rate is E1. Do you agree with this advisor? Explain why or why not?

**(3C)** Advisor #2 believes the best estimate of the income response is E3. However, advisor #1 argues that estimate E4 is showing that the estimate E3 is likely to be upward biased. Which of the two advisors do you agree with? Explain why.

**(3D)** The two differences-in-differences estimates E5 and E7 give two different results. Discuss the different assumptions underlying these two estimates and why the results may be different. Do you think these two estimates are equally good or do you prefer one estimate over the other estimate? Explain why.

**(3E)** What would be your preferred estimate in Table 1? Explain why. Describe the potential threats to identification of this estimate.