Written Exam at the Department of Economics summer 2018

Public Finance

Re-examination Exam

August 23, 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: Tax Incidence

Consider a worker with the following utility function

$$u(c,h) = c - v(h), \tag{1}$$

where c is consumption and h is labor supply. The worker maximizes utility subject to the following budget constraint

$$c = w_S h, \tag{2}$$

where w_S is the after-tax wage rate that the worker receive. The consumer takes w_S as given.

(1A) Show that the effect of a marginal increase in w_S on the worker's utility is given by

$$\frac{\partial u(c,h)}{\partial w_S} = h. \tag{3}$$

Provide intuition for the result. In particular, for why the effect is independent of the worker's behavioral response to the higher after-tax wage rate.
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Assume that the after-tax wage is given by $w_S = w_D - t$, where w_D is the wage rate that firms pay out to workers, and that the initial equilibrium on the labor market is given by $S(w_S) = D(w_D)$, where $S(w_S)$ is aggregate labor supply and $D(w_D)$ is aggregate labor demand.

(1B) Show that the effect of an increase in t on the after-tax wage (w_S) is given by

$$\frac{dw_S}{dt} = -\frac{\varepsilon_D}{\varepsilon_D + \varepsilon_S \frac{w_D}{w_S}} \approx -\frac{\varepsilon_D}{\varepsilon_D + \varepsilon_S}, \tag{4}$$

where $\varepsilon_D = -\frac{dD(w_D)}{dw_D}\frac{w_D}{D(w_D)}$ is the (numerical) elasticity of labor demand and $\varepsilon_S = -\frac{dS(w_S)}{dw_S}\frac{w_S}{D(w_S)}$ is the elasticity of labor supply. The last approximation holds when t is small. Describe the economic intuition behind the formula.
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Part 2: Labor taxation in the short run and in the long run

Consider a model economy where firms hire labor (L) and rent capital (K) to produce output (Y) according to the following Cobb-Douglas production function

$$Y = K^{\alpha} L^{1-\alpha}. \tag{5}$$

All markets are perfectly competitive and the wage rate (w_D) and the rental rate (r_D) that firms pay therefore equal the marginal product of labor and capital, respectively. Both labor and capital income are taxed so that the wage rate that workers receive (w_S) and the rental rate that capital capital owners receive (r_S) are given by

$$w_S = (1 - t_L) w_D \tag{6}$$

$$r_S = (1 - t_K) r_D. \tag{7}$$

Finally, assume that workers supply labor according to an aggregate labor supply function $L(w_S)$ with a constant elasticity ε. Log transforming and total differentiating the model above yields the following five model equations

$$\begin{aligned}
\hat{w}_D &= \alpha \left(\hat{K} - \hat{L} \right), && (8)\\
\hat{r}_D &= -(1-\alpha) \left(\hat{K} - \hat{L} \right), && (9)\\
\hat{w}_S &= -\frac{dt_L}{1 - t_L} + \hat{w}_D, && (10)\\
\hat{r}_S &= -\frac{dt_K}{1 - t_K} + \hat{r}_D, && (11)\\
\hat{L} &= \varepsilon \hat{w}_S, && (12)
\end{aligned}$$

where $\hat{x} = dx/x$, that is, the percentage/relative change in x. The government revenue is given by

$$R = t_L w_D L + t_K r_D K. \tag{13}$$

(2A) Show that in the short run, where the capital stock is assumed fixed ($K = \bar{K}$), the effect of an increase in the tax on labor (t_L) on labor supply is given by

$$\hat{L}_{Short} = -\frac{\frac{1}{\alpha}\varepsilon}{\frac{1}{\alpha} + \varepsilon} \frac{dt_L}{1 - t_L}. \tag{14}$$

Comment on the expression and on the importance of α and ε, respectively.
#

(2B) Show that in the long run, where the capital stock is assumed to be perfectly elastic at the world interest rate level ($r_S = \bar{r}$), the effect of an increase in the tax on labor (t_L) on labor supply is given by

$$\hat{L}_{Long} = -\frac{dt_L}{1 - t_L}\varepsilon \tag{15}$$

Comment on the expression and compare it to the effect of an increase in the tax on labor in the short run. Provide intuition for the difference.

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(2C) Is the behavioral effect on the government revenue of an increase in the labor tax largest in the short or in the long run? Does the answer depend on whether capital is taxed ($t_K > 0$) or not ($t_K = 0$)?

Part 3: Inequality and intergenerational mobility

(3A) Define the Pigou-Dalton principle and discuss when the principle is sufficient to rank two (income) distributions according to their degree of inequality.

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(3B) Describe how "inequality" and "intergenerational mobility" are different concepts (although they may be related).

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The article "Intergenerational Wealth Formation over the Life Cycle: Evidence from Danish Wealth Records 1984–2013" in the American Economic Review (2016) by Boserup, Kopczuk and Kreiner studies the impact of bequests following parental death on the wealth distribution of the next generation. Below (next page) is a copy of Figure 2 and Figure 3 from the article.

(3C) Describe the results in each of the graphs and how the graphs lead to different conclusions about the effect of bequests on inequality. How can this difference be explained/reconciled?

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(3D) Provide an argument for whether or not the results in Boserup et al. (2016) are likely to be causal estimates of the effect of bequests on the wealth distribution of the next generation. Is there anything in the graphs that validates or invalidates a causal interpretation?

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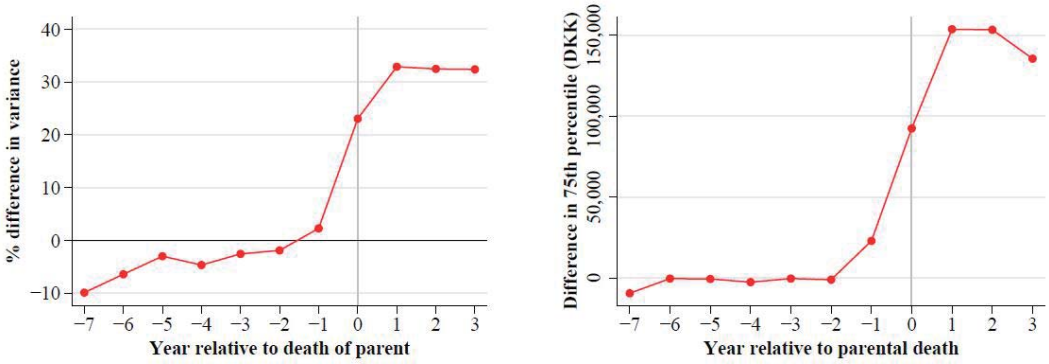
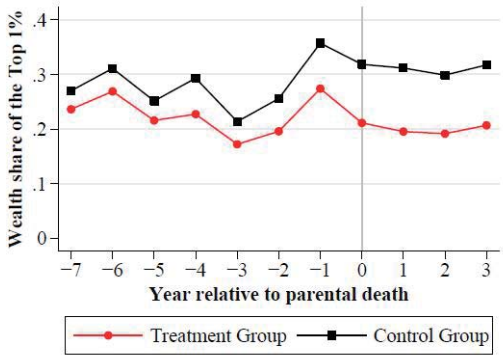
FIGURE 2. EFFECTS OF BEQUESTS ON THE VARIANCE AND THE 75TH PERCENTILE OF THE WEALTH DISTRIBUTION



Note: Percentage difference in variance of treatment group relative to control group (left panel), and difference between treatment group and control group in the value of the 75th percentile (right panel). Variance based on the distributions censored at the 1st and 99th percentiles. Weighting as in Figure 1. \$1 = DKK5.6 in 2010.

FIGURE 3. EFFECT OF BEQUESTS ON TOP 1% SHARE OF WEALTH



Note: Top 1% share in the treatment and control groups. Weighting as in Figure 1.