Written Exam at the Department of Economics winter 2020-21

Public Finance

Final Exam

23 January 2021

(3-hour open book exam)

Answers only in English.

The paper must be uploaded as <u>one PDF document</u>. The PDF document must be named with exam number only (e.g. '127.pdf') and uploaded to Digital Exam.

This exam question consists of 7 pages in total

This exam has been changed from a written Peter Bangsvej exam to a take-home exam with helping aids. Please read the following text carefully in order to avoid exam cheating.

Be careful not to cheat at exams!
You cheat at an exam, if you during the exam:

- Copy other people's texts without making use of quotation marks and source referencing, so that it may appear to be your own text. This also applies to text from old grading instructions.
- Make your exam answers available for other students to use during the exam
- Communicate with or otherwise receive help from other people
- 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
- Use parts of a paper/exam answer that you have submitted before and received a passed grade for without making use of source referencing (self plagiarism)

You can read more about the rules on exam cheating on the study information pages in KUnet and in the common part of the curriculum section 4.12.

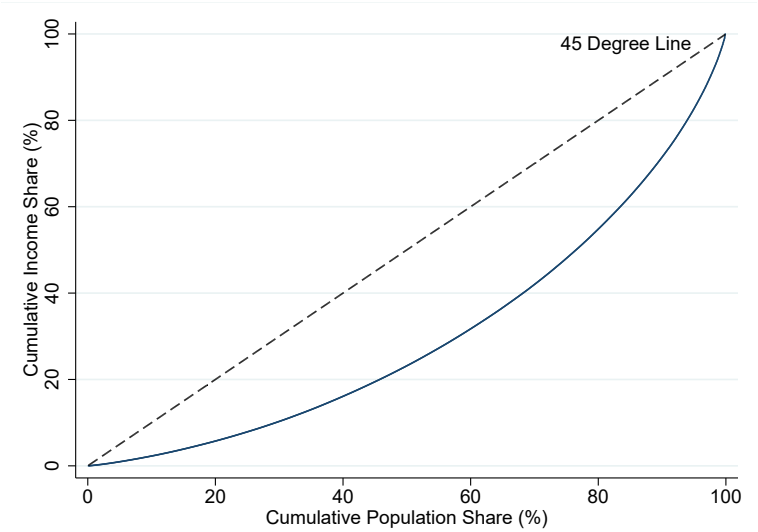
Exam cheating is always sanctioned with a warning and dispelling from the exam. In most cases, the student is also expelled from the university for one semester.

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

Part 1: Inequality Measurement

Figure 1 below shows the Lorenz curve for a hypothetical income distribution.

Figure 1: Lorenz Curve



(1A) Describe how the graph is constructed and relate it to the Gini Coefficient.

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Consider a policy that redistributes income from individuals with income around the median to individuals with income around the 20th income percentile.

(1B) How will this policy affect the Lorenz curve and the Gini coefficient? Does the change in the Gini coefficient satisfy the Pigou-Dalton principle for a sound inequality measure? Explain why or why not.

#

Consider instead measuring inequality as the P80/P50 income ratio (the 80th income percentile divided by the median).

(1C) How is this alternative inequality measure affected by the reform. Does the change in this inequality measure satisfy the Pigou-Dalton principle for a sound inequality measure? Explain why or why not.

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Part 2: Progressive Taxation and Laffer Rates

Consider an economy with N individuals. The preferences of individual i are represented by the utility function

$$u(c_i, z_i) = c_i - \frac{n_i}{1+\frac{1}{\varepsilon}} \left(\frac{z_i}{n_i}\right)^{1+\frac{1}{\varepsilon}}, \tag{1}$$

where c_i is consumption, z_i is labor income and n_i and ε are parameters. The budget constraint is given by

$$c_i = z_i - T(z_i), \tag{2}$$

where $T(z_i)$ describes the tax payment net of transfers. Assume that the tax function is described by

$$T(z_i) = m_L \min(z_i, K) + m_H \max(z_i - K, 0) - B, \tag{3}$$

where K is an income threshold, m_L and $m_H > m_L$ are marginal tax rates, and B is a lump sum benefit. Assume further that s is the share of high-income earners in the population such that $N_H = sN$ are the number of high-income earners with $z_i > K$ and $N_L = (1-s)N$ are the number of low-income earners with $z_i \leq K$.

(2A) Show that the optimal choices of the individuals are characterized by

$$z_i^* = n_i(1-m_i)^{\varepsilon}, \tag{4}$$

where m_i is the marginal tax rate of the individual. Comment on the expression. Describe how labor income responds to changes in m_i and B and why that is?

#

(2B) Argue why total government revenue can be written as

$$R = \sum_i T(z_i) = (1-s)Nm_L\bar{z}_L + sNm_H\left(\bar{z}_H - K\right) + sNm_LK - NB, \tag{5}$$

where $\bar{z}_L$ is the average income of low-income individuals $\left(\bar{z}_L = \frac{1}{N_L}\sum_{i\in L} z_i\right)$ and $\bar{z}_H$ is the average income of high-income individuals $\left(\bar{z}_H = \frac{1}{N_H}\sum_{i\in H} z_i\right)$.

#

(2C) Show that the revenue-maximizing top tax rate $\hat{m}_H$ is given by

$$\hat{m}_H = \frac{1}{1+\alpha\varepsilon}. \tag{6}$$

where $\alpha = \frac{\bar{z}_H}{\bar{z}_H - K}$ and ε is the labor supply elasticity (implied by equation (4)). Discuss the meaning and importance of ε and α.

#

(2D) Show that the revenue-maximizing bottom tax rate $\hat{m}_L$ is given by

$$\hat{m}_L = \frac{1 + \frac{s}{1-s}\frac{K}{\bar{z}_L}}{1 + \varepsilon + \frac{s}{1-s}\frac{K}{\bar{z}_L}}. \tag{7}$$

Describe how $\hat{m}_L$ depends on s and why that is?

#

(2E) Compare the two revenue-maximizing tax rates in question 2C and 2D. Does revenue maximization lead to the highest marginal tax rate for low-income individuals or for high-income individuals? Argue why.

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Part 3: Social Insurance: Moral Hazard

Consider an individual, who faces a risk of becoming unemployed with probability $1 - p$. If she becomes unemployed, she has to decide how hard to search for a new job and thus in effect determine her (expected) unemployment duration (D). In this case, she receives unemployment benefits b for the duration of the unemployment and earns income z for the remaining time in employment. If she does not become unemployed, she earns income z but has to pay contributions to the unemployment insurance scheme t. Hence, her consumption in the event of unemployment is $c_U = Db + (1 - D)z$ and in the event of employment is $c_E = z - t$. A higher unemployment duration D implies less search costs and more leisure, which in isolation gives higher utility captured by $\psi(D)$, where $\psi'(D) > 0$ and $\psi''(D) < 0$. Taken together, the individual's expected utility is given by:

$$U = pu(c_E) + (1 - p)\left(u(c_U) + \psi(D)\right), \tag{8}$$

where $u(\cdot)$ is the utility of consumption with $u'(\cdot) > 0$ and $u''(\cdot) < 0$. The government runs the unemployment insurance scheme with a balanced budget implying that $pt = (1 - p)Db$.

(3A) Show that the first-best insurance scheme (where the government can control D directly) implies that individuals have full insurance ($c_E = c_U$) and the unemployed duration is given by $\psi'(D) = u'(c_U)z$. Comment on the results.

#

(3B) Show that the individual optimization, when b and t are taken as given, implies $\psi'(D) = u'(c_U)(z - b)$. What would be the consequence if the individual had full unemployment insurance in this case?

#

In 2014-2015, the Danish Unemployment Commission and the Danish Economic Council considered a reform that increases unemployment benefits by 25% for unemployed individuals if they have been employed for at least 33 months out of the last 3 years. The reform was never implemented in practice, but Table 1 and Figures 2-4 below show hypothetical empirical evidence on the impact of the suggested reform.

From this empirical evidence, Advisor #1 argues that the reform clearly induces the unemployed to stay longer on benefits as the average unemployment duration of the affected group increases from 1.76 to 4.41 months (see Table 1). In contrast, Advisor #2 argues that the reform is unlikely to have affected the behavior of the unemployed as there is no clear difference after the reform between the average unemployment duration of individuals receiving the higher benefits and individuals who do not.

(3C) Do you agree with the assessment of the reform of each advisor? Explain why or why not?

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(3D) Based only on Table 1, what would be your best estimate of the effect of the reform? Describe the identifying assumption(s) behind your estimate. How would you validate the assumption(s) and is it possible based on the reported evidence?

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(3E) How would you evaluate the reform based on Figure 2-4? Describe the identifying assumption(s) underlying your suggested estimation strategy. How would you validate the assumption(s) and is it possible based on Figures 2-4?

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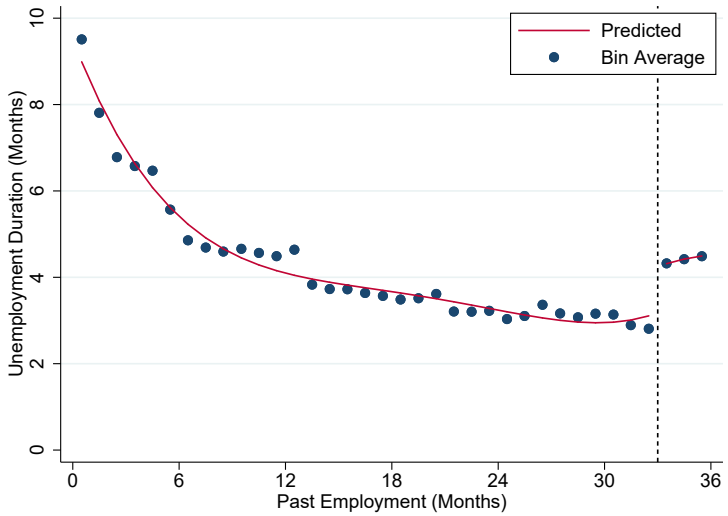
Table 1: Average Unemployment Duration Before and After the Reform

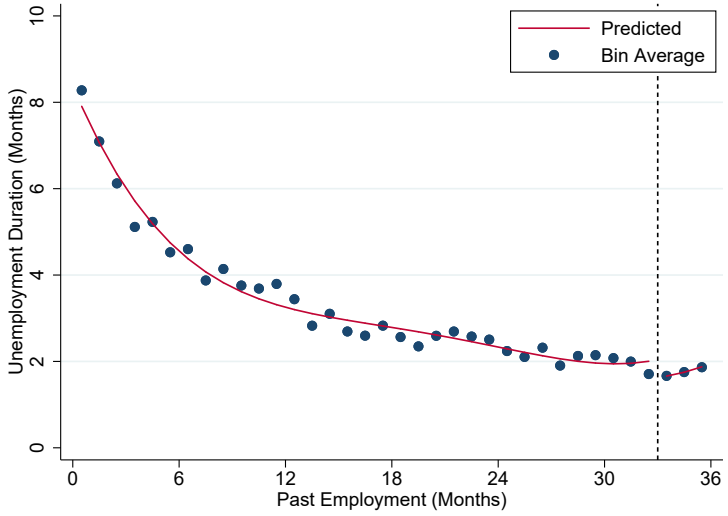
	Past Employment < 33 Months	Past Employment ≥ 33 Months	All Unemployed
		Months	
Before Reform	3.56	1.76	3.45
After Reform	4.46	4.41	4.46

Figure 2: Average Unemployment Duration After the Reform



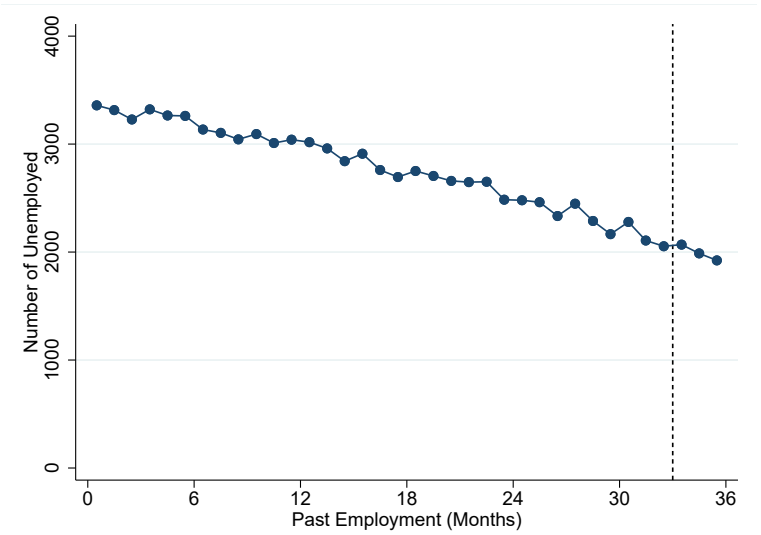
Notes: The figure shows the unemployment duration for individuals depending on their time in employment in the past 3 years after the suggested reform. The dots are the average within each bin (months of past employment) and the line is a fitted line based on a high order polynomial regression of unemployment duration on past employment. The vertical line indicates the 33 month cut-off for increase in the unemployment benefits.

Figure 3: Average Unemployment Duration Before the Reform



Notes: The figure is similar to Figure 1, but shows unemployment duration for individuals depending on their time in employment in the past 3 years before the suggested reform.

Figure 4: Distribution of Past Employment After the Reform



Notes: The figure shows the number of unemployed individuals depending on the past employment after the suggested reform. The vertical line indicates the 33 month cut-off for increase in the unemployment benefits.