

The University of Nottingham

SCHOOL OF ECONOMICS

3 HOUR TAKE HOME EXAM
AUTUMN SEMESTER 2022-23

ECON3003 Advanced Public Economics

Answer the questions from Section A and ONE question from Section B

Active working time guidance: If this were an in-person exam the time limit would be 3 hours

The maximum word limit for this exam is 2000 words.

Specific instructions:

Answers may be either fully handwritten or typed. Typed answers may also include handwritten equations or diagrams.

Handwritten work can be digitally captured using an app such as Adobe Scan, which allows you to capture an image using a smartphone and save it as a compressed PDF file. When digitally capturing handwritten work, it is important that you do not use an excessively large file size.

Submissions must be a single PDF file. It is your responsibility to ensure it contains and reliably displays all desired components.

For further guidance, please see the THE submission instructions.

Academic Misconduct: Please Read the THE submission instructions fully regarding academic misconduct rules and regulations.

SUBMISSION INSTRUCTIONS:

- All submissions should be uploaded into the designated box on the Moodle page by the given submission deadline. Late submissions will receive a mark of zero.
- Please upload in PDF format only.
- Exam start and return times are based on UK clocks (British Summer Time), so if you are based out of the country, please ensure this is considered in your workload planning.
- This rubric should be read in conjunction with the previously released THE submission instructions which provides more detailed information about formatting and referencing.

Submission of your work to the Moodle box constitutes an acceptance of the above procedures and that you have read and understood them.

ECON 3003 Advanced Public Economics
Fall 2022 – Prof. Dario Tortarolo

Final Exam

(A) Optimal Income Tax (60% of the mark)

The new Prime Minister of the UK has decided that the deficit has become too large. She is trying to figure out how to maximize the amount of tax revenue collected so she hires you to compute the tax rate that will maximize income tax revenue. Suppose all the workers have the following utility function:

$$U(c, l) = \frac{c^{1-\theta}}{1-\theta} - l$$

where c is consumption, l is labor supply, and θ is a fixed parameter with $0 < \theta < 1$. Assume also that the only income that individuals have is labor income, with an hourly wage rate given by w taxed linearly at rate t .

1. Write the budget constraint faced by the individual.
2. Set up the utility maximization problem and find the optimal labor supply function l^* .
3. We define the net-of-tax rate as $1 - t$ (i.e., the take-home pay of the marginal dollar earned). What is the effect of increasing $1 - t$ on l^* ?
4. Using the expression you found in part (3), show that the elasticity of labor supply with respect to the net-of-tax rate is $(1 - \theta)/\theta$.
5. Estimate $(1 - \theta)/\theta$ in the UK by comparing UK with Denmark in 2017 relative to 2016, using the data below. State precisely the assumption you are making to identify the labor supply elasticity.

	United Kingdom		Denmark	
year	tax rate	hours worked	tax rate	hours worked
2015	35%	1950	35%	1950
2016	35%	2000	35%	2000
2017	28.5%	2300	35%	2100

6. Find the revenue-maximizing tax rate given an estimate of $(1 - \theta)/\theta = 1$. Explain to the Prime Minister why the revenue-maximizing tax rate is strictly less than 100%, even though she would like to take away all of the workers income.

(B) Answer ONE of the following questions (40% of the mark)

Question (1)

Chancellor Kwasi Kwarteng announced in the Mini-budget this year a £45bn tax cut with the goal of boosting growth. Two controversial measures are the abolishment of the top 45% MTR on income above £150k and the removal of the cap on bankers' bonuses ($2 \times$ salary). The table below shows the expected revenue changes due to the reform. Explain why abolishing the 45% marginal tax rate from April 2023 costs -£2.3b *this* tax year, before it's even come into force; and then *raises* money next year.

Table 4.2: The Growth Plan 2022 policy decisions (£ million)¹

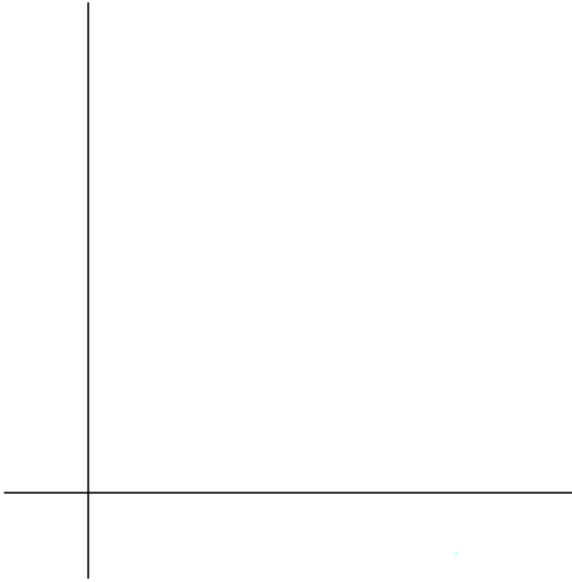
	Head	2022-23	2023-24	2024-25	2025-26	2026-27	
Cutting taxes for people							
1	National Insurance: reverse temporary 1.25pp increase in NICs rates from November 2022, and cancel the Health and Social Care Levy ²	Tax	-6,930	-16,955	-17,210	-17,685	-18,185
2	<i>Memo: increased tax yield due to higher wages and profits as a result of the tax change³</i>		+860	+2,620	+2,720	+2,825	+2,935
3	<i>Memo: net Exchequer cost of reversing temporary 1.25pp increase in NICs rates from November 2022, and cancelling the Health and Social Care Levy⁴</i>		-6,070	-14,335	-14,490	-14,860	-15,250
4	Dividend Tax: reverse 1.25% increase to rates, from April 2023	Tax	0	-1,440	+995	-1,090	-885
5	Income Tax: reduce the basic rate from 20% to 19% from April 2023 ⁵	Tax	0	-5,270	-535	+280	+45
6	Income Tax: remove the additional rates of income tax from April 2023 ⁶	Tax	-2,365	+625	-795	-2,190	-2,065
7	Stamp Duty Land Tax: increases to nil-rate thresholds ⁷	Tax	-795	-1,450	-1,535	-1,595	-1,655
8	Tax-free shopping: introducing a modern, digital, VAT-free shopping scheme	Tax	0	0	-1,265	-1,955	-2,060

Question (2)

1. A new administration is elected in the UK and decides to implement the following tax schedule to encourage labour supply:

- There is a 100% subsidy on the first £1,000 of labour income (so, the government provides you with a transfer equal to your earnings up to £1000).
- All labour income above £1,000 is then taxed at a marginal tax rate of 50%.

Graph the budget constraint under the new tax system in the consumption c and pre-tax income $z = wl$ space. Label clearly (i) the c and z values at the kink, and (ii) the slope of each segment.



2. Find the labour income value z where the transfer phases out completely (i.e., the break-even point).