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 under imperfect competition

Consider a market for good x produced by a monopoly firm with a fixed marginal cost c. The demand for the good implies a willingness to pay given by $p_D(x)$. The government considers imposing either an unit tax (t) in which case $p_D(x) = t + p_S$ or an ad valorem tax (τ) in which case $p_D(x) = (1+\tau)p_S$, where p_S is the pre-tax price set by the firm.

Profit maximization by the monopoly firm implies the following price setting

$$p_S + t = p_D(x) = \frac{c+t}{1-\frac{1}{\varepsilon}} \tag{1}$$

in the case of an unit tax and

$$p_S(1+\tau) = p_D(x) = \frac{c(1+\tau)}{1-\frac{1}{\varepsilon}} \tag{2}$$

in the case of an ad valorem tax, where $\varepsilon = -\frac{dx}{dp_D(x)}\frac{p_D(x)}{x}$ is the elasticity of demand, which is assumed to be constant.

(1A) Explain the difference between the formal incidence of a tax and the economic incidence.

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(1B) Derive the effect of an increase in t and τ on the pre- and post tax prices. To what extent is the tax burden shiftet to the consumers in the two cases?

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(1C) Compare the pre- and post tax prices with ad valorem taxation to the pre- and post tax prices with unit taxation in the case where $t = \tau c$. Would the monopoly firm prefer unit or ad valorem taxation in this case? Explain why.

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Part 2: Tax evasion

Below we consider three different models of tax evasion. In these three models, taxpayers are assumed to maximize the expected utility denoted by U^e. The model equations are

$$
\begin{array}{lll}
\text{All models} & x^{nc} = (1-t)Y + tE & \text{(A)} \\
\text{All models} & x^{c} = (1-t)Y - FtE & \text{(B)} \\
\text{Model 1} & U^{e} = (1-p)x^{nc} + px^{c} & \text{(C)} \\
\text{Model 2} & U^{e} = (1-p)u(x^{nc}) + pu(x^{c}) & \text{(D)} \\
\text{Model 3} & U^{e} = (1-p\,(E))\,x^{nc} + p\,(E)\,x^{c} & \text{(E)}
\end{array}
$$

where Y is true income, x is consumption, t is the tax rate, E is unreported income, p is the probability of being detected, F is a fine in proportion to the evaded tax and $u(\cdot)$ is a positive and strictly concave utility function of consumption ($u' > 0, u'' < 0$).

(2A) Provide a definition of tax evasion, and describe how tax evasion differs from tax avoidance.

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(2B) Provide an economic interpretation of the contents in each of the five equations in (A)-(E).

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(2C) Show that taxpayers in model 1 will evade taxes if and only if

$$(1-p)t - pFt > 0. \tag{3}$$

Provide an economic interpretation of this result. How will the size of p, t and F inuence the incentive to evade?

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In model 2 you can show that taxpayers will increase tax evasion as long as

$$\frac{dU^{e}}{dE} = (1-p)u'(x^{nc})t - pu'(x^{c})Ft > 0. \tag{4}$$

(2D) Provide an economic interpretation of this result. Does model 2 predict more or less tax evasion that model 1? Explain why.

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In model 3 you can show that taxpayers will increase tax evasion as long as

$$\frac{dU^{e}}{dE} = (1-p\,(E))\,t - p\,(E)\,tF - p'\,(E)\,(x^{nc} - x^{c}) > 0 \tag{5}$$

(2E) Provide an economic interpretation of this result. Assuming that $p'\,(E) > 0$, does model 3 predict more or less tax evasion that model 1? Why should we expect that $p'\,(E) > 0$

in Denmark (and many other countries)?

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Part 3: The elasticity of taxable income

Consider individuals with preferences represented by the utility function

$$u(c, z) = c - \frac{1}{1 + \frac{1}{\varepsilon}} z^{1+\frac{1}{\varepsilon}}, \tag{6}$$

where c is consumption, z is labor supply and ε is a preference parameter. The budget constraint is given by

$$c = (1 - t)z. \tag{7}$$

(3A) Illustrate in a diagram with z on the primary axis and c on the secondary axis the initial optimum of an individual. How does the optimum change if the tax rate is increased from t_1 to $t_2 > t_1$? Comment on the directions of the income and substitution effects.

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(3B) Give the intuition for why it might be more correct to look at the change in taxable income when computing the marginal deadweight loss instead of just hours worked?

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The article "The Effect of Marginal Tax Rates on Taxable Income: A Panel Study of the 1986 Tax Reform" in the Journal of Political Economy (1995) by Martin Feldstein studies the effect of the 1986 tax reform on the taxable income reported by different income groups. The reform significantly reduces marginal tax rates while broadering the tax base. Below is a copy of Table II from the article showing the main estimate from the paper.

(3C) Describe the empirical analysis and explain, using Table 2 below, how the author arrives at the estimates of the implied elasticity of taxable income (ETI). What are the main identifying assumptions needed for the estimates to be the causal effect of the marginal tax rates on taxable income?

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(3D) Describe how you could validate the main identifying assumptions needed in (3C) and what kind of data you would need to do so.

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TABLE 2

ESTIMATED ELASTICITIES OF TAXABLE INCOME WITH RESPECT TO NET-OF-TAX RATES

Taxpayer Groups Classified by 1985 Marginal Rate	Net of Tax Rate (1)	Adjusted Taxable Income (2)	Adjusted Taxable Income Plus Gross Loss (3)
	Percentage Changes, 1985–88		
1. Medium (22–38)	12.2	6.2	6.4
2. High (42–45)	25.6	21.0	20.3
3. Highest (49–50)	42.2	71.6	44.8
	Differences of Differences		
4. High minus medium	13.4	14.8	13.9
5. Highest minus high	16.6	50.6	24.5
6. Highest minus medium	30.0	65.4	38.4
	Implied Elasticity Estimates		
7. High minus medium		1.10	1.04
8. Highest minus high		3.05	1.48
9. Highest minus medium		2.14	1.25

NOTE.—The calculations in this table are based on observations for married taxpayers under age 65 who filed joint tax returns for 1985 and 1988 with no age exemption in 1988. Taxpayers who created a subchapter S corporation between 1985 and 1988 are eliminated from the sample.