Exam - Tax Policy - Fall 2014

Read carefully before you start:

The exam consists of three parts each with a number of subquestions. You are supposed to answer ALL questions and subquestions. Good luck!

Part 1: Income taxation

(1A) **Q**: Show that, in the framework of Diamond and Saez (2011), the optimal marginal tax rate on the highest incomes can be written as:

$$\tau^* = \frac{1}{1+ae}$$

where e is the elasticity of taxable income with respect to one minus the marginal tax rate:

$$e \equiv \frac{dz}{d(1-\tau)} \frac{1-\tau}{z}$$

and a is defined as:

$$a \equiv \frac{z_m}{z_m - z^*}$$

where z^* is the income level above which the top marginal tax rate applies and z_m is the average income level among individuals with incomes above z^*.

(1B) **Q**: Discuss the key assumptions of the model. **Q**: Explain the roles played by e and a in determining the optimal top marginal tax rate. **Q**: Does the formula reflect a trade-off between efficiency and equity?

Part 2: Commodity taxation

In the single-person Ramsey model, the optimal commodity tax system is described by the following first-order conditions known as the "Ramsey rule":

$$\frac{\lambda - \mu}{\lambda} = -\frac{\sum_j t_j S_{jk}}{X_k} \text{ for } k = 1, ..., n \tag{1}$$

where S_{jk} is short-hand notation for the partial derivative of the compensated demand for good j with respect to the price of good k

$$S_{jk} \equiv \frac{\partial x_j^C(q, Z)}{\partial q_k}$$

(2A) **Q**: Provide a brief verbal description of the Ramsey model and its key assumptions. **Q**: Interpret the formula.

(2B) **Q**: Restate the "Ramsey rule" on the form of the "Inverse elasticity rule" [**Hint**: Use that $S_{jk} = S_{kj}$]. **Q**: Provide a brief discussion of the assumptions necessary to derive the "Inverse Elasticity Rule".

(2C) **Q**: Show that in the special case with $k = 2$, the "Ramsey rule" can be rewritten on the following form known as the "Corlett-Hague rule":

$$\frac{t_1}{q_1} - \frac{t_2}{q_2} = \frac{\lambda - \mu}{\lambda D} \frac{X_2 X_1}{q_1 q_2} \{\varepsilon_{20} - \varepsilon_{10}\}$$

where $D = (S_{11}S_{22} - S_{12}S_{21}) > 0$ and ε_{k0} is the compensated elasticity of demand for good k with respect to the wage rate w.

[**Hint**: Use that $S_{jk} = S_{kj}$ and that $S_{k1}q_1 + S_{k2}q_2 + S_{k0}w = 0$ for $k = 1, 2$]

Q: Discuss the implications of the "Corlett-Hague rule" for practical policymaking

Part 3: Shorter questions

(3A) In their study of cigarette taxes and happiness, Gruber and Mullainathan (2005) estimate the following equation

$$\begin{aligned} H_{ijt} &= \alpha + \beta_j + \eta_t + \delta T_{jt} + \zeta X_{ijt} \\ &\quad + \theta PSMOKE_{ijt} + \gamma T_{jt} \times PSMOKE_{ijt} + \varepsilon_{ijt} \end{aligned}$$

where H_{ijt} is a measure of the subjective well-being; T_{jt} is the state-level cigarette tax; $PSMOKE_{ijt}$ is the estimated propensity to smoke and i refers to individuals, j to states and t to time. The estimated parameters are $\alpha, \beta_j, \eta_t, \delta, \zeta$, θ and γ. **Q**: Describe the identifying assumption with your own words. **Q**: Discuss examples where the identifying assumption would be violated.

(3B) In the Zodrow-Miezkowski-Wilson framework of international tax competition, the optimal capital tax rate from the perspective of a small, open country can be described as

$$G'(r) = \frac{1}{1 + E}$$

where E is the elasticity of the domestic capital stock with respect to the tax rate and $G(r)$ is the utility derived from public expenditure **Q**: Interpret the formula. **Q**: Does there exist a policy that can improve welfare?

(3C) Chetty Looney and Kroft (2009) use observational data on beer consumption and taxes to make inference about tax salience. The results are enclosed below. **Q**: What is the basic idea behind the empirical framework? **Q**: What is the salience parameter θ and what can be inferred about it from the estimates shown in the table?

TABLE 6— EFFECT OF EXCISE AND SALES TAXES ON BEER CONSUMPTION

	Baseline (1)	Business cycle (2)	Alcohol regulations (3)	Region trends (4)
Dependent variable: Change in log (per capita beer consumption)				
$\Delta \log(1 + \text{excise tax rate})$	−0.88 (0.17)	−0.91 (0.17)	−0.89 (0.17)	−0.71 (0.18)
$\Delta \log(1 + \text{sales tax rate})$	−0.20 (0.30)	−0.01 (0.30)	−0.02 (0.30)	−0.05 (0.30)
$\Delta \log(\text{population})$	0.03 (0.06)	−0.07 (0.07)	−0.07 (0.07)	−0.09 (0.08)
$\Delta \log(\text{income per capita})$		0.22 (0.05)	0.22 (0.05)	0.22 (0.05)
$\Delta \log(\text{unemployment rate})$		−0.01 (0.01)	−0.01 (0.01)	−0.01 (0.01)
Alcohol regulation controls			x	x
Year fixed effects	x	x	x	x
Region fixed effects				x
F-test for equality of tax elasticities (prob > *F*)	0.05	0.01	0.01	0.06
Sample size	1,607	1,487	1,487	1,487

Notes: Standard errors, clustered by state, in parentheses. All specifications are estimated on full sample for which data are available (state unemployment rate data are unavailable in early years). Column 3 includes three indicators for whether the state implemented per se drunk driving standards, administrative license revocation laws, or zero tolerance youth drunk driving laws, and the change in the minimum drinking age (measured in years). Column 4 includes fixed effects for each of nine census regions. *F*-test tests null hypothesis that coefficients on excise and sales tax rate variables are equal.