Written Exam for the M.Sc. in Economics autumn 2012-2013

Tax Policy

Final Exam

18 January 2013

(3-hour closed book exam)

Please note that the language used in your exam paper must correspond to the language of the title for which you registered during exam registration. I.e. if you registered for the English title of the course, you must write your exam paper in English. Likewise, if you registered for the Danish title of the course or if you registered for the English title which was followed by “eksamen på dansk” in brackets, you must write your exam paper in Danish.

If you are in doubt about which title you registered for, please see the print of your exam registration from the students’ self-service system.

Exam - Tax Policy - Fall 2012

Read carefully before you start:

The exam consists of three parts each with a number of subquestions. The three parts carry equal indicative weight in the assessment. You are supposed to answer ALL questions and subquestions. Good luck!

Part 1

Drawing on O'Donoghue and Rabin (2003), consider a consumer with the following intertemporal preferences over periods 0,1 and 2:

$$U^0(u_0, u_1, u_2) = u_0 + \beta(\delta u_1 + \delta^2 u_2) \tag{1}$$

and instantaneous utility in period t given by:

$$u_t = \rho \ln(x_t) + \sigma \ln(y_t) + z_t - \gamma \ln(x_{t-1}) \text{ for } t = 0, 1, 2 \tag{2}$$

where x denotes consumption of potato chips, y denotes consumption of carrots and z denotes consumption of other things.

Before-tax prices are normalized to one and z is untaxed, hence the consumer in each period faces the following budget constraint:

$$B = p_x x_t + p_y y_t + z_t \text{ for } t = 0, 1, 2$$

where $p_x = 1 + t_x$ and $p_y = 1 + t_y$ are the after-tax prices of potato chips and carrots respectively.

(1A) **Q**: Comment on the interpretation of β and δ. **Q**: Show that a consumer maximizing U^0 demands the following quantities in period 0:

$$x^* = \frac{\rho - \beta\delta\gamma}{p_x}$$

$$y^* = \frac{\sigma}{p_y}$$

$$z^* = B - (\rho - \beta\delta\gamma + \sigma)$$

(1B) The government sets tax rates so as to maximize:

$$U^0(u_0, u_1, u_2) = u_0 + \delta u_1 + \delta^2 u_2$$

while facing the constraint that taxes need to raise a fixed revenue R in each period:

$$R = t_x x^* + t_y y^*$$

Q: Comment on why the government maximizes a different function than the consumer's utility function.

Q: Show that the optimal tax on potato chips in period 0 can be characterized as:

$$\frac{t_x}{1+t_x} = \frac{\mu - \frac{\rho-\delta\gamma}{\rho-\beta\delta\gamma}}{\mu}$$

where μ is the Langrangian multiplier associated with the government revenue constraint

(1C) **Q**: Discuss the optimal tax formula notably the role played by β in shaping optimal taxes on potato chips

Part 2

Consider an economy where the distribution of the individuals' pre-tax earnings is described by the cummulative distribution function $H(z)$ and the density function $h(z)$. Individuals have quasilinear preferences, which eliminates income effects of tax changes. The government has a preference for equality, in particular let $G(z)$ denote the average social welfare weight on individuals with income larger than z relative to the average social welfare weight across all individuals.

The government can implement a general non-linear income tax function $T(z)$. The marginal tax rate at a given income level z is thus given by $T'(z)$. Behavioral responses to taxation are captured by the elasticity of pre-tax earnings with respect to $1 - T'(z)$

$$e(z) = \frac{\partial z}{\partial 1 - T'(z)} \frac{1 - T'(z)}{z}$$

(2A) Consider a small increase in the marginal tax rate from $T'(z)$ to $T'(z) + \Delta\tau$ in the small income range between z and $z + \Delta z$. **Q:** Derive the mechanical revenue effect ("ΔM"), the behavioral revenue effect ("ΔB") and the social welfare cost ("ΔW") of this policy change. **Q:** Explain the expressions with your own words.

(2B) **Q:** Show that the optimal marginal tax rate at income level z is characterized by:

$$\frac{T'(z)}{1 - T'(z)} = \frac{1 - G(z)}{e(z)} \cdot \frac{1 - H(z)}{zh(z)}$$

Q: Interpret the formula

(2C) Diamond and Saez (2011) argue that a plausible estimate of $e(z)$ is 0.25 and show the empirical values of the parameter $\alpha(z) \equiv zh(z)/(1 - H(z))$ for the US (enclosed in Annex A).

Q: What are the implications for optimal taxation of persons with high incomes (say above \$100.000) and very high incomes (say above \$400.000)?

Part 3

(3A) **Q**: Under what conditions is it optimal to condition tax payments on other things than income ("tagging")? **Q**: What is the intuition for this result?

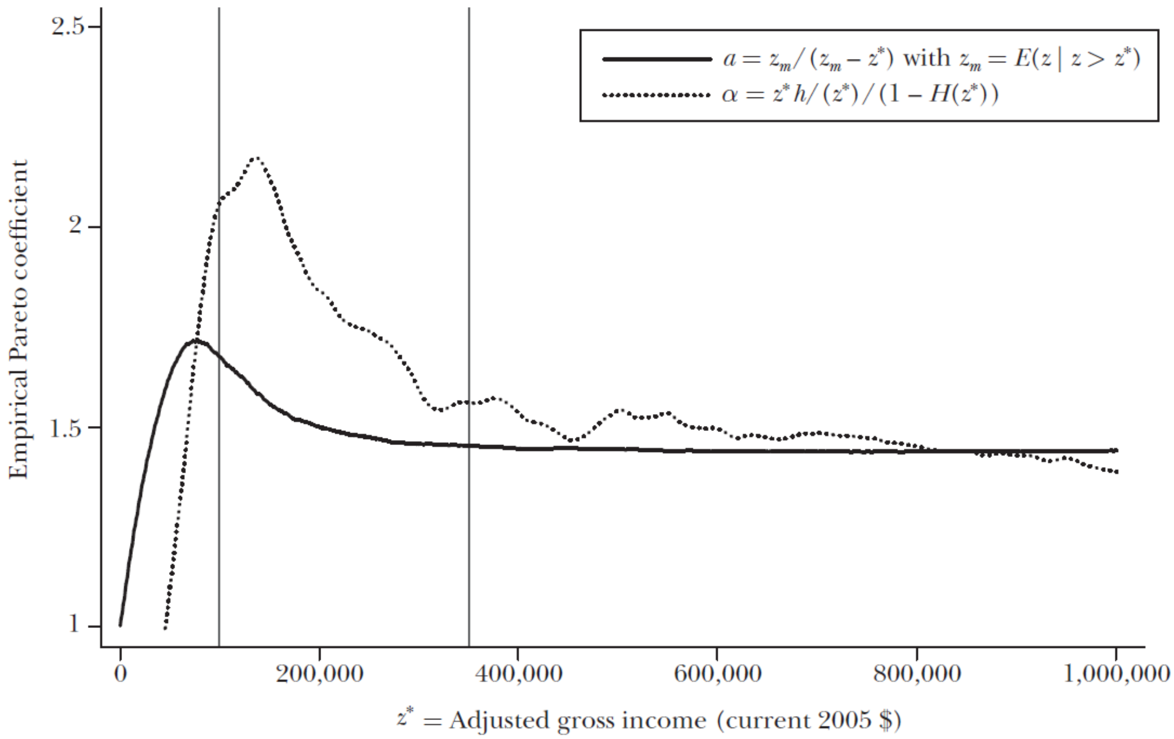
(3B) The results reported by Chetty, Kroft and Looney (2009) in their paper on tax salience are enclosed in Annex B. **Q**: What are the difference-in-difference and difference-in-difference-in-difference estimates of the effect of tax salience on consumer demand. **Q**: What is the identifying assumption underlying the two estimates?

(3C) **Q**: Explain with your own words whether a tax on dividends affects the level of investment and the amount of dividends paid under the "old view" of capital taxation and under the "new view".

Annex A

Figure 2

Empirical Pareto Coefficients in the United States, 2005



Source: Diamond and Saez (2011)

Annex B

TABLE 3— EFFECT OF POSTING TAX-INCLUSIVE PRICES: *DDD* ANALYSIS OF MEAN QUANTITY SOLD

Period	Control categories	Treated categories	Difference
Panel A. Treatment store			
Baseline (2005:1–2006:6)	26.48	25.17	−1.31
	(0.22)	(0.37)	(0.43)
	[5,510]	[754]	[6,264]
Experiment (2006:8–2006:10)	27.32	23.87	−3.45
	(0.87)	(1.02)	(0.64)
	[285]	[39]	[324]
Difference over time	0.84	−1.30	$DD_{TS} = -2.14$
	(0.75)	(0.92)	(0.68)
	[5,795]	[793]	[6,588]
Panel B. Control stores			
Baseline (2005:1–2006:6)	30.57	27.94	-2.63
	(0.24)	(0.30)	(0.32)
	[11,020]	[1,508]	[12,528]
Experiment (2006:8–2006:10)	30.76	28.19	−2.57
	(0.72)	(1.06)	(1.09)
	[570]	[78]	[648]
Difference over time	0.19	0.25	$DD_{CS} = 0.06$
	(0.64)	(0.92)	(0.95)
	[11,590]	[1,586]	[13,176]
DDD Estimate			−2.20
			(0.59)
			[19,764]

Notes: Each cell shows mean quantity sold per category per week, for various subsets of the sample. Standard errors (clustered by week) in parentheses, number of observations in square brackets. Experimental period spans week 8 in 2006 to week 10 in 2006. Baseline period spans week 1 in 2005 to week 6 in 2006. Lower panel reflects averages across the two control stores.

Source: Chetty, Kroft and Looney (2009)