Master PPD - Public Economics: Tax & Transfer Policies

Final Exam, November 22, 2011 - 14h-17h. No document allowed.

Exercise 1: Carbon Taxation (4 points)

1) What is the rationale for a carbon tax? (1 point)

Answer Without tax, carbon emission costs 0 to producers and consumers, whereas it has a positive cost for society, since it deteriorates the climate. A carbon tax allows consumers and producers to internalize the cost of carbon emissions, i.e. to correct the negative externality of carbon emissions.

2) How should the optimal tax rate on carbon be determined? What's the difference between a carbon tax and standard energy taxes, e.g. on fuel? (1 point)

Answer The optimal rate of the carbon tax is such that the marginal social cost of emission equals the marginal abatement cost, i.e. the cost of reducing emissions by an extra unit. By contrast, standard energy tax (e.g. on car fuel) do not aim to equalize costs of emissions and costs of abatement.

3) Discuss the idea that carbon taxes have a "double dividend" (1 point).

Answer Carbon taxes induce economic agents to reduce emissions, and they bring tax resources, which may be used to decrease distortionary taxes and improve overall efficiency. However, tax revenue are limited by the size of the energy sector. The two dividends contradict each other: if tax resources are big it means that emissions are big, and vice versa.

4) According to basic public economic theory, what could be expected from a financial transaction tax? Can such a tax be compared to a carbon tax? (1 point).

Answer Following the introduction of a financial transaction tax, the volume of transactions will decrease. A FTT can be compared to a carbon tax if there are negative external effects of financial transactions (such as sub-optimal volatility). In this case, a FTT can contribute to make agents internalize the externality and bring the volume of transactions in line with what is optimal.

Exercise 2: Inheritance and Capital Taxation (6 points)

1) What is approximately the amount of capital tax levied on average in the European Union as a fraction of GDP? (0.5 point) The amount of estate/inheritance taxes as a fraction of GDP? (0.5 point).

Answer Capital taxes: around 9% of GDP; inheritance taxes: around 1% of GDP.

2) What's the difference between an estate (or bequest) tax and an inheritance tax? (0.5 point). Name one country with an estate tax, one country with an inheritance tax. (0.5 point).

Answer Estate (or bequest) tax = tax on the total wealth left by decedents (e.g., US, UK). Inheritance tax = tax on the wealth received by each successor (e.g., France, Germany).

3) Explain briefly the logic of the Atkinson-Stiglitz (1976) result on the optimality of 0 capital taxation. (1 point).

Answer If 100% of capital accumulation comes from lifecycle savings, then taxing capital is equivalent to using differential commodity taxation (current consumption vs future consumption). Under fairly general conditions (separable preferences), differential commodity taxation is undesirable, and the optimal tax structure should rely entirely on direct taxation of labor income.

4) Why does the Atkinson-Stiglitz result not hold anymore in the presence of inheritance? (1 point)

Answer Because inheritance provides an additional source of lifetime income; with two sources of income (labor, inheritance), two instruments are in order (labor income tax, capital tax).

5) Do you think that capital should only be taxed at death? Or that lifetime capital incomes should also be taxed? Explain why (1 point).

Answer In most countries, lifetime capital taxes (corporate, personal income) are much bigger than estate/inheritance taxes. Two possible rationales: market imperfections and uninsurable idiosyncratic shocks to rates of return (see Piketty & Saez, 2011).

6) Give one example of international tax competition on capital. How can policy makers react to international tax competition? (1 point).

Answer International tax competition: preferential tax rates for FDI affiliates (e.g. Ireland); strict bank secrecy rules (e.g. Switzerland); 0 inheritance tax (e.g. Singapore), etc. Two broad policy answers: lower capital tax rate; co-ordinate to prevent harmful tax competition (e.g. offshore tax avoidance).

Exercise 3: Optimal Taxation of Top Labor Incomes (10 points)

Consider a nonlinear income tax system in which pre-tax earnings z pay $T(z)$ in taxes. Assume that in the last bracket, that is above a given earnings threshold $\bar{z}$, the marginal tax rate is constant. We denote by τ the constant top marginal tax rate: for $z \geqslant \bar{z}$, $T(z) = T(\bar{z}) + \tau \times (z - \bar{z})$. The goal of this exercise is to determine the optimal tax rate τ under different sets of assumptions.

Part 1: Standard Real Economic Responses

We start with a model where top earnings z are entirely determined by efforts e, that is for individual i, $z_i = e_i$. Assume that each agent i has utility function:

$$u_i(c_i, z_i) = c_i - exp(z_i)$$

where z_i denotes pre-tax earnings, $c_i = z_i - T(z_i)$ is disposable income, and $exp(z_i)$ reflects the cost of earning z_i.

1) Compute the optimal level of effort (that is, of pre-tax earnings z_i) that agent i makes (1 point).

Answer Each agent i chooses z_i to maximize his utility. The first order condition is $1 - T'(z) - exp(z_i) = 0$ that is $z_i = ln(1 - \tau)$.

2) Now, assume that each agent i now has utility function:

$$u_i(c_i, z_i) = c_i - h(z_i)$$

where z_i still denotes pre-tax earnings, $c_i = z_i - T(z_i)$ still denotes disposable income, and $h(z_i)$ is a convex and increasing function reflecting the cost of earning z_i. Show that i's optimal pre-tax earnings is an increasing function of the net-of-tax rate $1 - \tau$ (1 point).

Answer Each agent i chooses z_i to maximize his utility. The first order condition is $1 - T'(z) - h'(z_i) = 0$ that is $h'(z_i) = (1 - \tau)$. Since h is convex, h">0 so h' is strictly increasing; therefore we can write $z_i = (h')^{-1}(1 - \tau)$ and $h'^{(-1)}$ is increasing in $(1 - \tau)$

3) Aggregating over all top bracket taxpayers, we now denote by z the average income reported by top bracket taxpayers. As shown in question 2, z is an increasing function of the net-of-tax rate $1-\tau$, which we write $z(1-\tau)$. We define:

$$e_1 = \frac{1 - \tau}{z} \frac{dz}{d(1 - \tau)}$$

What does e_1 measure? (1 point).

Answer e_1 is the aggregate elasticity of income in the top bracket with respect to the net-of-tax rate $1 - \tau$. It measures real economic responses to the net-of-tax rate, i.e. labor supply effects, broadly defined (more hours of work, more intense effort per hour worked, occupational choices, etc.)

4) We assume that the government wants to maximize the tax resources it gets from top bracket taxpayers. Write the program of the government (0.5 point).

Answer The government chooses τ to maximize $T = \tau[z(1 - \tau) - \bar{z}]$

5) To solve the program of the government, it is useful to define $b = z/\bar{z}$ and a=b/(b-1). What does b capture? (0.5 point) Name two countries where b has increased since the 1980s. (0.5 point)

Answer b is the ratio of the average wealth of top bracket taxpayers to the top bracket threshold. The higher b, the fatter the upper-tail of income, i.e. the higher the concentration of income. b has increased in the U.S. and in the U.K. since the 1980s.

6) Express the optimal tax rate τ^* as a function of a and e_1 (1 point). Interpret (0.5 point).

Answer The first order condition of the government is

$$[z - \bar{z}] - \tau \frac{dz}{d(1-\tau)} = 0$$

Introducing e_1, the FOC can be re-arranged as:

$$\frac{\tau}{1-\tau} e_1 = \frac{z - \bar{z}}{z} = \frac{1}{a}$$

Which yields the formula

$$\tau^* = \frac{1}{1 + a e_1}$$

The higher the elasticity, the lower τ^* (don't tax what's elastic); the higher b, the lower a, and the higher τ^* (tax more if the upper tail is fatter).

Part 2: Putting Tax Avoidance in Optimal Tax Formulas

We now assume that taxpayers can avoid paying the regular income tax on a fraction of their earnings, and that they pay a smaller (possibly 0) income tax on this sheltered income.

7) Give two concrete examples of the way taxpayers can avoid paying the regular income tax (1 point).

Answer (i) They can try to earn more untaxed fringe benefits and less cash compensation; (ii) they can try to increase consumption within the firm (e.g. private use of corporate jets); (iii) they can change the legal organization of their business (e.g. shift profits from the individual income tax base to the corporate tax base); (iv) they can try to characterize ordinary income into favored capital gains; (v) they can evade taxes (e.g. offshore accounts).

8) We now denote y_i the total earnings of agent i, and x_i the earnings that avoid paying the regular income tax (sheltered income). $z_i = y_i - x_i$ is taxed at rate τ in the top bracket, and x_i is taxed at the constant and uniform marginal rate $t < \tau$. Assume that each agent i has utility function:

$$u_i(c_i, y_i, x_i) = c_i - h(y_i) - d(x_i)$$

where c_i denotes i's disposable income after taxes, $h(.)$ is a convex and increasing function reflecting the cost of earning y_i, and d(.) a convex and increasing function reflecting the cost of avoiding to pay the regular income tax on x_i.

Show that at the optimum, $h'(y_i) = 1 - \tau$ and $d'(x_i) = \tau - t$ (0.5 point). Interpret the formula $d'(x_i) = \tau - t$ (0.5 point).

Answer i's disposable income c writes $y - T(z) - tx = y - (T(\bar{z}) + \tau z - \tau\bar{z}) - tx = y - \tau z - tx + [\tau\bar{z} - T(\bar{z})] = y - \tau(y - x) - tx + [\tau\bar{z} - T(\bar{z})] = (1-\tau)y + (\tau - t)x + [\tau\bar{z} - T(\bar{z})]$

Plug this expression for c in i's utility function. The first-order condition with respect to y_i gives $h'(y_i) = 1 - \tau$ and the first-order condition with respect to x_i gives $d'(x_i) = \tau - t$.

Since d is convex, this implies that x_i is an increasing function of $\tau - t$. The higher the gap between the ordinary income tax rate τ and the sheltered income tax rate t, the higher the amount of earnings sheltered.

9) Aggregating over all top bracket taxpayers, we now denote by $y = y(1-\tau)$ the average real earnings of top bracket taxpayers, by $x = x(t - \tau)$ the average sheltered income of top bracket taxpayers, and by z the average income of top bracket taxpayers that is taxable according to the regular schedule. Show that z is an increasing function of $(1-\tau)$ and t (0.5 point).

Answer $z = z(1-\tau, t) = y(1-\tau) - x(\tau - t)$. y is increasing in $1-\tau$ because $h'(y) = 1 - \tau$ and h is convex; x is decreasing in t because $d'(x) = \tau - t$ and d is convex, so z is increasing in $1 - \tau$ and t.

10) We define the total elasticity of taxable income z with respect to $1-\tau$ when keeping t constant as:

$$e = \frac{1-\tau}{z}\frac{\partial z}{\partial(1-\tau)}$$

And the tax avoidance elasticity as:

$$e_2 = \frac{1-\tau}{z}\frac{dx}{d(\tau-t)}$$

Show that for a given t, the optimal top regular tax rate on top bracket income is:

$$\tau^* = \frac{1+tae_2}{1+ae}$$

(1 point).

Answer The government chooses τ to maximize:

$$T = \tau[z(1-\tau,t)-\bar{z}] + tx(\tau-t)$$

FOC:

$$[z-\bar{z}] - \tau\frac{\partial z}{\partial(1-\tau)} + t\frac{dx}{d(\tau-t)} = 0$$

Noting that

$$e_2 = \frac{\frac{dx}{d(\tau-t)}}{\frac{\partial z}{\partial(1-\tau)}} \times e$$

and after straightforward algebra, the FOC can be rewritten:

$$\tau^* = \frac{1+tae_2}{1+ae}$$

11) Interpret this formula. (0.5 point).

Answer When $t>0$, τ^* is higher than the optimal τ in the absence of tax avoidance $1/(1+ae)$. And the higher the avoidance elasticity, the higher τ^*. Avoidance creates a “fiscal externality”: because a fraction of income only pays $t < \tau$, to maximize tax resources it is necessary to increase τ.

This exercise was based on the model presented in Sections II and III of Piketty T., Saez E. and Stantcheva S. (2011), “Optimal Taxation of Top Labor Income: A Tale of Three Elasticities”, NBER Working Paper.