Lecture Notes: Systems Competition
II.1: “Race to the bottom” view

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1 Capital Tax Competition and Public Infrastructure

There is plenty of evidence showing that capital is nowadays more mobile now than before and that countries cut taxes in response to tax competition.

Labor may be the victim of systems competition because these markets are less integrated than the capital markets.

Here we will study:

- how systems competition affect taxes and the provision of public goods and

- which factor ultimately pays the provision of infrastructure goods.

1.1 The standard tax-competition argument

Assume again that labor is fixed in supply, but capital is internationally mobile and available at the exogenous interest rate r (small open economy).

Assume also that the government imposes a tax, t, on capital whose proceeds are spent on goods which do not enter the production function (as e.g. parks, theaters, income redistribution)

Since the cost of using capital is higher than before $(r+t)$, the tax will drive capital out of the country.

This will lead to less production, which in turn hurts workers (but the return on capital r stays constant).

The point is that even if the tax incomes were paid to the wage earners, they would still face a loss equal to the area CEF - see figure.

The “race to the bottom” view is a pessimistic view of capital taxation.

Not only taxes are important for investors’ allocation decisions, infrastructure matters too.

Investors will accept taxes if they are seen as the price that must be paid for the publicly provided infrastructure (benefit taxation).

Assume that all of the tax incomes goes to financing infrastructure, which is necessary for production.

$\Rightarrow$ Capital may not react to higher capital taxes - see figure.

Capital may become sufficiently more productive so as to generate the required higher rate of return.

Assume also that the tax is levied on the immobile production factor, labor.

We can see in the figure that the immobile factor benefits from the tax (the benefit is shown by the area DEG).

Question:

- Distributional aspect: Do we observe a positive level of capital taxation when the government acts in the interest of workers?

- Efficiency aspect: Will public policy be efficient?

1.2 Fiscal competition and public goods

To answer the questions we now introduce a model which is based on Sinn (2003), ch. 2.

1.2.1 Model

There is a private cost of using infrastructure: $c(k, W)$.

The size of this cost depends on the number of usage acts, k, and the capacity of the infrastructure provided by the government, W.

The total cost of using the public good is: $c(k, W)k$.

The number k also stands for the amount of capital employed.

We have that $c_k(k, W) > 0$ (users get in each others' way; crowding) and $c_W(k, W) < 0$.

However, in the case of a pure public good, when there is no rivalry in use, $c_k(k, W) = 0$.

$c(k, W)$ is homogeneous of degree λ.

$\overline{k} =$ wealth of the country.

The tax rate on capital is given by t.

The tax rate on labor is given by ω.

The total cost of providing the public good: ρW.

The production function is: $f(k, l)$

As usual, $f_k(k, l) > 0$, $f_{kk}(k, l) < 0$

and $f_l(k, l) > 0$ and $f_{ll}(k, l) < 0$.

Constant returns to scale

Capital is perfectly mobile.

Labor is completely immobile.

The return on capital, r, is constant from the point of view of the (small) country.

1.2.2 Firm Behavior

Firms maximize their profit π by selecting the capital stock optimally. They have the following problem

$$\max_k \pi = f(k,l) - rk - c(k,W)k - tk - wl.$$

The first-order condition is

$$f_k(k,l) - r - c(k,W) - t = 0. \tag{1}$$

Note, that the social marginal usage cost is

$$c(k,W) + c_k(k,W)k.$$

However, since the firm does not take the marginal congestion externality

$$c_k(k,W)k$$

into account, this term does not show up in the first-order condition.

1.2.3 Equilibrium Policy

As for the government, the budget balancing condition is

$$\omega l + tk = \rho W, \tag{2}$$

where ω is residually determined to balance the budget.

If, for example, the tax on capital generates more revenue than needed for the provision of the public infrastructure, there will be a subsidy to labor.

The government maximizes net-of-tax income of the domestic residents given by

$$R = f(k, l) - f_k(k, l)k + r\overline{k} - \omega l$$

subject to the firms' first-order condition (1) and the budget constraint (2).

Hence, substituting equations (1) and (2) into the government's problem gives

$$R = f(k, l) - r(k + \overline{k}) - c(k, W)k - \rho W$$

The government's problem is to

$$\max_{k,W} f(k,l) - r(k+\overline{k}) - c(k,W)k - \rho W.$$

Note, the federal government does not optimize over t. The capital tax rate t can be inferred from the first-order condition (1). For a given level of k and W the condition gives the tax rate t which supports the choices of k and W as an equilibrium.

The first-order conditions are

$$f_k(k,l) - r - c(k,W) - c_k(k,W)k = 0 \quad (3)$$

$$-c_W(k,W)k - \rho = 0. \quad (4)$$

Now, remember the firms' first-order condition (1):

$$f_k(k,l) - r - c(k,W) - t = 0.$$

We note that, in contrast to the firms, the government takes the congestion externality $c_k(k,W)k$ into account.

Results:

- To make firms behavior congruent with the government's preferences, the capital tax rate is set to $t = c_k(k,W)k$.

- W is such that the sum of all users' marginal willingness to pay is equal to the marginal cost of providing infrastructure - Eq. (4).

1.2.4 Efficiency

How does the competitive equilibrium compare with the international social optimum?

Suppose there is a supranational benevolent planner ruling over n countries.

The planner selects the international capital allocation and the respective national provisions of public goods such that the sum of all rents is maximized.

- Production efficiency:

$$f_{k_i}(k_i, W_i) - c(k_i, W_i) - c_{k_i}(k_i, W_i)k_i$$
$$= f_{k_j}(k_j, W_j) - c(k_j, W_j) - c_{k_j}(k_j, W_j)k_j \quad (5)$$

  The marginal product of capital net of the marginal social cost of using the infrastructure is equal in all countries.

- Allocative efficiency:

$$-c_W k_i = \rho. \tag{6}$$

  The social marginal willingness to pay for infrastructure is equal to its price.

Efficiency of the competitive equilibrium:

- Production efficiency holds as $t = c_k(k, W)k$ and the firms' first-order condition (1) give (5).

- Allocative efficiency holds as public infrastructure provision satisfies (6).

In sum, the equilibrium in systems competition is efficient.

1.3 Do we observe positive labor taxes in systems competition?

The question analyzed next is a distributional one.

In particular, does the government have to accept a deficit which would have to be covered by the fixed factor labor?

When infrastructure is a pure public good $c_k(k, W) = 0$, it is clear that the tax-rate is equal to zero because there is no externality.

Therefore, there will be no capital tax revenues to finance the public expenditures.

This is a typical feature of public goods.

But back to the more realistic case when

$$c_k(k, W) > 0.$$

The Euler theorem implies that

$$c_k(k, W)k + c_W(k, W)W = \lambda c(k, W). \qquad (7)$$

where λ is the degree of homogeneity of the usage cost function $c(k, W)$.

We now derive expressions for c_k and c_W in terms of ρ, t and k.

The Samuelson condition (6) gives

$$-c_W(k, W)k = \rho \qquad \Rightarrow \qquad c_W(k, W) = -\frac{\rho}{k}$$

The equilibrium tax rate satisfies

$$t = c_k(k, W)k \qquad \Rightarrow \qquad c_k(k, W) = \frac{t}{k}.$$

Now, substitute for c_W and c_K in Eq. (7) to get

$$\frac{t}{k}k - \frac{\rho}{k}W = \lambda c(k, W) \ \Rightarrow \ \tau k - \rho W = \lambda c(k, W)k.$$

- If we double inputs and the cost goes down ($\lambda < 0$), we have $\omega > 0$.

- If the cost goes up when we double inputs ($\lambda > 0$), then $\omega < 0$.

- If the cost remains constant when we double inputs ($\lambda = 0$), then $\omega = 0$.

$\Rightarrow$ The point is that, in general, marginal cost pricing generates enough capital tax revenues to cover the total cost of production only when there are constant or decreasing returns to scale.

What is the plausible sign of λ?

Constant returns to scale is often assumed in production theory, $\lambda = 0$.

Is it valid in our context as well?

Prediction: If $\lambda < 0$, then private competition would be ruinous.

$\Rightarrow$ public intervention needed ("selection principle"). See Sinn (2003), ch. 2 for a formal treatment of the argument ("Theory of clubs").

1.4 Policy Implications

- Tax harmonization

- Self-financing constraint

$\Rightarrow$see assignment #1