Lecture 22

Brueckner (2004)
Dhillon-Wooders-Zissimos (2004)

1. Bruecker (2004)

   (a) Fiscal decentralization has a "good side" and a "bad side."

   The good side is emphasized by Tiebout. It is characterized by mobile consumers, demand heterogeneity, exogenous incomes, and good local governments. Equilibrium allocations are supposed to be efficient, although a precise theorem along these lines does not appear until Bewley (1981).

   The bad side is emphasized by the fiscal competition literature. It is characterized by immobile consumers (but mobile capital), demand homogeneity (all consumers are identical), endogenous incomes of consumers, and good (but sometimes bad) local governments.

   So, what if we take an *approximation* to the Tiebout economy which also allows fiscal competition for mobile capital. Is decentralization good or bad?

   The answer is going to depend on:

      i. the nature of the approximation (what we mean by a "Tiebout" model here), and
      ii. what happens under centralization.

   (b) The combined Tiebout/tax competition model.

      i. The technology for producing all-purpose good is the same in every region. It depends on just capital and labor:

         $F(K_i, N_i)$

         Per-capita output as a function of the capital/labor ratio is:

         $f(k_i)$

      ii. Capital is mobile across jurisdictions.
      iii. Individuals have preferences over private good x_i and publicly provided private good z_i.
         Brueckner seems to assume z_i is a private good to stay consistent with Zodrow-Mieszkowski. It isn't entirely clear what other role this assumption plays here.
         Further comments about this appear below.
      iv. There are I distinct taste groups with preferences:

         $u_i(x_i, z_i)$

Taste group i is assigned to community i and given the best feasible allocation for its taste group.

Further comments about this appear below.

(c) Planner problem for the combined Tiebout/tax competition model.

Neither Zodrow-Mieszkowski nor Brueckner write down the planner problem here. With two communities, this should be something like:

$$\max_{x_1, x_2, z_1, z_2, k_1, k_2} U_1(x_1, z_1)$$

subject to:

$$f(k_1) + f(k_2) = x_1 + z_1 + x_2 + z_2$$
$$k_1 + k_2 = \bar{k}$$
$$U_2(x_2, z_2) = \bar{U}_2$$

This gives two conditions.

i. We have:

$$f'(k_1) = f'(k_2)$$

Thus, aggregate output is maximized.

ii. *Note!* Maximizing aggregate output requires equalizing the marginal product of capital, not the marginal product of "capital per-capita," but these two conditions are the same given constant returns to scale. Even allowing for differences in technology, we would have at the maximum $F_{11}(K_1, N_1) = F_{21}(K_2, N_2)$. These are homogeneous of degree zero given CRS, so $f_1'(k_1) \equiv F_{11}(K_1/N_1, 1) = F_{11}(K_1, N_1) = F_{21}(K_2, N_2) = F_{21}(K_2/N_2, 1) \equiv f_2'(k_2)$.

iii. Since the technologies are the same and $f'' < 0$, this implies:

$$k_1 = k_2$$

Maximizing aggregate output in necessary for overall efficiency, and this requires each region to have the same quantity of capital.

iv. We also have:

$$\frac{U_{i2}}{U_{i1}} = 1$$

This is the same as in Mieszkowski-Zodrow.

Note that *this really isn't the Samuelson condition.* It is the standard requirement that MRS equal MRT for each individual. Nevertheless, Brueckner states in a couple of places that he assumes that the Samuelson condition holds.

Odd.

(d) The decentralized case.

There is a source based tax on capital in each region, t_i. The net return to capital is ρ, which much be the same in each region. Capital is hired until the marginal value product equals the gross cost. Thus:

$$f'(k_i) = \rho + t_i$$

The tax provides local public good (per-capita):

$$z_i = t_i k_i$$

Private good (including i's share of the aggregate return to capital) is then:

$$x_i = f(k_i) - k_i f'(k_i) + \rho\bar{k}$$

i. Brueckner states that in general production is inefficient. High demand communities have high z, high taxes, little capital and low wages. Low demand communities have low z, low taxes, lots of capital and high wages.

   This pattern is analogous to that in the decentralized outcome in Flatters-Henderson-Mieszkowski.

ii. Regarding migration equilibrium.

   Should we expect the Nash equilibrium in tax rates to also give a migration equilibrium, so no individual from i would want to migrate to region j?

   Region i chooses t_i optimally for type i. The problem is the set of feasible allocations in i depends on t_j. If $t_i = t_j$ in Nash equilibrium then there is no question we have a migration equilibrium for the types, since then the set of feasible allocations in i (taking t_j as given) is the same as the set of feasible allocation in j (taking t_i as given), and t_j cannot be better for type i than is t_i. In general, however, $t_i \neq t_j$. This raises the possibility that t_j, while not optimal from the point of view of type i, could still lead to a superior allocation in region j than type i receives in region i. For example, region j could have so much capital in Nash equilibrium that t_j leads to a superior allocation for type i.

   Brueckner says this will not happen. This merits some further exploration.

(e) The centralized case.

In the centralized case, the national capital tax is levied at uniform national rate t and a uniform public good level is provided to all consumers.

Brueckner writes, "The main results are derived by assuming that the public good is chosen as if by a planner, with the Samuelson condition satisfied" (p. 138).

This is somewhat problematic since z is a *private* good. There is no Samuelson condition to satisfy (recall the analysis above). Presumably he means the proper efficiency condition.

In the centralized case, production is efficient. Firms hire capital until the marginal value product equals the cost:

$$f'(k_i) = \rho + t_i$$

With $t_i = t = t_j$, this implies:

$$f'(k_i) = f'(k_j)$$

which means:

$$k_i = k_j$$

since the technologies are identical. This is a good thing.

Finally, wages, which equal $f(k_i) - k_i f'(k_i)$, are the same everywhere. It follows that every individual receives the same allocation of private and public goods everywhere. This holds despite the fact that people have different tastes. This is a bad thing.

(f) The "pure" Tiebout case.

Brueckner also defines a pure Tiebout benchmark. In this case there is no tax on capital ($t_i = 0$). Instead, the public good is funded by a head tax in each community.

The allocation of capital is efficient.

(g) Simulation model

Two equal sized taste groups: a high demand group denoted h and low demand group denoted l.

Quasi-linear preferences:

$$x_h + (\theta + \delta)v(z_h)$$

$$x_l + (\theta - \delta)v(z_l)$$

where δ captures preference dispersion.

Production:

$$f(k) = \gamma k - \beta k^2/2$$

$$f'(k) = \gamma - \beta k$$

Technical issue: second-order conditions are satisfied if $f''' \leq 0$. My work assumes $f''' \geq 0$. So the quadratic case is OK but others are not.

Notice that:

$$\frac{\partial k_i}{\partial t_i} = \frac{1}{f''} = -\frac{1}{\beta}$$

Thus, the smaller is β, the greater the expectation of capital flight.

(h) High-Demand, High-Curvature: Table 1 ($\beta = 50$).

Compare the decentralized case with the centralized case. The parameters give the "expected" result: the benefit of decentralization grows with taste dispersion.

The benefits of taste matching offset the costs of fiscal competition (tax rates that are too low and a distorted allocation of capital).

The Tiebout case allows one to isolate these two effects. The utility gain from moving from the centralized case to the Tiebout case isolates the benefits of sorting.

The utility gain from moving from the decentralized case to the Tiebout case isolates the benefits of eliminating tax competition.

(i) High-Demand, Low-Curvature: Table 2 ($\beta = 5$).

Expect this to weaken the case for fiscal decentralization since it increases the distortion.

Indeed, z_h actually falls as dispersion increases. The tax distortion overwhelms the rising demand.

Decentralization versus centralization: decentralization is never better! The loss from the tax distortion always overwhelms the gain from sorting.

(j) Lower-Demand, High-Curvature: Table 3.

Much like High-Demand, High-Curvature.

BUT, if the underlying demand for the public good is small, then the whole problem is less interesting.

(k) Strategic Behavior: Table 4.

Capital flight is attenuated.

Using the same parameter values as Table 1, he finds that the case for fiscal decentralization is strengthened.

"The good side of fiscal decentralization has a better chance of dominating under strategic behavior."

2. Dhillon-Wooders-Zissimos (2004)

(a) Recall the Mieszkowski-Zodrow model for business public services.

Individuals derive utility from consumption C only.

(b) "Output" (all purpose good) is produced by competitive firms within each jurisdiction using land, capital and now public infrastructure B:

$$F(K, B)$$

Output can be transformed (globally) into C and B in a 1:1 ratio. Therefore the overall resource constraint in each region is:

$$B + C = F(K, B)$$

(c) Optimum

Restrict attention to optima in which all quantities (C, B, and K) are the same in all regions. Since there is a fixed capital stock we then necessarily have:

$$K = \bar{K}/N$$

The overall optimum problem can then be written:

$$\underset{B}{\text{Max}} \;\; F(\bar{K}/N, B) - B$$

This immediately gives for all regions:

$$F_B = 1$$

DWZ define B^E as the level of B such that:

$$F_B\left(\frac{\bar{K}}{2}, B^E\right) = 1$$

(DWZ assume $N = 2$).

(d) Equilibrium

$$r + T = F_K(K, B)$$

$$B = TK$$

$$C = F(K, B) - (r + T)K + r(\bar{K}/N)$$

(e) The effect of capital taxes on the quantity of capital in the region.

$$r + T = F_K(K, TK)$$

This defines $K(T)$. Substituting back in gives the identity:

$$r + T \equiv F_K[K(T), TK(T)]$$

Differentiating both sides gives:

$$1 = F_{KK}\frac{\mathrm{d}K}{\mathrm{d}T} + F_{KB}\left(K + T\frac{\mathrm{d}K}{\mathrm{d}T}\right)$$

This gives:

$$\frac{\mathrm{d}K}{\mathrm{d}T} = \frac{1 - KF_{KB}}{F_{KK} + TF_{KB}}$$

(f) The denominator is negative in both ZM (equation (17)) and DWZ (equation (10)):

$$F_{KK} + TF_{KB} < 0$$

Mieszkowski and Zodrow assume that given any B, the numerator is positive at the equilibrium K:

$$1 - KF_{KB} > 0$$

The marginal cost of diverting a unit of consumption to a unit of infrastructure, which is 1, exceeds the extra output associated with the higher marginal productivity of capital.

(g) This is the assumption weakened in DWZ. See their A5.

Given $K = \bar{K}/2$, DWZ assume that as B varies, $1 - KF_{KB}$ has the shape in Figure 1.

Figure 1

It is negative at B near zero, positive for B large enough, and monotone increasing.

DWZ define B^I as the level of infrastructure that solves:

$$1 - KF_{KB}\left(\frac{\bar{K}}{N}, B^I\right) = 0$$

(h) Some vocabulary.

DWZ call KF_{KB} the *mpgv*, the "marginal public good valuation." They call 1 the *mcpg*, the "marginal cost of the public good."

(i) DWZ then show that $\frac{\mathrm{d}K}{\mathrm{d}T}$ (at given K and B) characterizes the incentive to deviate from the efficient plan.

Behavior is determined by the optimization problem:

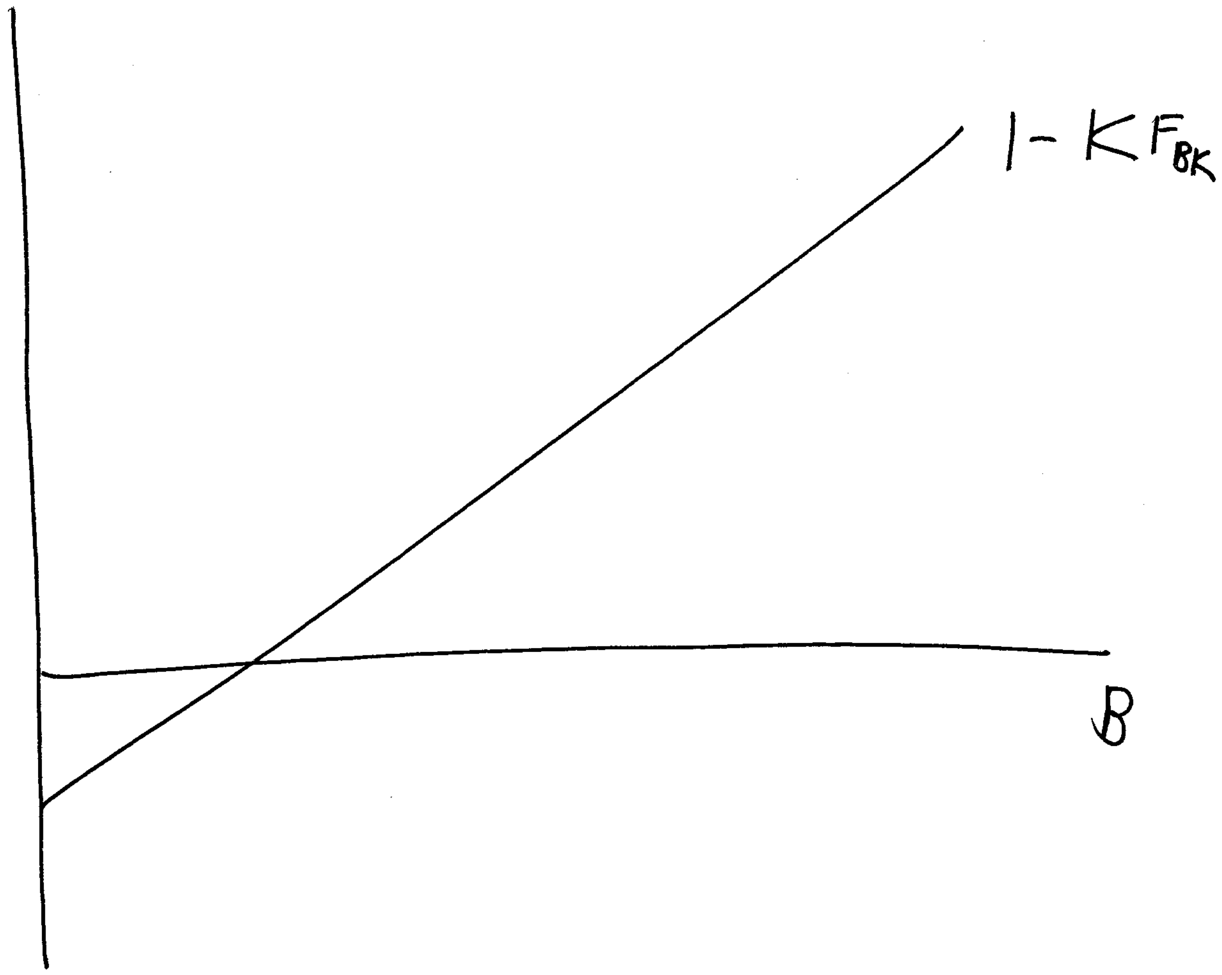
$$\underset{T}{\text{Max}}\ \ C(T) \equiv F[K(T), TK(T)] - (r+T)K(T) + r(\bar{K}/N)$$

We have:

$$\frac{\mathrm{d}C}{\mathrm{d}T} = F_K\frac{\mathrm{d}K}{\mathrm{d}T} + F_B\left(K + T\frac{\mathrm{d}K}{\mathrm{d}T}\right) - \left[K + (r+T)\frac{\mathrm{d}K}{\mathrm{d}T}\right]$$

Using $r + T = F_K$ gives:

$$\frac{\mathrm{d}C}{\mathrm{d}T} = (r+T)\frac{\mathrm{d}K}{\mathrm{d}T} + F_B\left(K + T\frac{\mathrm{d}K}{\mathrm{d}T}\right) - \left[K - (r+T)\frac{\mathrm{d}K}{\mathrm{d}T}\right]$$


1 - K F_BK
B

Rearranging gives:

$$\begin{aligned}\frac{\mathrm{d}C}{\mathrm{d}T} &= \frac{\mathrm{d}K}{\mathrm{d}T}TF_B + K(F_B - 1) \\ &= \left(\frac{1 - KF_{KB}}{F_{KK} + TF_{KB}}\right)TF_B + K(F_B - 1)\end{aligned}$$

(j) Their main theorem (Theorem 2) says the following.

Suppose $B^I < B^E$. Then the equilibrium quantity of infrastructure, B^*, falls between these two values. Thus, infrastructure is *below* the optimal level. This is the "race to the bottom."

On the other hand, if $B^I > B^E$, then again B^* falls between these two values, but now infrastructure is *above* the optimal level. This is the "race to the top."

(k) Suppose $B^I < B^E$. At B^I we have:

$$\frac{\mathrm{d}C}{\mathrm{d}T} = K(F_B - 1)$$

We know $F_B(\cdot, B^I) > F_B(\cdot, B^E)$, so $F_B(\cdot, B^I) - 1 > F_B(\cdot, B^E) - 1 = 0$, and so:

$$\frac{\mathrm{d}C}{\mathrm{d}T}(T^I) > 0$$

where $T^I \equiv B^I / K^I$.

At B^E we have:

$$\frac{\mathrm{d}C}{\mathrm{d}T} = \left(\frac{1 - KF_{KB}}{F_{KK} + TF_{KB}}\right)TF_B$$

We know $0 = 1 - KF_{KB}(B^I) < 1 - KF_{KB}(B^E)$, so the numerator is positive, and we know the denominator is negative. Therefore:

$$\frac{\mathrm{d}C}{\mathrm{d}T}(T^E) < 0$$

where $T^E \equiv B^E / K^E$.

By continuity of C, there must be a level of infrastructure, B^*, at which the derivative is zero. This is the equilibrium level of infrastructure and corresponds to a tax rate $T^* \equiv B^* / K^*$.