1 Local Public Goods and Tiebout's Idea

- The under-provision of public goods problem we discussed so far is mainly due to the fact that the government can not elicit the citizens' (voters') preferences truthfully.

- Local public goods are public goods that can be enjoyed only by residents in the local community: for example, local public school, beaches, parks, etc. are typical examples of public goods.

- Tiebout (1956) suggests that lots of public goods are provided by local expenditures, and if there were enough communities, individuals would reveal their true preferences for public goods by the choice of community in which to live (in much the same way as individuals reveal their preferences for private goods by their choices).

- Where there is a wide range of choices, all those deciding to live in the same community would have essentially the same taste, and there would be no problem of reconciling conflicting preferences. This is an intriguing idea since it suggests that the invisible hand can solve the important problem of under-provision of public goods.

- The crucial idea in Tiebout's hypothesis is residential mobility, which creates competition among communities.

2 A Formalization of Tiebout Idea

- Bewley (1981) formalizes Tiebout's idea in Arrow-Debreu general equilibrium models:

- Decision Makers in the Model: Consumers, Firms, and Local Governments

- n distinct regions of habitation (communities), $j = 1, ..., n$.

- Each region has a government which provides local public goods, and collects local taxes to pay for them;

- Crucial Assumption: There is perfect consumer mobility between regions;

- Consumers are fully informed about prices, taxes, and public goods in each region and choose to live in the region where they can enjoy the highest level of utility;

- Consumers behave competitively, i.e., they do not believe that prices, taxes, or the provision of public goods are influenced by their own choices.

- Local government cannot discriminate among consumers by name or according to taste when levying taxes (otherwise, Lindahl prices may be charged); local government knows about the initial endowments of residents when levying taxes;

- Suppose that there is no spillover effects between regions; the inhabitants of one region are affected by what happens in other regions only through prices and migration;

- Assume that regions do not directly affect utility or production and there is no land.

- COST OF LOCAL PUBLIC GOODS: We can think of three possibilities:

    1. The cost is independent of population (called "pure public goods case");

    2. The cost is proportional to the population, hence the per capita cost is constant (called "pure public service case");

    3. The per capita cost of public goods is a U-shaped function of population.

- How does production take place? Two possibilities are considered:

    1. Autarkic Regions Case: all production takes place inside regions and there is no trade between them;

    2. Free Trade Case: production is completely independent of the regional distribution of populations.

- What is the motivation of the government? Two possibilities are considered:

    1. Democratic governments seek to maximize the welfare of their own citizens;

    2. Entrepreneurial governments have objectives which are independent of the welfare of their citizens, may try to repel some inhabitants or attract new ones.

- Decisions: Consumers choose consumption bundles and regions of residence; Firms choose their input-output vectors; Local governments choose the bundle of public goods or services and a tax system: a tax system specifies each inhabitant's tax payment as a function of his initial endowment.

2.1 Tiebout Equilibrium

- An *allocation* in a Tiebout model specifies the following items:

  1. The consumption bundle of each consumer;
  2. The input-output vector of each firm;
  3. The bundle of public goods provided by each regional government;
  4. The region of residence of each consumer.

- An allocation is *feasible* if the goods absorbed by consumers and governments may be produced or supplied directly from the consumers' initial endowments.

- A feasible allocation is *Pareto optimal* if there exists no other feasible allocations which makes every consumer at least as well off and some strictly better off.

- A *Tiebout equilibrium* consists of a feasible allocation, a price for each commodity, and a tax system for each region such that the following conditions are satisfied:

    1. Each consumer's consumption bundle satisfies his budget constraint given his residence choice and it maximizes the consumer's utility in this budget set;

    2. Each consumer chooses the region he prefers (When a consumer compares regions, he assumes that tax systems, public expenditures and prices would not change if he moved);

    3. Each firm maximizes profit;

    4. Each regional government balances budget (i.e. public goods provided by a regional government must be equal to its tax revenue);

    5. Each government's expenditures, tax system and choice of inhabitants are consistent with whatever its objective may be.

2.2 Are Tiebout Equilibria Pareto Efficient?

- The main conclusions is: Tiebout equilibria may not be Pareto efficient.

- Bewley (1981) proceeds by providing a series of examples which highlight the various perspectives which lead to the inefficiency of Tiebout equilibria.

Example 1 (Democratic Government, Pure Public Goods) *There are two identical consumers and two regions. One public good and one private good which is leisure. Each consumer is endowed with one unit of leisure. The consumer's utility function is* $u(l, g) = g$ *where* g *is the level of local public good in the region he inhabits and* l *is leisure. The production technology for public goods is* $g_j = L_j$ *where* g_j *is the public good provided in region* j *and* L_j *is the quantity of labor.*

- To rationalize the assumption that consumers behave competitively, we should imagine that there are continuum of consumers with measure two.

- The following is a Tiebout equilibrium:
  - The prices of labor and public good are both 1.
  - The tax system is that a tax of 1 is imposed on any initial endowment.

- One consumer lives in each region, each consumer sells his leisure to the producer of the public goods and one unit of public good is provided in each region.

- This Tiebout equilibrium is inefficient since both consumers can be better off if they lived together in one region and two units of public gods are provided in that region and none in the other. The latter is also a Tiebout equilibrium.

• The feature of this example is that the cost of public good provision is independent of the population size and in the inefficient Tiebout equilibrium, the economies of scale is not properly exploited.

- Economies of scale is not necessary for the inefficiency to result:

Example 2 (Democratic Government, Pure Public Service) *Two identical regions, four consumers, and four types of public services, and one private good which is leisure. Each consumer is endowed with one unit of leisure. Regions are labeled by 1 and 2, consumers and public services are labeled by A, B, C, D. Consumer k's utility function is given by*

$$\begin{aligned} u_A(l, g_A, g_B, g_C, g_D) &= 2g_A + g_B \\ u_B(l, g_A, g_B, g_C, g_D) &= g_A + 2g_B \\ u_C(l, g_A, g_B, g_C, g_D) &= 2g_C + g_D \\ u_D(l, g_A, g_B, g_C, g_D) &= g_C + 2g_D \end{aligned}$$

The public service production function in region j is

$$g_{jA} + g_{jB} + g_{jC} + g_{jD} = \frac{L_j}{n_j}$$

where n_j is the number of consumers in region j.

- The following situation describes a Tiebout equilibrium:
  - consumer A and C live in region 1 and consumer B and D live in region 2, $(g_{1A}, g_{1B}, g_{1C}, g_{1D}) = (1, 0, 1, 0)$ and $(g_{2A}, g_{2B}, g_{2C}, g_{2D}) = (0, 1, 0, 1)$.
  - The prices of labor and each type of public service are both 1 in both regions.
  - The tax system in each region is to tax away each consumer's endowment.
  - This is an equilibrium because in this allocation, each consumer gets a utility 2 and if he moves to the other region his utility is reduced to 1.

- This Tiebout equilibrium is not Pareto optimal.

- The following allocation (which is also a Tiebout equilibrium allocation) dominates it: consumers A and B live in region 1, C and D in region 2 and

$$(g_{1A}, g_{1B}, g_{1C}, g_{1D}) = (1, 1, 0, 0)$$

and

$$(g_{2A}, g_{2B}, g_{2C}, g_{2D}) = (0, 0, 1, 1)\,.$$

In this allocation each consumer obtains 3 units of utility.

- In the above examples local governments do not initiate changes in the supply of public goods when agents move.

  - In Example 1, if one of the regional government proposes a tax system of 1 for every resident and provides 2 units of public goods, such a region will attract all the consumers and the resulting allocation will be efficient;

  - in Example 2, if a local government proposes a tax of one unit for every resident and provides a public service bundle

    $$(g_{1A}, g_{1B}, g_{1C}, g_{1D}) = (1, 1, 0, 0)\,,$$

    it will attract all the type A and B consumers. Again efficiency will be restored.

  - Is it the case that introducing such entrepreneurial government solves the inefficiency problem? The answer is not necessarily. Here we consider such governments.

- One possible motivation for an entrepreneurial government is to maximize the population of the region they control; another possible motivation is to maximize profits: their revenues come from taxes and their expenses are the cost of public goods.

- The following difficulties must be resolved: First, should we assume that all the regional governments simultaneously choose a public goods/service and tax system mix? Bewley (1981) assumes that each government believes that no other government will change policy when it changes its own. Second, what happens if a change in policy leads to multiple competitive equilibrium in the competitive good market?

Example: (Profit Maximizing Government, Pure Public Goods) Two regions, two consumers, one private good which is leisure, and one public good. Each consumer is endowed with one unit of leisure. Production function for the public good is $g = L$. The utility function of consumer 1 is $u_1(l, g) = g$, while the utility function for consumer 2 is $u_2(l, g) = 3l + g$.

- The following situation is a Tiebout equilibrium of this example:
  - Consumer i lives in region i. In region 1, consumer 1 devotes all his labor to the production of the public good and so consumes no leisure and one unit of the public good; consumer 2 devotes no labor to the production of the public good and consumes one unit of leisure and none of the public good.
  - In each region the price of each good is 1. The tax system in region 1 requires that all

consumers pay a tax of 1 and in region 2 no tax is levied. The utility level in this equilibrium of consumer 1 is 1 and that of consumer 2 is 3.

– Why is this a Tiebout equilibrium? Clearly each consumer optimizes. Suppose that a new regional regime were to be established involving both consumers. They would have to pay the same taxes since their initial endowment is the same. Let τ be the tax rate. Then 2τ units of the public good will be provided. To attract consumer 1, it must be the case that $2\tau \geq 1$, hence $\tau \geq 1/2$; to attract consumer 2, it must be the case that $3\,(1-\tau)+2\tau \geq 3$, which implies that $\tau \leq 0$. Hence there exists no such τ that can attract both consumers away from the above postulated situation.

- This Tiebout equilibrium allocation is not Pareto efficient.

- It is dominated by the following allocation: consumers live together, consumer 1 pays all his income in taxes and consumer 2 pays none. One unit of public good would be provided, consumer 1 would consume no leisure and consumer 2 would consume one unit of leisure. The utility of consumer 1 in this allocation is 1, as was in the previous equilibrium; but the utility of consumer 2 would be 4, higher than before.

- The reason that this is not an equilibrium is that we assumed that it is impossible to tax the consumers at different rate.

2.3 A Tiebout Model with Efficient Equilibrium

Bewley showed a theorem that is loosely as follows:

Under a set of assumptions on preferences and production technologies, together with the assumption that *the number of regions are no less than the number of possible types of agents,* there exists a Tiebout equilibrium; moreover, every Tiebout equilibrium allocation is Pareto optimal.