

due : Wed. March 15, before class

All 5 questions count equally.

1. Suppose that a city is inhabited by many different people. The income of person i is y_i , which is assumed to be fixed, and unaffected by any taxes levied in the city.

The city can levy a proportional tax rate on the income of all its residents, at rate t .

The city's taxes are collected by a private agency, which receives a share of the revenue collected as compensation for collecting the taxes. This share is an increasing function of the tax rate t ; the agency collects a share s of all tax revenue collected,

$$s = \frac{\alpha}{2}t$$

where α is some positive constant.

The revenue collected from the income tax (after the collection agency has received its share) is distributed equally to all residents of the city.

Person i knows her own income, and knows the income of all the other people in the city.

What is her preferred tax rate t ?

2. If the tax rate t for the city described in question #1 above is decided by direct vote of the residents, using pairwise majority rule, what tax rate will be selected?

3. Another city is identical to the one described in questions # 1 and 2, with two differences. Instead of distributing the net revenue from the income tax in cash, this city spends it all on a public good. Each person in the city has a utility function

$$u(x_i, Z) = x_i + \ln Z$$

where x_i is the person's income (net of tax), and Z is the level of the pure public good provided in the city.

Also, in this city the tax collection agency does not get a share of the tax revenue; all the tax revenue collected is used for public good provision.

If the cost of the public good is c , what level of tax be chosen in this city?

4. Three towns are located along a straight road. Town 1 is at the south end of the road, and has 10000 inhabitants. Town 2 is located 9 kilometres north of town 1, and has 5000 inhabitants. Town 3 is located 21 kilometres north of town 2, and has 12000 inhabitants.

People can travel along the road at 1 kilometre per minute.

The three towns are all in the same county (and contain all the people in the county). Two parties are running for election to the county council ; each wants to win. The one issue in the election is where to locate the new events centre for the county. Each voter wants her travel time to the events centre to be as low as possible.

What location will each party propose as a location for the event centre, if they each want to win the election?

What location would minimize the aggregate travel time of all 27000 residents of the county?

5. Redo question # 4 if residents' travel times were proportional to the **square** of the distance travelled?