Micro II
Problem Set 4
QUESTIONS

Dominic Rohner, Geneva Graduate Institute, Spring 2025

May 20, 2025

Conflict with different "prizes"

1. In the lecture it was assumed that the "prize" (i.e. "stake") was the same for both groups. This is not necessarily the case, and in this problem set we will relax this assumption, while keeping the rest of the game as simple as possible.

   There are two groups, i and j. Each group chooses the amount of fighting resources, D_i resp. D_j, that maximizes the expected payoff as a response to the fighting effort contributed by the opposing group. Conflict has two possible outcomes (v, d), v corresponds to a victory of group i and d corresponds to a defeat of group i (and hence a victory of group j). The payoffs for each of the groups in the event of the two possible outcomes can be labelled as (U_{vi}, U_{di}) and (U_{dj}, U_{vj}), where $U_{vi} > U_{di}$ and $U_{dj} > U_{vj}$. The payoff function of groups i and j are:

$$U_i = qU_{vi} + (1-q)U_{di} - D_i \tag{1}$$

$$U_j = (1-q)U_{dj} + qU_{vj} - D_j \tag{2}$$

   with the probability of group i winning given by the following contest success function:

$$q = \frac{D_i}{D_i + D_j} \tag{3}$$

   We assume that the per unit cost of fighting is unitary (which could be interpreted again as opportunity cost of production).

   (a) What can be the reasons that groups face different gains from winning a contest?

(b) Derive the reaction functions. Display this graphically.

(c) Derive the Nash equilibrium. Display this graphically.

(d) What is the equilibrium probability of group i winning? What is the total cost from conflict?

(e) Fighting effort

  (i) If group i has more to gain in case of victory ceteris paribus, i.e. $U_{vi} > U_{dj}$, $U_{di} = U_{vj}$, which group will fight harder in equilibrium?

  (ii) What if $U_{vi} = U_{dj} - k$, $U_{di} = U_{vj} - k$, where k is some constant?

  (iii) Set $U_{di} = U_{vj} = 0$. Compare country A where $U_{vi} = 3$, $U_{dj} = 1$ with country B where $U_{vi} = 2$, $U_{dj} = 2$. In which country will total fighting effort be larger? Is this a general feature?

  (iv) Do you know real world examples that fit well the predictions of this framework?