

SOCIAL CHOICE.
THE PRINCIPAL-AGENT PROBLEM

*Write your answers neatly on a separate sheet of paper (attach as many sheets as necessary).
Show all calculations (no credit for answers giving final result only). Justify your steps.
Remember to write your name and staple all pages together.*

QUESTION 1. Suppose there are seven individuals with the following preferences over three alternatives:

1	2	3	4	5	6	7
<i>z</i>	<i>z</i>	<i>x</i>	<i>x</i>	<i>y</i>	<i>y</i>	<i>y</i>
<i>x</i>	<i>x</i>	<i>y</i>	<i>y</i>	<i>x</i>	<i>x</i>	<i>x</i>
<i>y</i>	<i>y</i>	<i>z</i>	<i>z</i>	<i>z</i>	<i>z</i>	<i>z</i>

- (a) What is the social preference ordering under pairwise majority voting?
- (b) Is it rational? Why or why not?
- (c) Instead of pairwise majority voting, consider *plurality voting* where each individual votes only for his most preferred alternative and alternatives are ranked socially by the total number of votes each receives. What is the social preference ordering now?
- (d) Consider *z* to be the “irrelevant alternative”, show, by changing the preferences of individuals 1 and 2 only, that plurality voting violates the independence of irrelevant alternatives condition. (That is, the social ranking of *x* and *y* does not depend only on each individual’s ranking of *x* and *y* but also on the ranking of *x* and *z* or *y* and *z*. Hint: move alternative *z* to the bottom of the first two individuals’ preference orderings.)
- (e) Consider now the preference aggregation rule known as the *Borda count* where each individual casts a different number of votes depending on how he ranks the alternatives. Each individual casts 5 votes for his most preferred alternative, 4 votes for his second-best, and 1 vote for the least preferred one (that is, each individual has 10 votes). The votes for each alternative are then summed across individuals and the alternatives ranked according to these sums. What is the social preference ordering now?
- (f) Construct a change in individuals 6 and 7’s preferences such that there is a violation of the IIA condition.

QUESTION 2. There are three individuals with the following preferences over three alternatives:

1	2	3
x	x	z
y	z	x
z	y	y

- Construct the social preference ordering under majority rule. Is it rational?
- Are these preferences single-peaked? (Hint: try putting the three alternatives on the horizontal axis in some order, say x , followed by y , followed by z , and see if changing this order changes the way preferences “peak”. The answer in (a) should also clue you in about how this one must turn out.)

QUESTION 3. NUCLEAR ARMS CONTROL. Figure 1 represents a negotiation between Peaceniks and Hawks over arms control. We want to reach an agreement that is acceptable to both. The principal appoints three agents who come from the groups “Students against the Bomb” (SAB), “Scholars for Responsible Defense” (SRD), and “Citizens for World Domination” (CWD). The range of options is from bilateral disarmament to no arms control whatsoever. Some of the intermediate positions (deep cuts, nuclear freeze, and selective limits) are shown as well. The status quo is at the selective limits (ABM, neutron bomb).

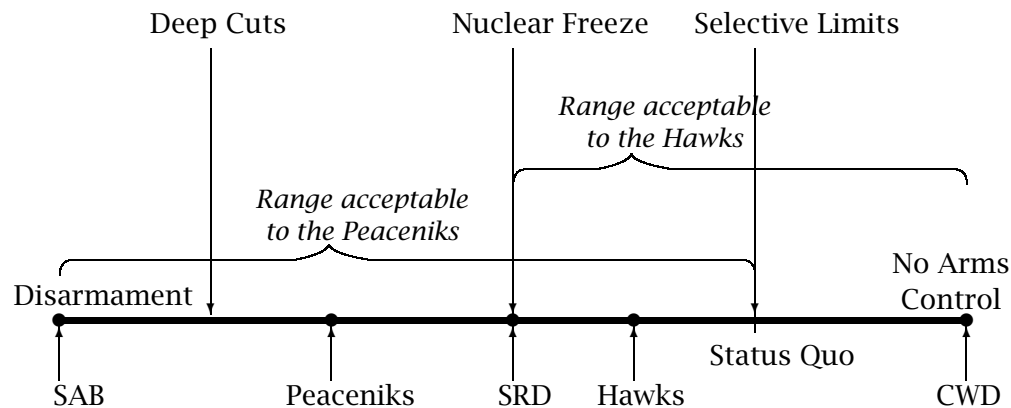


Figure 1: Nuclear Arms Control.

Referring to the ideal points of the three agents, the Peaceniks, and the Hawks, and the acceptance ranges for the two main actors as specified in Figure 1, answer the following questions:

- What will each agent offer? (Mark the positions on the figure.)
- Why do some agents propose their ideal points while others do not?
- Given the recommendations, where will the final deal fall, and why?

QUESTION 4. INTERNATIONAL BARGAINING WITH DOMESTIC CONSTRAINTS. The executives of two countries are engaged in negotiating a bilateral trade treaty. The terms of trade can vary anywhere from autarky (no trade, high protectionist tariffs) to unfettered free trade. The status quo is autarky because no current trade relationship exists. The Executive of one of the states is constrained by a domestic ratification procedure that requires that any agreement between him and the leader of the Foreign state must be ratified by Congress. For an agreement to be ratified, the median voter in Congress must agree to it. If the agreement fails to be ratified, the status quo prevails. The leader of the Foreign state is not constrained.

Figure 2 shows the ideal points of the two leaders, the location of the status quo and the range of acceptable bargains that they are prepared to strike. The overlap of the two leaders' acceptance regions represents the *bargaining range*; that is, this is the range where any possible agreement must have to lie in. Assume that everything is common knowledge. That is, all players involved know everything about each other.

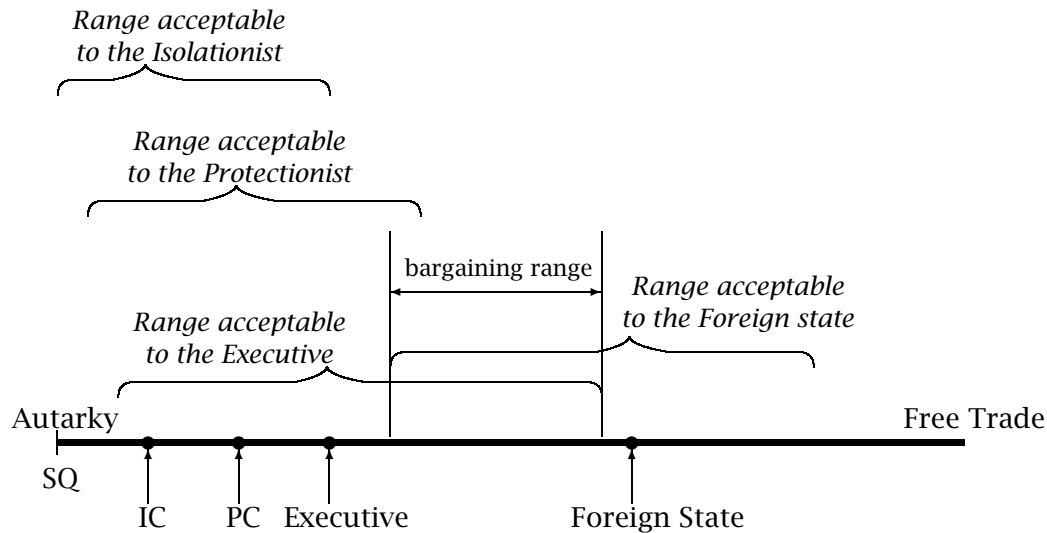


Figure 2: Bilateral Trade Treaty Negotiations.

- Suppose that the median voter in Congress has the same preferences as the Executive. What is the bargaining range now?
- Suppose that the median voter in Congress is a Protectionist (PC) with the acceptance range indicated in the figure. What is the bargaining range now?
- Suppose that the median voter in Congress is an Isolationist (IC) with the acceptance range indicated in the figure. What is the bargaining range now?
- How constrained is the Executive if the median voter has the same preferences? If he is a Protectionist? If he is an Isolationist? What can you say about the possible deals the Executive can reach given these different degrees of constraint. Can weakness (that is, being constrained by a domestic ratification procedure) be a bargaining strength in international negotiations? How does this relate to our findings about commitment by constraining one's available choices?