Political science. Master level.
STV-4217 Rational Choice Models and International Conflict
Fall 2022

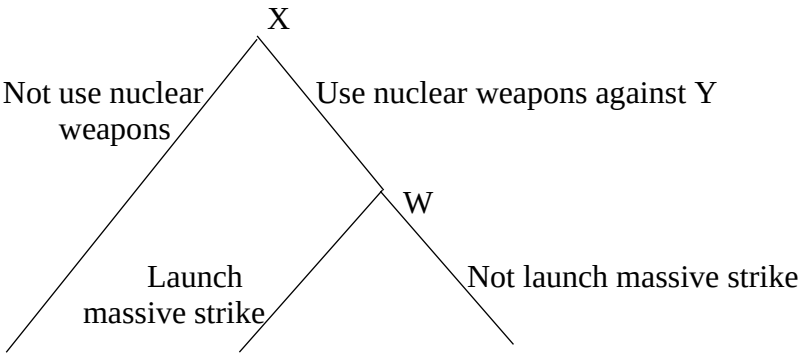
<u>Please answer all questions</u>.

I (40%)

During a war with its neighbor country Y, Country X contemplates using nuclear weapons against Y. To deter country X from doing so, a third country, W, threatens to retaliate any nuclear attack from X by launching a massive strike with conventional weapons against X. We assume it is common knowledge that W's threat is sufficiently severe to deter X from using nuclear weapons.

Assume for now that the threat is also credible. The situation may then be depicted as in Figure 1, where all payoffs may be interpreted as net costs and benefits compared to the situation where X does not use nuclear weapons.

Figure 1.



X:	0	-30	20
W:	0	-50	-60

a. Explain why W's threat is both credible and sufficiently severe in Figure 1.

<u>Answer</u>: The threat is sufficiently severe because X prefers not to use nuclear weapons given that X will then retaliate by launching a massive strike (0 > -30). The threat is credible because W prefers to launch a massive strike given that X uses nuclear weapons against Y (-50 > - 60).

b. Assume that the game in Figure 1 is a game of complete information. Find the subgame-perfect equilibrium of the game.

<u>Answer</u>: Using backward induction, we find that the SPE is that X does not use nuclear weapons, while W would launch a massive strike IF X did use nuclear weapons.

c. Now, assume it is common knowledge that W's payoff equals -40 (rather than -60) if W does not launch a massive strike after X has used nuclear weapons against Y. What does this change of assumptions imply for the threat's severity and/or credibility?

<u>Answer</u>: This change of assumptions implies that the threat is no longer credible. The change has no implications for the threat's severity.

d. Find the revised game's subgame-perfect equilibrium, using at least two different methods.

Answer:

Method 1: Using backward induction, we find that W prefers not to launch a massive strike even if X uses nuclear weapons. X will therefore use nuclear weapons, because doing so results in X's most-preferred outcome. The SPE is therefore that X uses nuclear weapons, while W does not launch a massive strike (i.e., it fails to retaliate).

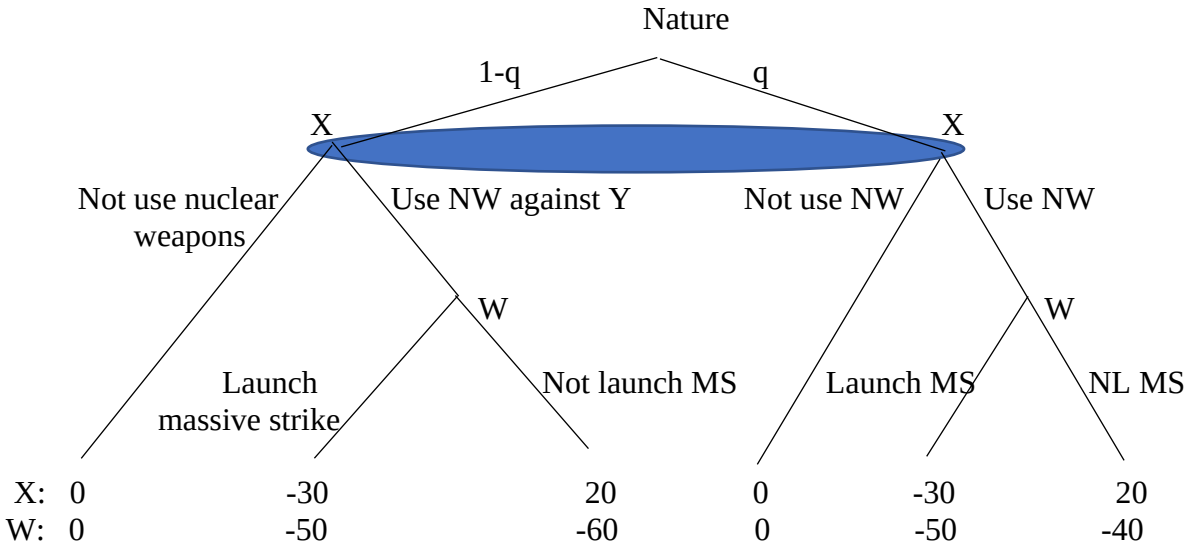
Method 2: Table 1 shows the game on normal form. Using successive elimination of weakly dominated strategies, we find that W's left-hand strategy is weakly dominated by its right-hand strategy. It may therefore be deleted. Of the remaining two outcomes, X prefers the top one, which is the SPE.

Method 3: The game in Table 1 contains two NE. However, the bottom left NE is based on an empty threat, namely the empty threat that W will launch a massive strike if X uses nuclear weapons. We can therefore rule out the bottom left NE and are left with the top right-hand NE, which is the SPE.

Table 1		W	
		Launch massive strike	Not launch massive strike
X	Use nuclear weapons	-30 , -50	**20** , **-40** NE/SPE
	Not use nuclear weapons	**0** , **0** NE	0 , **0**

e. Now, assume that X is uncertain whether W's payoff at the far-right end node equals -40 or -60. Specifically, assume that when the game begins, X believes with probability q that the payoff concerned equals -40, and with probability 1-q that it equals -60. Draw the game tree.

Answer:



f. Find the game's Bayesian perfect equilibrium for different values of q.

Answer: We already know that W will launch a massive strike if U=-60 and that W will not launch a massive strike if U=-40. However, to find the game's BPE, we need to calculate the expected utility of X's two strategies.

EU_X(Use NW) = 0

EU_X(Not use NW) = q*20 + (1-q)*(-30) = 20q – 30 + 30q = 50q – 30

W prefers to use NW if 50q – 30 > 0, that is, if q > 3/5.

Thus, the game has two BPE, depending on q.

BPE1: If q > 3/5, X uses NW, and W launches a massive strike if U = -60 and does not launch a massive strike if U = -40, where U is W's payoff at the far-right end node.

BPE2: If q < 3/5, X does not use NW, and W does not get a choice to make.

g. Are the equilibria you found under the previous question pooling or separating?

Answer: BPE1 is separating because equilibrium play reveals W's true type. BPE2 is pooling because equilibrium play does not reveal W's true type; hence, in BPE2 there is still uncertainty about W's type when the game ends.

h. For at least one equilibrium, use Bayes' rule to find X's belief by the end of the game regarding whether the payoff concerned equals -40 or -60.

Bayes' rule:

$$P(A/B) = \frac{P(B/A)P(A)}{P(B/A)P(A) + P(B/\tilde{A})P(\tilde{A})}$$

Answer:

Let:

A = U equals -40

Ã = U equals -60

B = W launches massive strike

P(A) = q

P(Ã) = 1-q

Consider PBE1. We then have:

P(B/A) = 0

P(B/Ã) = 1

Plugging these probabilities into Bayes' rule gives:

P(A/B) = 0*q/(0*q + 1*(1-q) = 0/(1-q) = 0

This means that if W launches a massive strike, then the posterior probability is 0 that U = -40. In other words, the posterior probability is 1 that U = -60.

We now turn to BPE2. In this case, Bayes' rule cannot be used to update X's belief. The reason is that in this equilibrium W does not get to make any choice. Hence, the probability is 0 that W launches a massive strike, regardless of whether U equals -40 or -60. We thus gets 0 in the denominator, which means that the fraction is not defined.

II (20%)

Discuss briefly under which conditions *imposed* economic sanctions may cause the target government to change its behavior.

Answer: According to Hovi, Huseby & Sprinz (2005), there are three main possibilities why a target government might resist the threat of sanctions and yet yield to the sender's demands after sanctions have been imposed.

1. The target might erroneously believe that the threat of sanctions is empty. It may then yield when sanctions are imposed, thereby proving that the threat was credible.

2. The target might erroneously believe that the negative impact of sanctions are tolerable (not sufficiently severe). It may then yield after sanctions have been imposed if the imposed sanctions prove more severe than expected.

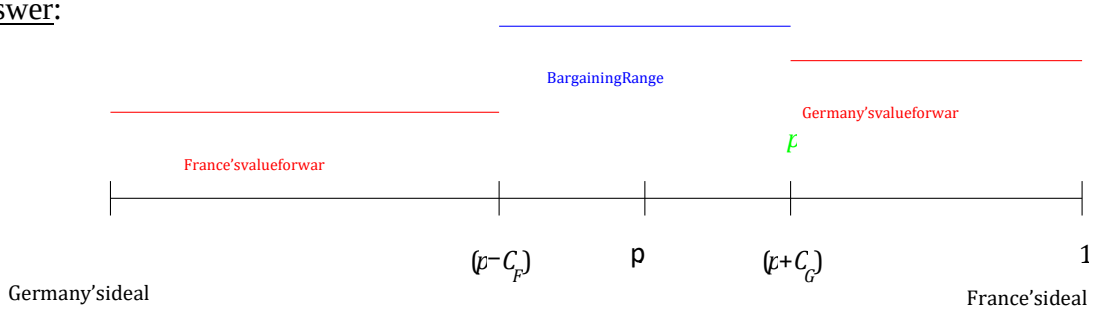
3. The target might erroneously believe that sanctions will be imposed and sustained even if it yields to the demands of the sender. It may then yield only after sanctions have been imposed if the sender is then able to convince the target that yielding will cause the sanctions to be lifted.

III (40%)

James Fearon (1995) argues that war between rational, unitary actors will only occur if at least one actor has private information or cannot credibly commit to a negotiated settlement.

(a) Explain using the geometric model of bargaining why war is not rational if there is complete information and no commitment problem.

Answer:

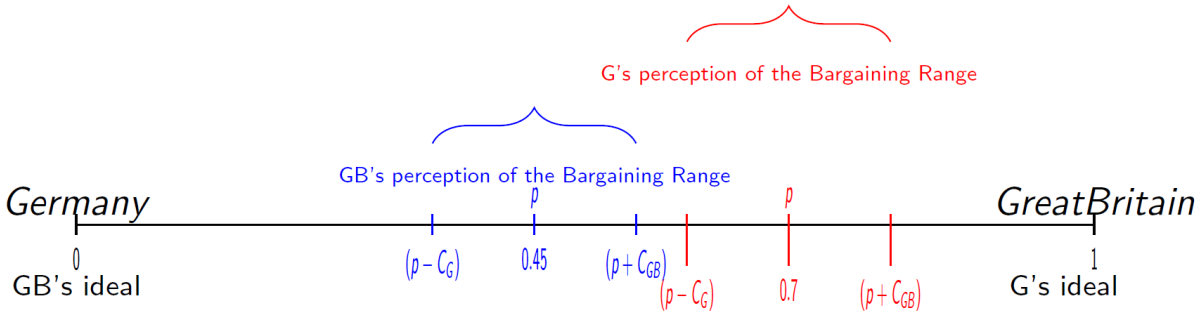


Complete Information – geometric model
Given complete information and given the probability of victory for France (p) and the costs of war for France and Germany, we find a bargaining range marked in blue. The

ex-post costs of war, and the presence of a bargaining range will give the two players an opportunity to negotiate a peaceful outcome without resorting to war.

(b) Explain using the geometric model of bargaining how incomplete information might lead to war.

Answer:



As portrayed in the Figure above, both Great Britain and Germany believe that they will win a war. The costs of war for both parties are such that there is no overlap in each country's perception of the bargaining range. War is possible because there is no bargaining space.

For this to occur there must be a problem of incomplete information. Both countries believe that they could win a war. Germany perceives that it would win 70% of the time. Great Britain believes that Germany has a 45% chance of winning (or that Britain has a 55% chance).

As portrayed in this figure, the costs of war are not uncertain. Only the chances of winning (p) is uncertain.

Incomplete information about the costs of war could also affect the prospects for war. In words, if the costs of war were greater, then ($p + C_{GB}$) would shift to the right and ($p - C_G$) would shift to the left. (See Figures 1 and 2 below). The greater the costs of war the greater the shift. These shifts would enlarge the perceived bargaining ranges for both countries. The larger the costs of war, the greater the degree of overlap between the two bargaining ranges. So, despite incomplete information and very different beliefs about who would win, the chances of war are reduced due to the overlapping bargaining ranges. The more the costs of war increase, the greater the size of the mutual bargaining range. A large bargaining range will decrease the chances of war.

Figure 2 below shows how expanding the costs of war, leads to larger bargaining ranges. The two countries believe that there are different chances of winning and

therefore they believe in different bargaining ranges. But because the perceptions of the bargaining ranges overlap, there exists a common bargaining range.

If the costs of war were to shrink, then the prospects of war would increase.

Figure 1.

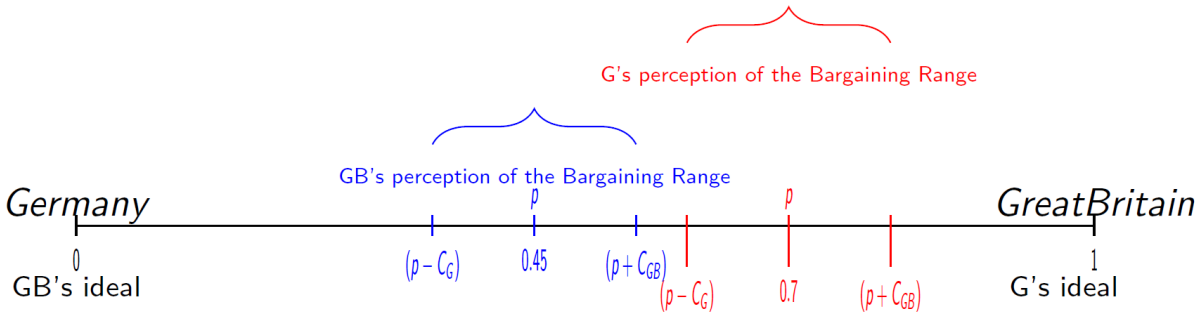
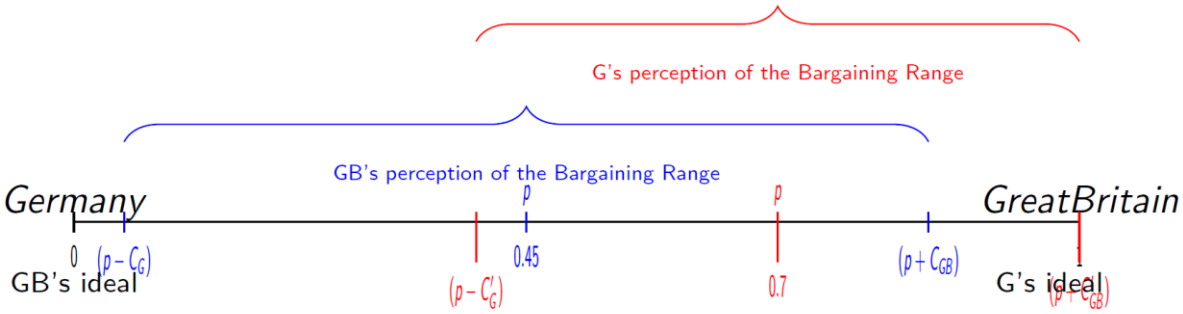
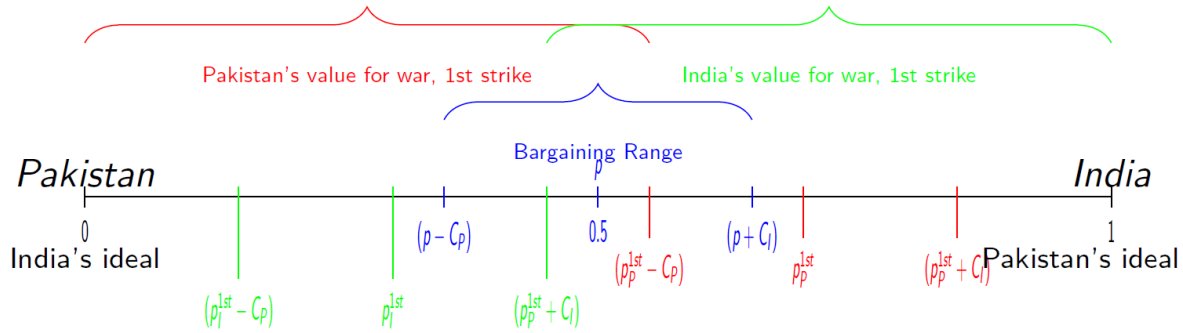


Figure 2.



(c) Explain using the geometric model of bargaining how first-strike advantage produces a commitment problem. Why is this a commitment problem? How often does preemptive war occur in history?

Answer:



This figure shows both countries with first-strike advantage. The bargaining range disappears. (One could also draw the model such that there is no bargaining range when only one country has a first-strike advantage).

When the combined states' (or a single state's) first-strike advantages are greater than the costs of war, the bargaining range is empty, and no self-enforcing peaceful outcomes exist. When p_f - c_P > p_s+ c_I or p_f - p_s > c_P+ c_I, the bargaining range is empty and no self-enforcing peaceful outcomes exist.

Nonetheless, bargains do exist. Both sides would prefer peace rather than going to war; since both states cannot enjoy the advantage of going first, mutually advantageous agreements are always available in principle.

The problem is that these bargains are not enforceable: the parties cannot credibly commit to the bargain when first-strike advantages exist.

Preemptive wars do not occur very often. One could argue that the Six Day War, Germany in WW1, North Korea in the Korean War were preemptive wars. These are cases in which one of the countries had a first strike advantage.

(d) Explain how a rising power that challenges a dominant power creates a problem of preventive war. Why is this a commitment problem? Which party cannot credibly commit to peace? Why?

Answer:

The problem is that sometime in the future, the rising power will have increased its military capability that it could win a war with the previously dominant power. The dominant power then has a problem to attack the rising power today while it has the advantage or to wait, which means that the rising power will be more powerful.

This is a commitment problem, in that the dominant power fights a preventive war against the rising power, since the rising power cannot commit to never reneging on the negotiated outcome. Preventive war occurs despite the parties' agreement about relative power and resolve. The rising power cannot credibly commit to peace, but it is the dominant power that starts the war.