Ceasefires as bargaining instruments in intrastate conflicts: ceasefire objectives and their effects on peace negotiations

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Appendix Chapter Four

This appendix contains proof for the equations used in the formal choice model of chapter four (*The problem of costly concessions*).

Standard model

In Fearon's (1995) choice model, conflict party A and B's expected utilities under perfect information and with risk-neutral actors are expressed as follows:

$$u_A = \{ \quad \begin{matrix} p - c_A & \text{if there is no agreement} \\ x & \text{if there is agreement} \end{matrix} \qquad (1)$$

$$u_B = \{ \quad \begin{matrix} 1 - p - c_B & \text{if there is no agreement} \\ 1 - x & \text{if there is agreement} \end{matrix} \qquad (2)$$

A's absolute gains from agreement x are therefore:

$$u_A(x) - u_A(na) = x - p + c_A, \qquad (3)$$

while B's absolute gains are

$$u_B(x) - u_B(na) = p + c_B - x. \qquad (4)$$

Integrating social preferences

The negative utility of concessions is determined by the importance an actor attaches to avoiding concessions (β_i) and the scope of those concessions ($u_{-i}(x) - u_{-i}(na)$). This suggests that once we account for the negative utility of concessions, the old utility functions of A and B become interrelated, expressed here through the new utility function $\tilde{u}_i(x)$. Under perfect information, the utility of an agreement x for a member of A is now

$$\tilde{u}_A(x) = x - \beta_A(p + c_B - x), \qquad (5)$$

and for a member of B

$$\tilde{u}_B(x) = 1 - x - \beta_B(x - p + c_A). \qquad (6)$$

The utility of non-agreement remains unchanged, as continued fighting does not entail any concessions. Accordingly, under perfect information, members of A will only support an agreement if

$$x - \beta_A(p + c_B - x) \geq p - c_A, \qquad (7)$$

or

$$x - p + c_A \geq \beta_A(p + c_B - x), \qquad (8)$$

that is, if the absolute gains of an agreement are larger than the negative utility of making concessions. In the same vein, members of B will only support an agreement if

$$p + c_B - x \geq \beta_B(x - p + c_A). \qquad (9)$$

Minimally acceptable agreement (individual perspective)

The utility of the minimally acceptable agreement $\tilde{u}_i(\tilde{x}_i)$ equals the utility of non-agreement $\tilde{u}_i(na)$, i.e. for A:

$$\tilde{x}_A - \beta_A(p + c_B - \tilde{x}_A) = p - c_A \qquad (10)$$

$$\tilde{x}_A = p + \frac{\beta_A c_B - c_A}{1 + \beta_A}, \qquad (11)$$

and for B:

$$1 - \tilde{x}_B - \beta_B(\tilde{x}_B - p + c_A) = 1 - p - c_B \qquad (12)$$

$$\tilde{x}_B = p + \frac{c_B - \beta_B c_A}{1 + \beta_B}. \qquad (13)$$

In equations (11) and (13), a higher β_i yields a higher $\tilde{x}_A$ for members of A (who prefer 1) and a lower $\tilde{x}_B$ for members of B (who prefer 0), as long as the costs of war are positive for the opponent.

Conditions for a bargaining range (leader perspective)

Under the assumptions outlined in chapter four, and building on equations (8) and (9), we know that leader A will only consider an agreement x if

$$x - p + c_A \geq s_A \beta_A (p + c_B - x), \tag{14}$$

and leader B if

$$p + c_B - x \geq s_B \beta_B (x - p + c_A). \tag{15}$$

Equation (14) may also be expressed as

$$\frac{x-p+c_A}{p+c_B-x} \geq s_A \beta_A, \tag{16}$$

and equation (15) as

$$\frac{p+c_B-x}{x-p+c_A} \geq s_B \beta_B. \tag{17}$$

This means that leaders on both sides only accept an agreement if their own gains relative to the other side's gains are larger than the negative weight they attribute to concessions ($s_i \beta_i$). Because

$$\frac{x-p+c_A}{p+c_B-x} \times \frac{p+c_B-x}{x-p+c_A} = 1, \tag{18}$$

it also implies that agreement under perfect information will only be possible if

$$s_A \beta_A \times s_B \beta_B \leq 1. \tag{19}$$

If equation (19) is not true, then a continuation of war is the natural outcome.