Summary, Powell, "Guns, Butter, and Anarchy"

Powell devises a formal infinite-horizon model to analyze the guns-versus-butter problem. Each state has to decide how to allocate its limited resources between its internal goals and its military buildup. The game is played between two states, S1 and S2. At the beginning of the first period, S1 decides how to allocate its resources and whether to attack S2. During the second period, S2 decides how to allocate its resources and whether to attack S1, and so on, infinitely, until someone attacks. If one state attacks, then there are only two options: either S1 eliminates S2 or S2 eliminates S1. The probability that a state will prevail in war depends on 3 factors: S1's military allocation, S2's military allocation, and a parameter w that measures the balance between offense and defense.

- **Some of the model's assumptions:**
1) A state derives direct benefit only from those resources which are allocated to its internal ends.
2) Military allocations bring indirect benefits because of the international strategic setting: allocating to the military today makes it possible for a state to survive in order to meet its internal goals tomorrow.
3) As long as neither state attacks, each state's resources remain constant
4) States are trying to maximize their absolute gains in the form of their allocations for internal needs.
5) Actors' preferences are given and remain constant.
6) A state cannot stockpile arms in one period for use later
7) There are no constraints on the amount of resources a state can allocate
8) There is complete information -- each state knows the other's payoffs.

- **Powell's findings:**
There are equilibria in the system in which neither state will attack the other: these equilibria lie in a lens created by the intersection of two curves which depict the countries' willingness to attack based on their resource allocations. The Pareto dominant outcomes lie at the lower end of this lens, where the countries' military allocations as percent of total resources is smallest. (I'm not going into the math – I didn't understand it, and I hope you didn't either).

- **Conclusions:**
1) Powell finds that a long shadow of the future, rather than making peace more likely, actually encourages conflict because it will lead to higher military allocations – states want to ensure their survival tomorrow rather than reaping internal benefits today. It suffers an immediate loss by doing this. States with high military allocations thus prefer attacking in order to rid themselves of the threat so they can reallocate toward their internal ends. "The incentive to attack is that the expected future internal allocations that attacking may bring will exceed those of the status quo allocation."
2) Unlike work which argues that offensive dominance and first-strike advantages are destabilizing, Powell contends that shifts in the offensive/defensive balance encourage higher military allocations, but that there could still be peaceful equilibria at these higher allocation levels.
3) Powell solves the game for Markov perfect equilibria instead of Nash equilibria, which means that, because states don't have an incentive to deviate from the equilibrium path, they can't rely on threats that it would not be in their interest to carry out. Powell uses this to extend the game's findings to the problem of anarchy and absolute versus relative gains.
--Anarchy is often seen as "the fundamental fact of international relations." Two possible definitions for anarchy:
a) the lack of a central authority to enforce agreements among states
b) the lack of a central authority in a strategic setting where the use of force is omnipresent
Powell contends that if the definition is taken to be (a), then anarchy can't be the "fundamental fact of international relations," because we see the necessity for self-enforcing agreements (perfect equilibria) in many other places. (examples are economic and legislative bargaining problems).
If the definition is taken as (b), then the distinctive characteristic is not the lack of central authority but the use of force.
Powell contends that his model undercuts the identification of relative gains—structural realism and absolute gains—neoliberal institutionalism because the model clearly identifies the use of force as the primary characteristic of the system, yet it has states maximizing their absolute gains. He contends that this identification is therefore flawed because his model is in keeping with structural realism.