Nuclear Weapons, Brinkmanship, and Deterrence: A Cheat Sheet[1]

1 Nuclear Crises and Brinkmanship

Thomas C. Schelling formalized deterrence and the effect of nuclear weapons in terms of game theory, a field of economics which attempts to model strategic interactions between states in terms of mathematical models. His two books, *The Strategy of Conflict* (1960) and *Arms and Influence* (1966), are still heavily cited in political science work today for the insights they provide on conflict and cooperation.[2]

Game theory heavily relies on the notion of rationality and credibility.

- **Rationality** mean players are trying to achieve the best outcome for themselves which is often conditional on what they think the other actor(s) will do.

- **Credibility** is a belief that actors will choose certain strategies or actions in the game. Credibility may be demonstrated in IR through past action (your history for being tough), domestic audience costs, or reputational costs for backing down from something you said you would do.

1.1 Chicken and Brinkmanship

"Cold war politics have been likened, by Bertrand Russell and others to the game of "chicken." (Schelling 1966, 116).

In this game, it's a Friday night and the kids from school are hanging around a single lane bridge drinking, talking, and making insults. Two teenagers with freshly-minted drivers license get in an argument of some kind and decide to hop in their cars and start driving towards each other on a single lane bridge from opposite directions to settle the issue. Obviously, they would both like to prove to their friends they are more brave than their adversary so hit the accelerator and drive towards each other at increasingly reckless speeds. As their respective girlfriends and gangs cheer on, the cars continue to accelerate towards the single lane bridge. The first to swerve away yields the bridge to the other driver in order to avoid the collision is called 'chicken.'

The formal model of the game consists of two players, the two drivers, and the payoffs or outcomes to each depend on what action they choose to follow: a) drive straight or b) swerve away. The payoff matrix for the game looks like this:

Figure 1: The Game of Chicken

		Driver 2	
		Swerve	Straight
Driver 1	Swerve	Tie, Tie	Lose, Win
	Straight	Win, Lose	Crash, Crash

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[1]Iris Malone 2016. Please do not circulate without author's permission.

[2]The following games and explanations here are adapted from these two books.

This game illustrates the concept of *brinkmanship* or what Professor Sagan defined in class as "threats that leave something to chance." In this game, each driver wants the other driver to swerve at the last second so that they can secure the most advantageous outcome. Brinkmanship is a shared risk of war in which each side pushes the other towards the brink of disaster or war ever closer in order to force the other side to capitulate at the last second. Soviet-American interactions at several points during the Cold War manipulated this situation in order to extract favorable gains none so clearly as during the Cuban Missile Crisis.

Figure 2: Chicken and the Cuban Missile Crisis

Soviet Union

		Withdraw Missiles	Deploy Missiles
USA	Do Nothing	Tie, Tie	Lose, Win
	Confront	Win, Lose	War, War

The Chicken game also introduces an interesting point about *uncontrollable risk and rationality*. Here, even if both drivers are acting rationally, uncontrollable events can still trigger a crash between the drivers if both believe the other will swerve at the last second. This generates the possibility of "accidental nuclear wars" or nuclear instability caused by misinformation or wrong beliefs about the other side.

1.2   Prisoner's Dilemma and Deterrence

The second game also used in nuclear crises is the Prisoner's Dilemma game which explains the concept of mutually assured destruction (MAD) and the stabilizing effect of deterrence.

In this game, two prisoners are suspected of colluding on something sinister and have been brought in for questioning in two separate rooms. Each prisoner does not know what the other prisoner will say and would like to, ideally, protect themselves. The police admit they don't have enough to convict the prisoners on suspicion alone, but if the prisoners cooperate with the investigation, the police will assure them a more lenient prison sentence. Each prisoner is given the opportunity to help the police and rat out the other prisoner ("defect") or remain silent and help their pal ("cooperate"). If both betray each other, they each serve two years in prison; if both remain silent, they each serve one year. Finally, if one cooperates and the other defects, then the defector will be set free and the other guy will serve three years in prison.

The formal model for the game looks like this (with values denoting the payoff or how much each prisoner values that outcome):

Figure 3: The Prisoner's Dilemma

Prisoner 2

		Coop	Defect
Prisoner 1	Coop	1, 1	-3, 2
	Defect	2, -3	-2, -2

In this game, the dominant strategy for each prisoner is to defect even though mutual cooperation (each remaining silent) provides a better outcome for each prisoner. In the context of the Cold War between the US and the USSR, we see a similar set-up with regards to defense:

Figure 4: The Prisoner's Dilemma and the Cold War

		USSR	
		Don't Attack	Attack
US Don't Attack		1, 1	-3, 2
US Attack		2, -3	-2, -2

The destructive power of nuclear weapons means the payoffs for both sides attacking each other is catastrophic. If the US is likely to retaliate if the USSR attacks and vice versa, it means we risk complete destruction and annihilation of the other players if we use nuclear weapon.

In real-life, however, the US cares about the next round of the game or making it to another day without being annihilated. Similarly, the Soviet Union would also like to continue existing without having to worry about a nuclear war. The continued play of the Prisoner Dilemma over multiple rounds changes our calculations then if we were only to play it once. Main story: if you care enough about living to tomorrow, it is possible to make the strategy for each players to not attack an equilibrium, or best strategy, of the game. This is deterrence!