NUCLEAR SUPERIORITY AND THE BALANCE OF RESOLVE: EXPLAINING NUCLEAR CRISIS OUTCOMES

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ALL THINGS NUCLEAR: INTRODUCTION

- Introduction of nuclear weapons into international system fundamentally transformed nature of international political competition
- Raised cost of war and reduced the incidence of direct military confrontation among possessors
- The nuclear crisis became the main arena for nuclear-armed states to settle important disputes
  - Substitution of crises for wars- Hoffman
  - The ability to prevail in a nuclear crisis was the central determinant of distribution of international power and influence
- But what is a nuclear crisis?
  - State exerting coercive pressure by raising risk of nuclear war until one state submits or it ends in disaster
  - A standoff between nuclear-armed states is a nuclear crisis, whether or not nuclear weapons are part of the dispute

TWO SCHOOLS OF THOUGHT

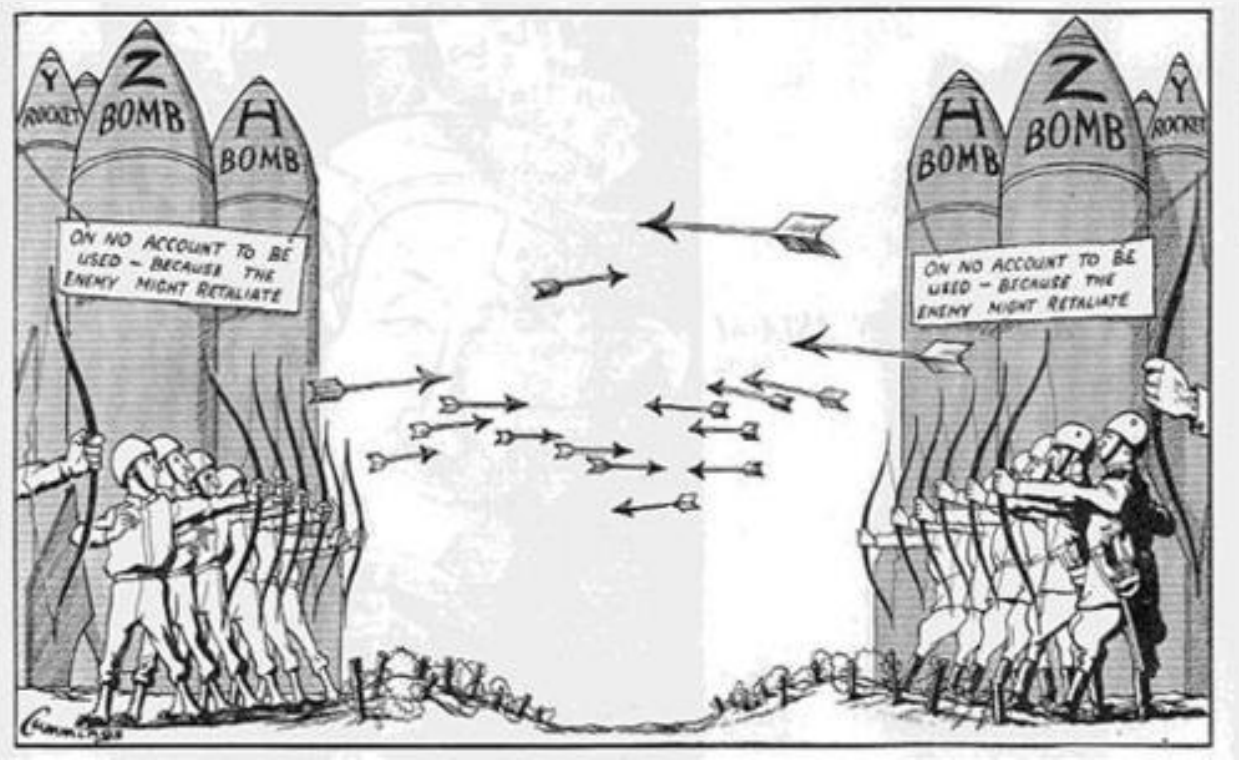
- Nuclear Brinkmanship Theory: The state that is willing to run the greatest risk of nuclear war before submitting will be most likely to win
  - Balance of Resolve that determines the outcome
    - More resolved states are willing to push harder in a crisis
  - States can escalate crisis situations, raising risk of nuclear war, in effort to force less resolved opponent to submit

- Many claim that nuclear superior states have used their nuclear advantage to coerce opponents into submission
  - No clear logic as to why nuclear superiority translates into improved crisis outcomes

- Why not both?

KROENIG'S THEORY TO BE TESTED

- Synthesizing the Nuclear Brinkmanship Theory with the arguments about advantages of nuclear superiority
  - Nuclear superiority: Advantage in size of state's nuclear arsenal relative to opponent
  - Nuclear superiority may influence nuclear crisis outcomes through its effect on the balance of resolve
    - Increases level of risk a state is willing to run in a crisis



NUCLEAR BRINKMANSHIP: THE DETAILS

- Relies on Deterrence
  - Nuclear capable states can't credibly threaten a nuclear attack on another nuclear capable state, but can make "a threat that leaves something to chance" – Schelling
  - Can threaten a situation that may spiral out of control
  - Benefit of winning contested issue should be greater than each increase in risk of nuclear war
- Relies on Uncertainty
  - If states possessed compete information about their resolve and resolve of opponents, nuclear crises would not occur
  - The theory assumes intel is imcomplete, but the crisis itself helps to uncover some of it
- The level of risk a state is willing to risk relies on the state's political stakes in the conflict
  - Higher the stakes, more risk they can threaten to run
- Assumes that if both states have 2nd strike capability, the cost of nuclear war is equally devastating

NUCLEAR SUPERIORITY: THE DETAILS

- Nuclear Superiority provides states with coercive advantage
  - Cuban Missile Crisis 1962
  - Kargil Crisis 1999
  - Suggest nuclear superior states would incur fewer costs in event of disaster, increasing resolve and prospects of victory
- Nuclear strategists recognize that not all nuclear wars would be equally devastating
  - Deaths and causalities, economic destruction, recovery time, etc. all vary
- Nuclear strategists recognize that nuclear superiority reduces expected costs that a country would incur in event of war
  - More fire power to blunt retaliatory capability of opponents
  - When states believe they are superior and will succeed, they have more resolve to push harder

NUCLEAR BRINKMANSHIP MODEL

- Two states S_I and S_{II} are moving toward nuclear crisis
  - S_I (potential challenger) decides to escalate crisis or submit to S_{II}
  - S_I submits? End of game with payoff (s_I, w_{II}) s = payoff of submission and w = payoff of winning
  - S_I escalates? Play shifts to S_{II} who chooses to escalate or submit
  - S_{II} submission ends game (w_I, s_{II}) or escalates
- This second escalation introduces nuclear war probability, f
  - If there is nuclear war, states receive payoff (d_I, d_{II}) d = payoff of disaster
  - No disaster? Play shifts back to S_I
  - If S_I escalates it can only do so by generating risk of disaster 2f, every escalation increases f by one
- Game continues until it ends in submission or disaster

NUCLEAR BRINKMANSHIP MODEL: CONT.

- 3 possible endings: Win, lose, or disaster
  - $w_I > 0 > s_I > d_I$ 0 = status quo
- In equilibrium a state will escalate if the payoff is greater than or equal to the payoff of submitting
  - S_I's expected payoff of running risk of disaster r is $w_I (1 - r) + rd_I$
  - S_I would be willing to run risk of r if $s_I \leq w_I (1 - r) + rd_I$
- From this he derives R_I, the largest risk of disaster a state would be willing to run
  - $R_I = (w_I - s_I)/(w_I - d_I)$
- The more resolved state, the state that is willing to tolerate highest risk of disaster, will win as long as crisis does not end in disaster
- Relies on incomplete information on balance of resolve
- S_I is more likely to prevail over S_{II} when $R_I > R_{II}$
  - R_I is increasing in w_I and decreasing in s_I
  - The values a state places on winning and submitting is based on a state's stakes in the crisis

KROENIG'S NEW MODEL & HYPOTHESES

- Brinkmanship theorists see the payoff of disaster d as the same for all states
  - Feel differentiating is not pertinent because most have 2nd strike capabilities
- Incorporates nuclear balance into payoff structure based on belief that not all nuclear wars would be equally devastating and the belief that nuclear superiority reduces expected costs of that state
- Assume S_I has nuclear superiority over S_{II}
  - d_{II} is cost of absorbing a nuclear attack by S_I and vice versa
  - In event of nuclear exchange, since S_{II} possesses smaller nuclear arsenal than S_I, $d_I > d_I$
  - Also, since S_I will be willing to run a greater risk since they will be more likely to prevail, $R_I > R_{II}$
- Hypothesis 1: States that enjoy nuclear superiority will be more likely to win nuclear crises
- Hypothesis 2: The greater the state's level of nuclear superiority, the more likely it is to win nuclear crises

NUCLEAR CRISIS DATA

- International Crisis Behavior Project (ICB) list of international crises from 1945-2001
  - Information on outcomes, arsenal size, and political stakes
  - Using dyad unit of analysis
- Creates analysis on crisis only if one state perceives the other has directed a threatening action against it
- Identifies 52 nuclear crisis dyads in 20 unique crises, all with varying degrees of escalation
- Dependent Variable: Outcome
  - whether there is a winner (country achieves victory) or it's a loss (compromise, stalemate, or defeat)
    - Victory recorded in 18/52
- Independent Variable
  - Superiority and nuclear ration
  - Control Variables
    - Proximity, gravity, capabilities, regime, population, 2nd strike, violence, security

TABLE 1. *Nuclear crises, 1945–2001*

Crisis name	*Year*	*Nuclear-armed participants*
Korean War	1950	Soviet Union, United States
Suez crisis	1956	Great Britain, Soviet Union,* United States*
Berlin deadline	1958	Great Britain, Soviet Union, United States
Berlin wall	1961	France, Great Britain, Soviet Union,* United States
Cuban Missile Crisis	1962	Soviet Union, United States*
Congo crisis	1964	Soviet Union, United States*
Six-Day War	1967	Israel,* Soviet Union, United States*
Sino-Soviet border war	1969	China, Soviet Union*
War of attrition	1970	Israel, Soviet Union
Cienfuegos submarine base	1970	Soviet Union, United States*
Yom Kippur War	1973	Israel, Soviet Union, United States*
War in Angola	1975	Soviet Union,* United States
Afghanistan invasion	1979	Soviet Union,* United States
Able Archer exercise	1983	Soviet Union, United States
Nicaragua, MIG-21S	1984	Soviet Union, United States
Kashmir	1990	India, Pakistan
Taiwan Strait crisis	1995	China, United States*
India/Pakistan nuclear tests	1998	India, Pakistan
Kargil crisis	1999	India,* Pakistan
India Parliament attack	2001	India,* Pakistan

Note: A state's victory in a crisis is denoted by an asterisk. Not all crises have victors and some crises have multiple victors. For a list of when countries acquired nuclear weapons, see Gartzke and Kroenig 2009.

EMPIRICAL ANALYSIS

TABLE 2. *Cross tabulations of nuclear crisis outcomes, 1945–2001*

		Outcome		
		Win	*Loss*	*Total*
SUPERIORITY	*Yes*	14 (54%)	12 (46%)	26 (100%)
	No	4 (15%)	22 (85%)	26 (100%)
	Total	18 (35%)	34 (65%)	52 (100%)

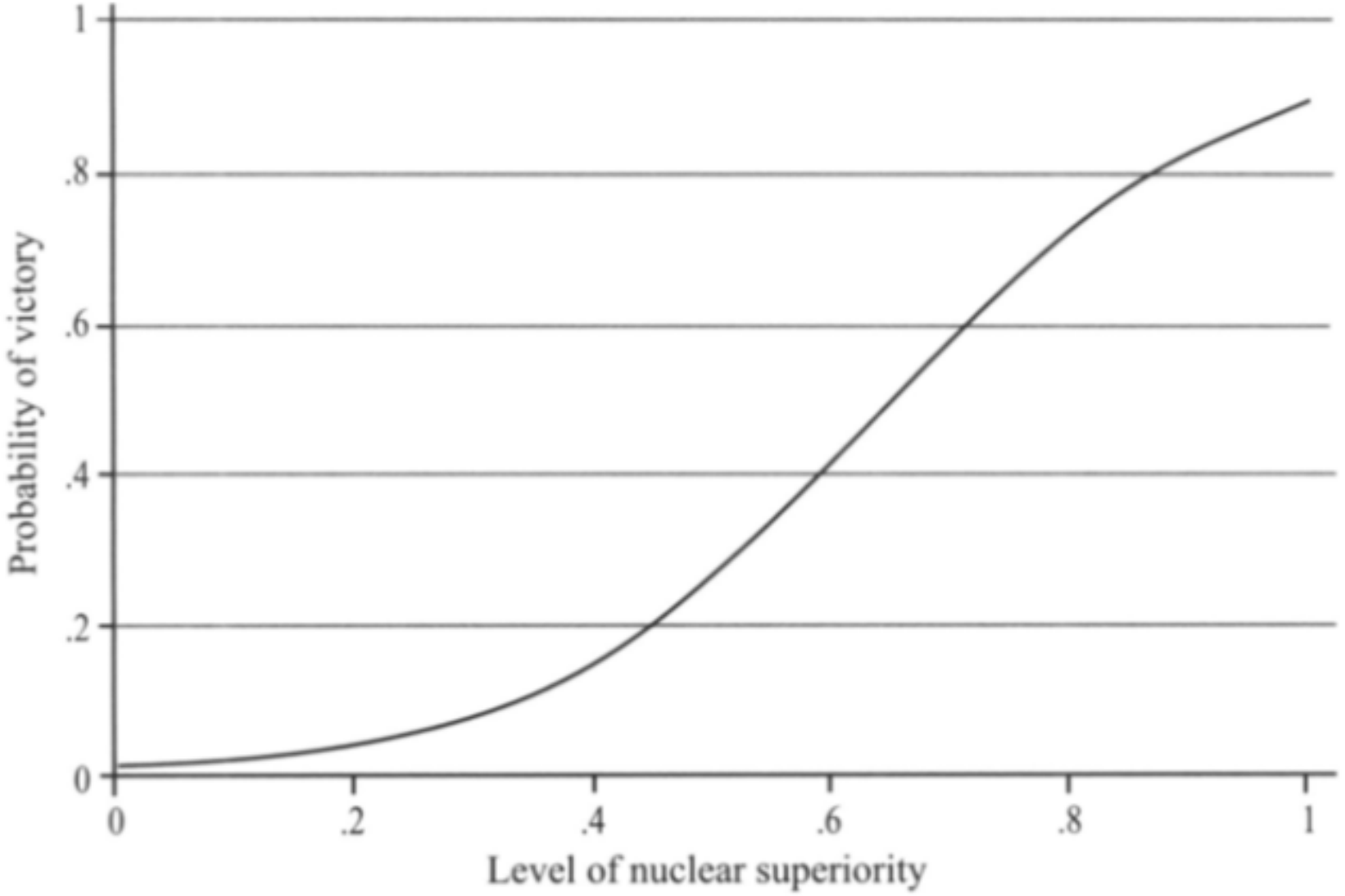
Note: $X^2 = 8.497$ ($p = 0.004$).

REGRESSION ANALYSIS

TABLE 3. *Nuclear superiority and nuclear crisis outcomes, 1945–2001*

Variables	*Model 1*	*Model 2*	*Model 3*	*Model 4*	*Model 5*	*Model 6*
SUPERIORITY	1.117**	2.005**	1.877***			
	(0.413)	(0.676)	(0.459)			
NUCLEAR RATIO				1.294*	4.252***	2.479***
				(0.509)	(1.306)	(0.622)
PROXIMITY		1.666***	1.196***		2.323***	1.283***
		(0.409)	(0.238)		(0.551)	(0.284)
GRAVITY		−0.760			−0.952	
		(0.755)			(0.875)	
REGIME		0.032			0.036	
		(0.038)			(0.033)	
CAPABILITIES		0.451			−1.602	
		(1.667)			(1.713)	
2ND STRIKE		2.296*	0.566		2.328	
		(1.096)	(0.501)		(1.315)	
POPULATION		−9.54e-07			2.52e-07	
		(1.44e-06)			(1.59e-06)	
VIOLENCE		0.299**	0.239*		0.333**	0.205*
		(0.104)	(0.097)		(0.119)	(0.087)
SECURITY		−7.320			−7.611	
		(5.911)			(6.719)	
Constant	−1.020***	−3.159***	−3.025***	−1.091***	−3.883***	−2.786***
	(0.277)	(0.844)	(0.898)	(0.313)	(1.030)	(0.561)
N	52	52	52	52	52	52
Wald chi^2	7.32	303.70	40.28	6.47	797.25	22.88
Log pseudolikelihood	−29.107	−22.663	−24.818	−30.240	−22.572	−26.456
Pseudo R^2	0.1322	0.324	0.260	0.098	0.327	0.211

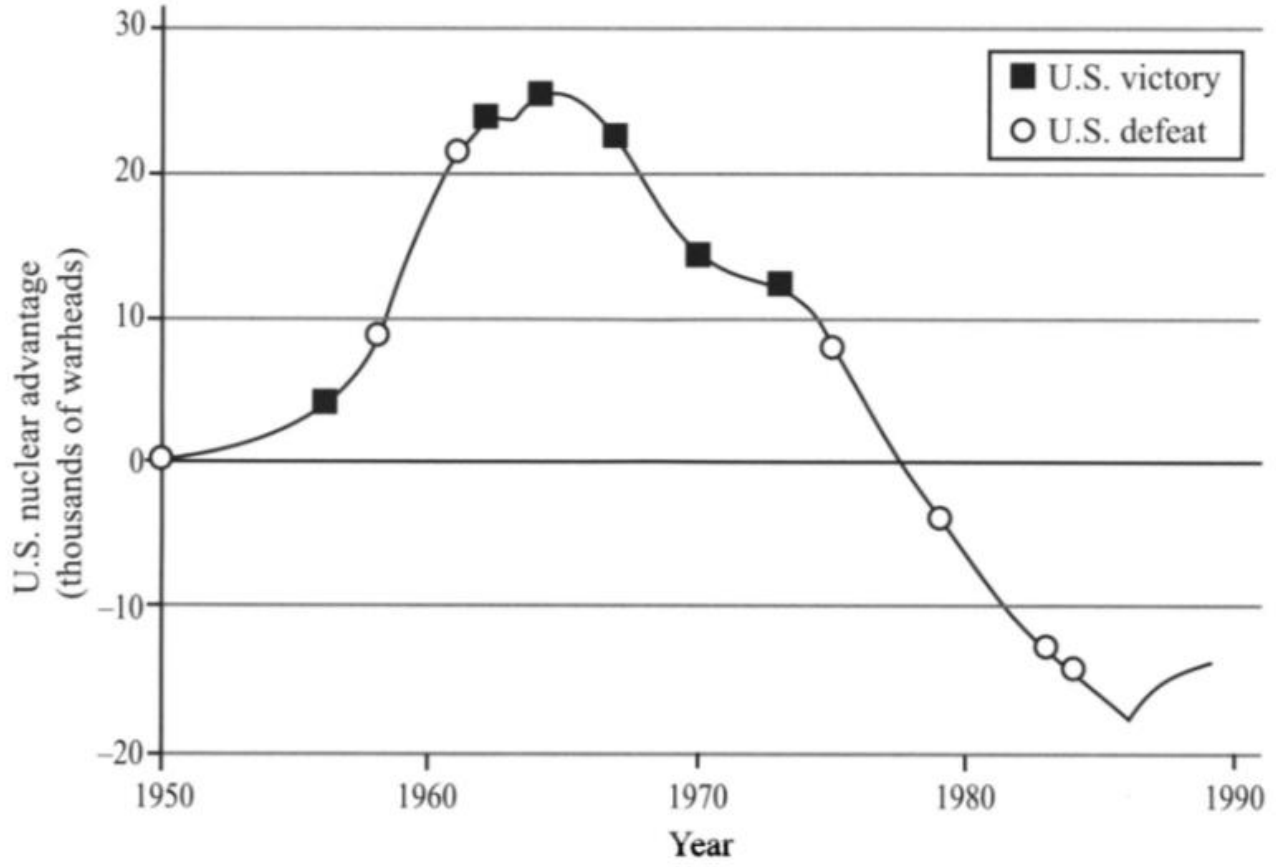
Note: Robust standard errors adjusted for clustering by crisis dyad in parentheses. *significant at 5%; **significant at 1%; ***significant at 0.1%. All tests are two-tailed.



Note: Estimates obtained from Model 5. Level of nuclear superiority is from lowest (0) to highest (1).

FIGURE 1. *Conditional effect of the degree of nuclear superiority on the probability of victory in nuclear crises, 1945–2001*

NUCLEAR CRISES BETWEEN U.S. AND USSR 1949-1989

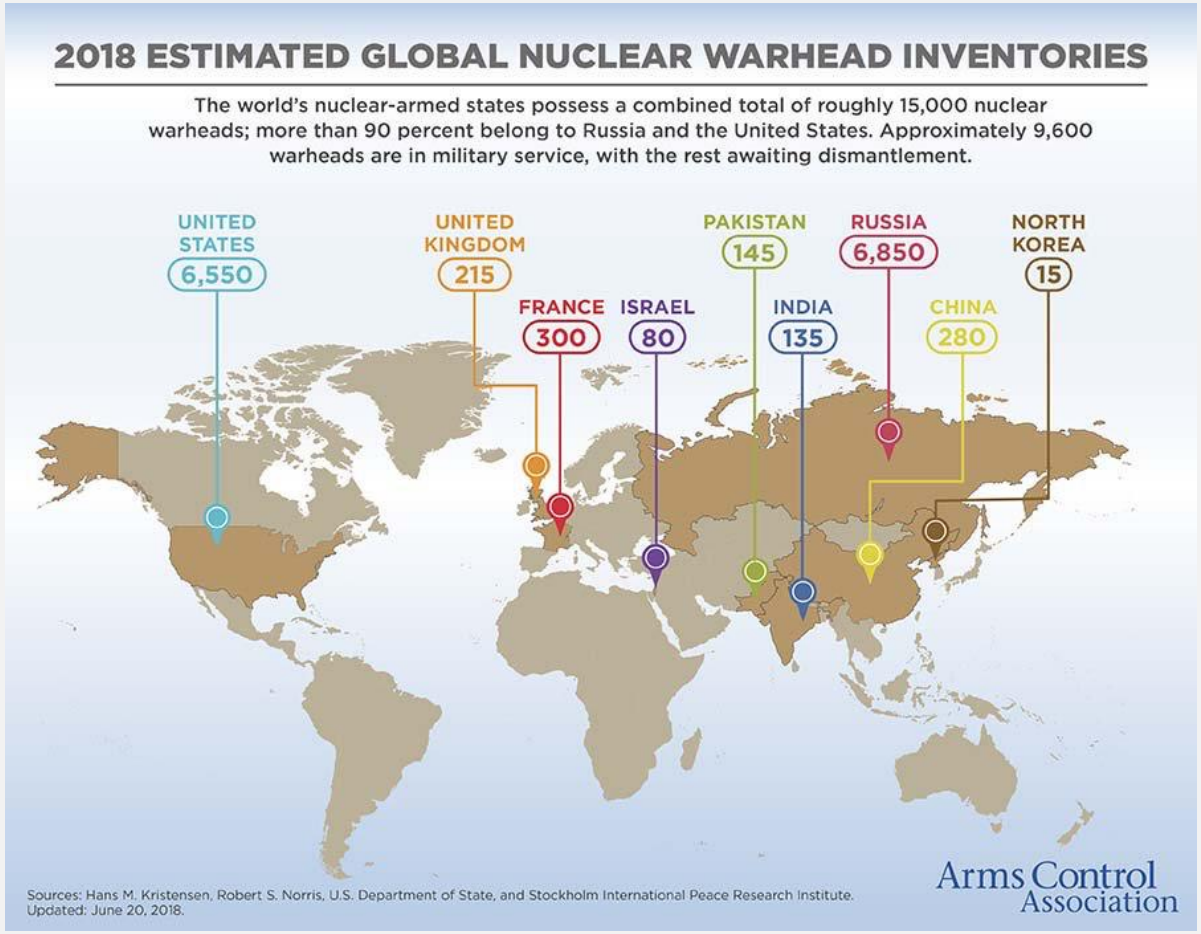


Note: The y-axis depicts the U.S. nuclear advantage relative to the Soviet Union measured in numbers of nuclear warheads.

FIGURE 2. *U.S.–Soviet Union nuclear balance and crisis outcomes, 1949–1989*

ROBUSTNESS TESTS

- Robustness tests examine whether the observed relationship is the result of a selection effect, sensitive to modeling decisions, or are dependent on the character of the nuclear balance between the states
- Selection Effect
  - Possible that nuclear superior states are more likely to win because they select into crises they know they will win
- Performs multiple tests to determine that his data is not skewing results, but finds no evidence that it is



CONCLUSION

- Nuclear Balance between states is important for analyzing patterns of victory in nuclear crises
- States that enjoy nuclear superiority over their opponents are more likely to win
- Findings hold after:
  - Controlling for conventional military balance and Selection into crises
  - Robust to exclusion of each individual crisis and weapon state
- New model of nuclear brinkmanship theory to incorporate nuclear superiority
- Nuclear Crises are competitions in risk taking
  - Nuclear superior and resolved states are willing to run the risk
  - Superiority also decreases costs and allows said state to stay in crisis longer
- Evidence that political stakes shape crisis outcomes