Nuclear Superiority or the Balance of Resolve? Explaining Nuclear Crisis Outcomes

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Question and Answer

Question:

What determines the outcome of nuclear crises?

Answer:

Nuclear superiority increases states' resolve making them more likely to win nuclear crises.

Outline

1) ***Previous Research***

2) ***The Advantages of Nuclear Superiority***

3) ***Empirical Evidence, 1945-2001***

4) ***Conclusions***

1) Previous Research: Brinkmanship Theory

Nuclear brinkmanship theory emphasizes political stakes.

- ***Schelling, Powell, Jervis etc.***

  - ***Credibility problem***
  - ***"Threat that leaves something to chance"***
  - ***"Competition in risk taking"***
  - ***State with a greater stake in a crisis will win***

1) Previous Research

Historians and policy analysts have pointed to role of nuclear superiority in specific cases.

- ***Trachtenberg, Betts, etc.***

Others have looked at related issues.

- ***Gartzke and Kroenig, Gelpi and Griesdorf, etc.***

Scholars have not:

- ***explicated logic linking superiority to victory.***
- ***performed systematic empirical analysis on entire universe of cases.***

2) The Advantages of Nuclear Superiority: Standard model

S_i, S_{ii} : escalate or submit

Nature: f, 2f, 3f,……kf=1.

Outcomes: win (w), lose (s), disaster (d)

$w > 0 > s > d$

2) The Advantages of Nuclear Superiority: Standard model

State willing to run greatest risk will win.

In equilibrium, states escalate as long as the expected payoff of escalating is greater or equal to the expected payoff of submitting.

$$r = w(1 - r) + rd \geq s$$

$$^{*}R = (w - s) / (w - d)$$

2) The Advantages of Nuclear Superiority: Standard model

$$R = (w - s) / (w - d)$$

Brinkmanship theorists have focused on w and s.

2) The Advantages of Nuclear Superiority: Superiority model

$$R = (w - s) / (w - d)$$

Nuclear superior states incur a smaller cost of disaster and, therefore, have higher levels of effective resolve.

2) The Advantages of Nuclear Superiority

Hypothesis 1: States with a greater political stake in a nuclear crisis will be more likely to win.

Hypothesis 2: States that enjoy nuclear superiority will be more likely to win nuclear crises.

Hypothesis 3: The greater a state's level of nuclear superiority, the more likely it is to win nuclear crises.

3) Statistical Analysis: Data and Method

Data: original nuclear crises dataset,1945-2001

Dependent variable: Nuclear crisis outcome

Independent variables:

- ***nuclear superiority***
- ***nuclear ratio***
- ***stakes***
- ***proximity***
- ***controls***

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*
Ussuri River Crisis	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*
Cod War	1973	Great Britain, Soviet Union*
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.		

3) Statistical Analysis: Data and Method

Data: original nuclear crises dataset,1945-2001

Dependent variable: Nuclear crisis outcome

Independent variables:

- ***nuclear superiority***
- ***nuclear ratio***
- ***stakes***
- ***proximity***
- ***controls***

Table 2. Cross Tabulations of Nuclear Crisis Outcomes

		Outcome		
		Win	Loss	Total
Superiority	Yes	14 (52%)	13 (49%)	27 (100%)
	No	5 (18.5%)	22 (81.5%)	27 (100%)
	Total	19 (35%)	35 (65%)	54 (100%)
Stakes	Yes	3 (27%)	8 (73%)	11 (100%)
	No	16 (37%)	27 (63%)	43 (100%)
	Total	19 (35%)	35 (65%)	54 (100%)
Proximity	Yes	7 (35%)	13 (65%)	20 (100%)
	No	12 (35%)	22 (65%)	34 (100%)
	Total	19 (35%)	35 (65%)	54 (100%)

Note: The compromise, stalemate, and defeat categories were consolidated into a single category labeled "Loss."

3) Statistical Analysis:
Probit Models

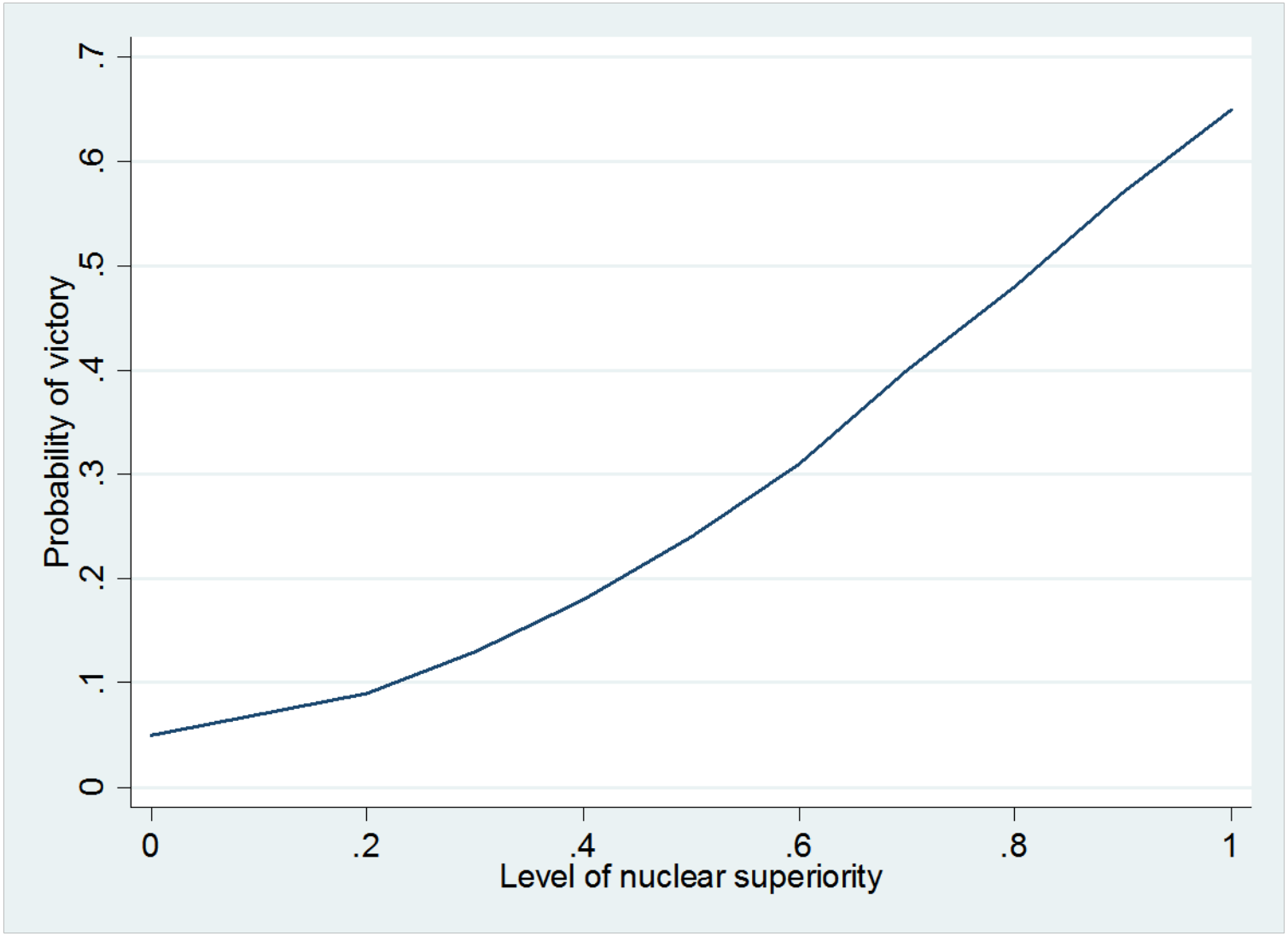
1. States that possess nuclear superiority are more likely to win nuclear crises

2. The greater a state's level of nuclear superiority, the more likely they are to win nuclear crises

3. There is no relationship between a state's stakes in a crisis, or geographical proximity, and the outcome of nuclear crises

4. There is no relationship between regime type and victory in nuclear crises.

3) Conditional effect of the degree of nuclear superiority on the probability of victory in nuclear crises, 1945-2001.

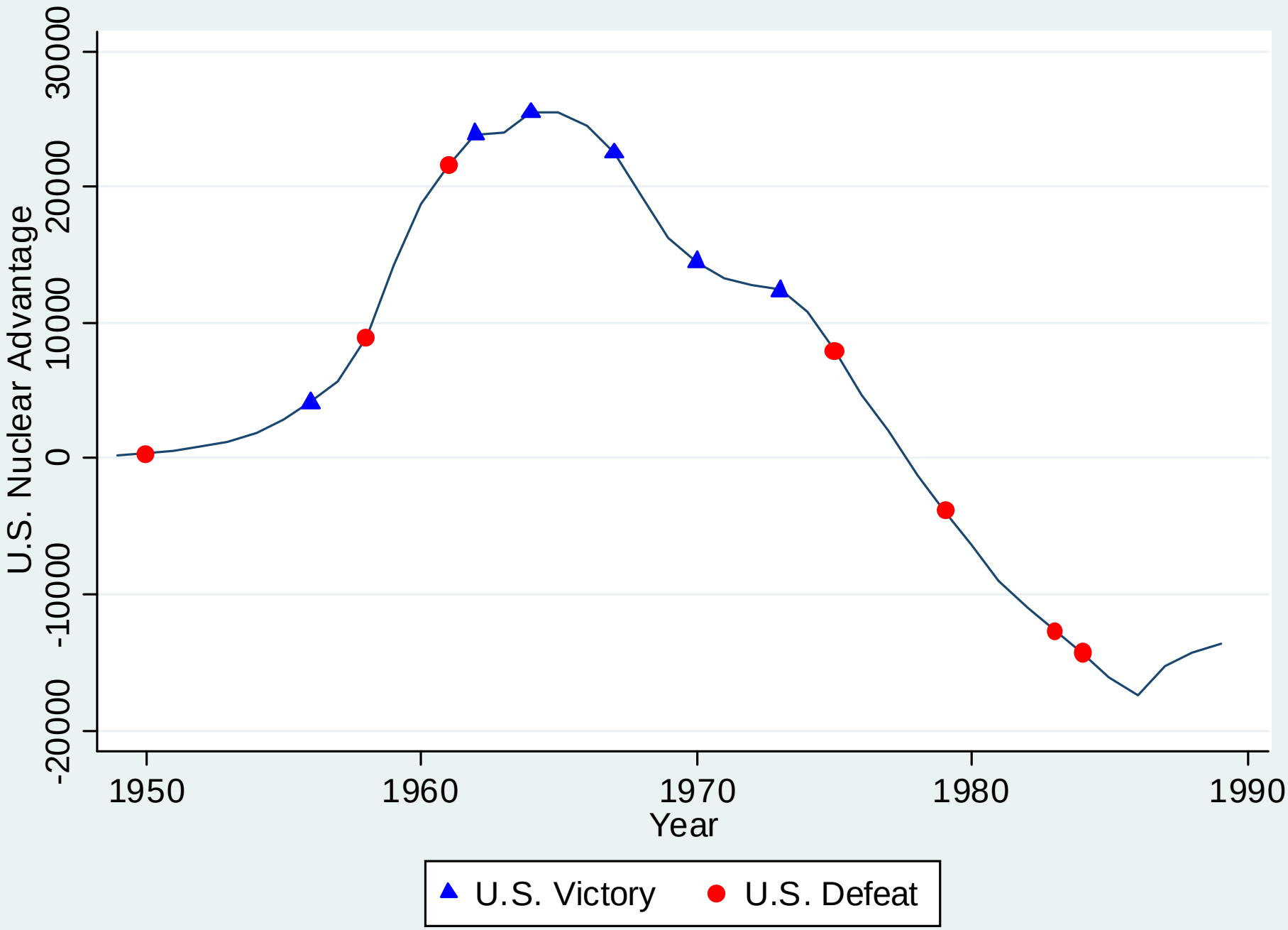


3) Statistical Analysis:
Robustness tests

Findings hold after accounting for selection into crises.

Results are not sensitive to the exclusion of each crisis or even each country.

3) Within Case Variation: US-USSR Nuclear Crises


U.S. Nuclear Advantage
30000
20000
10000
0
-10000
-20000
1950
1960
1970
1980
1990
Year
U.S. Victory
U.S. Defeat

4) Conclusions

Implications for international relations theory:

- ***A new theory of nuclear crisis outcomes.***
- ***First systematic empirical test of nuclear crises.***
- ***The meaning of the nuclear revolution.***

Implications for U.S. foreign policy:

- ***Is nuclear proliferation in Iran a threat?***
- ***How should the United States size its nuclear arsenal?***

QUESTIONS?

3) Statistical Analysis:
Selection tests

Findings hold after accounting for selection into crises.

- ***Control for target of crisis.***
- ***Heckman model. Nuclear crisis onset a function of: military capabilities, security environment, geographic distance between states, preference similarity, regime type, and trade dependence.***
- ***One stage model.***

Table 3. The Advantages of Nuclear Superiority

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
SUPERIORITY	0.942** (0.430)			1.186*** (0.462)	1.316*** (0.496)	1.169*** (0.455)
STAKES		-0.278 (0.474)		-0.193 (0.520)		
PROXIMITY			-0.008 (0.427)		0.453 (0.448)	
REGIME				-0.015 (0.027)	-0.013 (0.028)	
SUPERPOWER				0.417 (0.670)	0.445 (0.700)	
CAPABILITIES				-0.048** (0.020)	-0.045** (0.018)	-0.036** (0.015)
2ND STRIKE				-0.195 (0.385)	-0.139 (0.380)	
POPULATION				-1.69e-07 (8.14e-07)	-1.21e-07 (7.83e-07)	
SECURITY				0.184 (1.948)	-0.139 (1.859)	
Constant	-0.896**** (0.285)	-0.326** (0.163)	-0.377* (0.219)	-0.734 (0.619)	-1.006 (0.624)	-0.876**** (0.283)
N	54	54	54	54	54	54
Wald chi^2	4.81	0.34	0.00	11.73	12.25	8.63
Log pseudolikelihood	-31.634	-34.828	-35.023	-28.827	-28.411	-29.532
Pseudo R^2	0.097	0.006	0.000	0.177	0.189	0.1568

Note: Robust standard errors adjusted for clustering by crisis dyad in parentheses. *significant at 10%, **significant at 5%, ***significant at 1%, ****significant at 0.1%.

Table 4. The Advantages of Greater Levels of Nuclear Superiority				
Variables	Model 7	Model 8	Model 9	Model 10
NUCLEAR RATIO	0.992* (0.577)	1.245* (0.719)	1.519* (0.820)	1.406** (0.647)
STAKES		-0.160 (0.541)		
PROXIMITY			0.472 (0.472)	
REGIME		-0.006 (0.028)	-0.005 (0.029)	
SUPERPOWER		0.459 (0.676)	0.404 (0.703)	
CAPABILITIES		-0.046** (0.019)	-0.044** (0.017)	-0.036** (0.015)
2ND STRIKE		-0.163 (0.391)	-0.130 (0.388)	
POPULATION		1.46e-07 (7.97e-07)	1.65e-07 (7.87e-07)	
SECURITY		0.351 (1.872)	-0.018 (1.776)	
Constant	-0.903**** (0.341)	-0.907 (0.675)	-1.201* (0.693)	-0.973**** (0.358)
N	54	54	54	54
Wald chi^2	2.95	8.51	9.64	7.00
Log pseudolikelihood	-32.870	-30.240	-29.750	-30.617
Pseudo R^2	0.062	0.137	0.151	0.126

Note: Robust standard errors adjusted for clustering by crisis dyad in parentheses. *significant at 10%, **significant at 5%, ***significant at 1%, ****significant at 0.1%.

Table 5. Selection Models

	Independent Variables	Model 11	Model 12	Model 13
OUTCOME				
	NUCLEAR RATIO	1.358** (0.611)	1.595** (0.655)	1.840*** (0.652)
	STAKES	-0.074 (0.492)	0.284 (0.211)	0.394 (0.246)
	CAPABILITIES	-0.034**** (0.010)	-0.039**** (0.011)	-0.040**** (0.011)
	SECURITY			-0.890 (3.220)
	DISTANCE			0.0002 (0.00010)
	PREFERENCES			-0.143 (0.079)
	JOINT DEMOCRACY			-0.026** (0.012)
	TRADE			0.032 (0.049)
	TARGET	0.760* (0.445)		
	CONSTANT	-1.150**** (0.338)	-1.124** (0.458)	-1.512* (0.907)
CRISIS				
	NUCLEAR RATIO		-0.100 (0.213)	
	CAPABILITIES		0.004 (0.005)	
	SECURITY		174.796**** (5.992)	
	DISTANCE		-0.00010** (0.00005)	
	PREFERENCES		0.017 (0.025)	
	JOINT DEMOCRACY		-0.016 (0.011)	
	TRADE		-0.036 (0.025)	
	CONSTANT		-1.293**** (0.302)	
	N	54	1701	54
	Wald chi^2	20.78	13.83	57.89
	Log pseudolikelihood	-27.505	-94.206	-27.659
	R^2	0.215		0.210
	Rho		-0.059 (0.178)	

Note: Robust standard errors adjusted for clustering (by crisis dyad in Models 11 and 13 and by dyad in Model 12) in parentheses. *significant at 10%, **significant at 5%, ***significant at 1%, ****significant at .10%. Model 12 is estimated after including t, t^2, and t^3 to control for temporal dependence as recommended by Carter and Signorino (2009).