The Secret Success of Nonproliferation Sanctions & Determinants of Nuclear Weapons Proliferation

Presentation by
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The Secret Success of Nonproliferation Sanctions

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Argument

“Building on the rationalist literature on sanctions, this article argues that economic and political sanctions are a successful tool of nonproliferation policy, but that selection effects have rendered this success largely hidden relatively hidden. “

U.S. made sanctions a credible threat against nuclear proliferators since the late 1970’s.

Rational leaders assess the risk of sanctions before initiating a nuclear weapons program.

This produces a selection effect: States highly vulnerable to sanctions are deterred from starting nuclear weapons programs in the first place, and the only states who start the programs are those who are not economically or security dependent on the U.S. and already assessed the risk of sanctions. Sanctions therefore are ineffective against them.

Selection Effects

Pose an obstacle to assessing the efficacy of sanctions in nonproliferation

If states expect that sanctions are likely and too costly to endure, they may abstain from nuclear proliferation in the first place, which may mean that sanctions succeed before they are even implemented--biasing downward our estimates of sanctions' efficacy.

Miller provide evidence that since the late 1970s--when the U.S. made clear through congressional legislation that positive economic and security relations with the country were contingent on nonproliferation and regularly employing sanctions against proliferating states--sanctions have been ineffective in halting ongoing nuclear weapons programs, but have succeeded in deterring states from starting nuclear weapons programs in the first place and have thus contributed to a decline in the rate of nuclear pursuit.

Existing literature on sanctions and nuclear proliferation

Argument and methods

Built on the rationalist work on economic sanctions, he argues that the key to understanding the dynamics of sanctions and non proliferation is that rational leaders consider the risk of sanctions before initiating a nuclear weapons program.

Threat of sanctions deter proliferation by states dependent on the U.S. three ways:

Security

Domestic Politics

Norms

Argument and methods, cont.

“Selection effects occur when factors that influence the choices that produce cases also influence the outcome or dependent variable for each case.”

When the threat of sanctions is credible, dependence on U.S. is likely to influence both (1) whether a state starts nuclear weapons programs and (2) whether that state concedes in the face of sanctions that are ultimately threatened or imposed.

A reputation for imposing sanctions is necessary for the policy to successfully deter

The Deterrent Effect of Nonproliferation Sanctions

TABLE 1. *Pre-sanctions nuclear aspirants*

Pre-1976	*Year*	*Economic aid*	*Military aid*	*US troops*	*High trade*	*Dependence score*
France	1953	X	X	X		3
China	1954					0
Israel	1957	X		X	X	3
Australia	1961		X	X	X	3
India	1963	X	X	X		3
Egypt	1964	X		X	X	3
Taiwan	1966	X	X	X	X	4
Libya	1969	X	X	X	X	4
South Korea	1969	X	X	X	X	4
Pakistan	1971	X	X	X		3
South Africa	1973			X	X	2
Average		72.7%	63.6%	90.9%	63.6%	2.91

TABLE 2. *Post-sanctions nuclear aspirants*

Post-1976	*Year*	*Economic aid*	*Military aid*	*US troops*	*High trade*	*Dependence score*
Brazil	1977	X	X	X		3
Argentina	1978			X		1
North Korea	1979					0
Iraq	1982				X	1
Iran	1984					0
Average		20%	20%	40%	20%	1.0

TABLE 3. *Logistic regression results*

	Model 1	*Model 2*	*Model 3*
DEPENDENCE SCORE	0.398	0.553	0.457
	(0.279)	(0.302)‡	(0.294)
POST-1976 DUMMY	2.113	2.579	2.489
	(1.124)‡	(1.514)‡	(1.714)
DEPENDENCE SCORE * POST-1976	−1.591	−1.643	−1.359
	(0.616)*	(0.575)**	(0.587)*
NO. OF NCAS		0.048	.030
		(0.042)	(.044)
NCAXAVERAGE NO. OF MIDS IN PAST 5 YEARS		0.038	0.063
		(0.020)‡	(0.018)**
AVERAGE NO. OF MIDS IN PAST 5 YEARS		0.339	0.355
		(0.089)**	(0.090)**
GDP PER CAPITA		0.000	0.000
		(0.000)‡	(0.000)
INDUSTRIAL CAPACITY THRESHOLD		1.641	1.977
		(0.670)*	(.767)*
GDP PER CAPITA SQUARED		−0.000	−0.000
		(0.000)*	(0.000)*
POLITY SCORE		0.003	0.005
		(0.048)	(0.051)
NUCLEAR ALLY		−0.144	0.246
		(0.701)	(0.803)
INTERSTATE RIVALRY		1.683	1.314
		(0.866)‡	(0.825)
TRADE OPENNESS		−0.003	0.002
		(0.011)	(0.010)
CHANGE IN POLITY SCORE IN PAST 5 YEARS		−0.101	−0.103
		(0.080)	(0.071)
CHANGE IN TRADE OPENNESS IN PAST 5 YEARS		0.024	0.022
		(0.013)‡	(0.012)‡
NPT MEMBER			−3.468
			(1.499)*
NPT ERA (POST-1970)			0.704
			(1.065)
NO PROLIFERATION YEARS		0.004	0.032
		(0.023)	(0.024)
Constant	−6.556	−10.028	−10.376
	(0.863)**	(1.372)**	(1.476)**
N	5,835	5,156	5,156
Pseudo R^2	.0611	.3288	.3761

Notes: Clustered standard errors are in parentheses. MIDS = militarized interstate disputes. NCA = nuclear cooperation agreements. NPT = Nuclear Non-Proliferation Treaty. ‡$p < .10$ *$p < .05$; **$p < .01$ (two-tailed tests).

TABLE 4. *First differences*

	First difference estimate	*95% confidence intervals*	*%Δ relative to median probability*
Dependence score, 0 to 1, post-1976 era	−.0018*	−.0075, −.0001	−536%
Dependence score, 0 to 2, post-1976 era	−.0023*	−.0092, −.0001	−685%
Dependence score, 0 to 3, post-1976 era	−.0024*	−.0095, −.0001	−715%
Dependence score, 0 to 4, post-1976 era	−.0025*	−.0096, −.0001	−745%
Dependence score, 0 to 1, pre-1976 era	.0001	−.0000, .0006	+30%
Dependence score, 0 to 2, pre-1976 era	.0003	−.0001, .0016	+89%
Dependence score, 0 to 3, pre-1976 era	.0008	−.0001, .0037	+238%
Dependence score, 0 to 4, pre-1976 era	.0017	−.0001, .0082	+507%

Note: * Significant at the 95% confidence level.

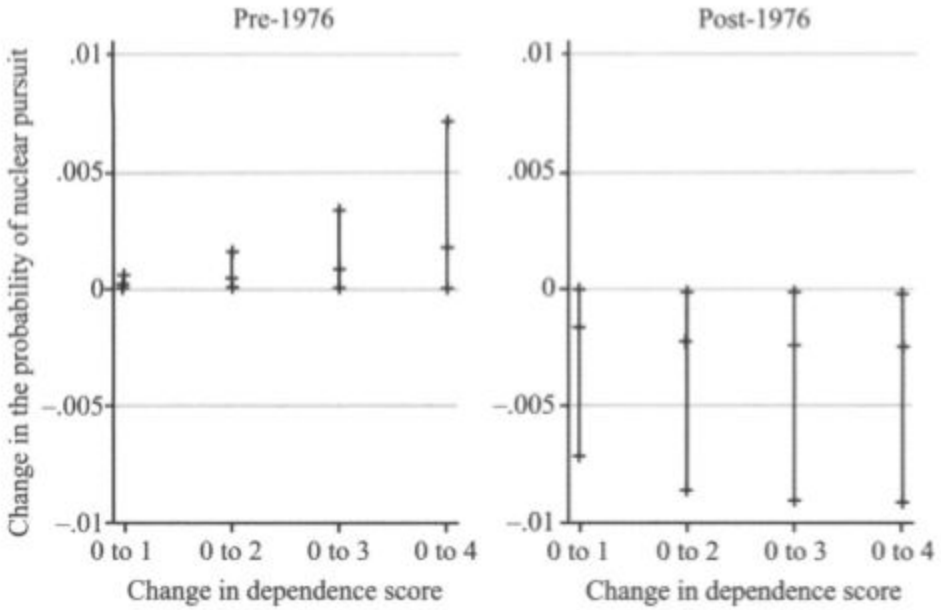

FIGURE 1. *Effects of changes in dependence on the United States, by era*

expected.[70] Taken together, these results suggest that in the postsanctions era, the biggest dampening effect is moving from no dependence to some dependence. However, moving from the pre- to postsanctions era has the biggest negative effect on states with the highest levels of dependence.

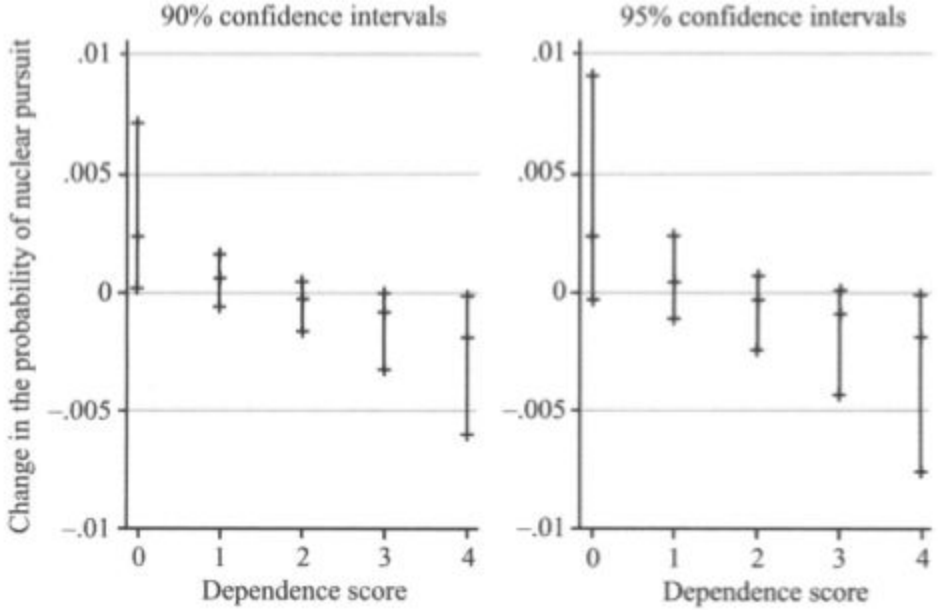

FIGURE 2. *Effect of changing from pre-1976 to post-1976 era, by dependence score*

Case Studies

Taiwan

South Korea

Conclusion

Criticism

He explained that sanctions are successful when states miscalculate U.S.' credibility using case studies, but did not prove that states that choose nuclear weapons are highly insulated and able to weather the threat and imposition of sanctions which is important to his argument.

Determinants of Nuclear Weapons Proliferation

Dong-Joon Jo and Erik Gartzke

Overview

They evaluate a variety of explanations in 2 stages of nuclear proliferation, the presence of nuclear weapons production programs and the actual possession of nuclear weapons. They examine proliferation quantitatively, using data collected by the authors on national latent nuclear weapons production capability and several other variables, while controlling for the conditionality of nuclear weapons possession based on the presence of a nuclear weapons program.

They found that security concerns and technological capabilities are important determinants of whether states form nuclear weapons programs, while security concerns, economic capabilities, and domestic politics help to explain the possession of nuclear weapons.

Non-Proliferation of Nuclear Weapons (NPT): Signatories less likely to initiate nuclear weapons programs, but has not deterred proliferation at the system level

Method to Obtain Data

Effort to apply statistical analysis on nuclear proliferation

Multivariate Regression

Use 2 related but distinct stages of nuclear proliferation: the presence of nuclear weapons program and the possession of nuclear weapons

Conceptual Framework

Conceptual Framework

Opportunity

Willingness

Research Design & Data

Dependent Variables

Independent Variables

Results & Implications

Table 1
Statistical Analyses of Nuclear Proliferation

Dependent Variable Nuclear Weapons Possession Status	Model 2-1: Censored Model			Model 2-2: Noncensored Model		
	Coeff.	S.E.	Sig.	Coeff.	S.E.	Sig.
Independent variables						
Latent nuclear weapons production capability$_{i,t-1}$	0.4275	(0.448)		0.6082	(0.233)	***
Economic capacity$_{i,t-1}$	110.5096	(28.70)	****	6.5480	(3.929)	*
Diffusion$_{t-1}$	13.0360	(3.801)	***	1.9503	(0.698)	***
Conventional threat$_{i,t-1}$	2.7294	(0.453)	****	1.3437	(0.258)	****
Nuclear threat$_{i,t-1}$	–5.0045	(0.834)	****	–2.1532	(0.604)	****
Nuclear defender$_{i,t-1}$	–3.5502	(0.902)	****	–1.3794	(0.576)	**
Diplomatic isolation$_{i,t-1}$	0.3904	(1.068)		1.6953	(0.867)	*
Domestic unrest$_{i,t-1}$	0.1632	(0.129)		0.4322	(0.120)	****
Democracy$_{i,t-1}$	0.2709	(0.107)	***	0.0666	(0.059)	
NPT(system effect)$_{t-1}$	–0.0169	(0.035)		0.0007	(0.006)	
Major power status$_{i,t-1}$	7.4898	(1.040)	****	4.6929	(0.741)	****
Regional power status$_{i,t-1}$	1.2096	(0.498)	**	1.5459	(0.495)	***
Count2	–0.1474	(0.029)	****	–0.0652	(0.034)	*
Constant	–53.8317	(10.13)	****	–14.8721	(2.477)	****
Obs.		440			4,697	
Log likelihood		–26.09			–133.16	
Pseudo R^2		0.914			0.861	
Wald chi-square		606,935	****		201.6	****

Table 1 (continued)

Dependent Variable Nuclear Weapons Program Status	Coeff.	Model 1 S.E.	Sig.
Independent variables			
Latent nuclear weapons production capability$_{i,t-}$	0.4836	(0.079)	****
Economic capacity$_{i,t-1}$	1.4826	(1.944)	
Diffusion$_{t-1}$	1.0550	(0.251)	****
Conventional threat$_{i,t-1}$	0.7002	(0.258)	***
Nuclear threat$_{i,t-1}$	–0.9140	(0.364)	**
Nuclear defender$_{i,t-1}$	–0.0976	(0.306)	
Diplomatic isolation$_{i,t-1}$	–0.0602	(0.438)	
Domestic unrest$_{i,t-1}$	–0.1480	(0.096)	
Democracy$_{i,t-1}$	–0.0262	(0.022)	
NPT membership$_{i,t-1}$	–0.7809	(0.363)	**
NPT(system effect)$_{t-1}$	0.0052	(0.004)	
Major power status$_{i,t-1}$	2.0000	(0.388)	****
Regional power status$_{i,t-1}$	1.5491	(0.236)	****
Count1	–0.1132	(0.012)	****
Constant	–6.3543	(1.001)	****
Obs.		4,697	
Log likelihood		–256.71	
Pseudo R^2		0.824	
Wald chi-square		644.5	****

Notes: Statistically significant parameter estimators are denoted by * ($p < .10$), ** ($p < .05$), *** ($p < .01$), and **** ($p < .001$). The sample in Model 2-1 includes country-years where a given country has an active nuclear weapons program.

Table 2
Log-Likelihood Ratio (*LR*) Test

	Model 1		Model 2	
Omitted Independent Variables	Chi-square	Sig.	Chi-square	Sig.
Opportunity variables	61.20	****	42.50	****
Willingness variables				
International security	8.62	*	59.40	****
Domestic politics	4.88	*	15.63	****
Norms	5.54	*	0.23	
Status	53.83	****	52.07	****

Notes: "Opportunity variables" include latent nuclear weapons production capability, economic capacity, and diffusion.
"Willingness variables—International security" include conventional threat, nuclear threat, nuclear defense pact, and diplomatic isolation.
"Willingness variables—Domestic politics" include domestic unrest and democracy.
"Willingness variables—Norms" include NPT membership, NPT system, major power status, and regional power status.
Statistically significant parameter estimators are denoted by * ($p < .10$), ** ($p < .05$), ***($p < .01$), and ****($p < .001$).

Table 3

Effect of Changes in Independent Variables on Probability of Proliferation

Independent Variables	Probability	Minimum	Mean	Maximum	Pr. Change	Relative Risk %
Opportunity variables						
Latent nuclear weapons production capability$_{i,t-1}$	$Pr(Y_2 = 1)$	0.010	0.046	0.188	0.143	313
	$Pr(Y_1 = 1 \mid Y_2 = 1)$	0.502	0.553	0.560	0.007	1
Economic capacity$_{i,t-1}$	$Pr(Y_2 = 1)$	0.094	0.094	0.127	0.033	35
	$Pr(Y_1 = 1 \mid Y_2 = 1)$	0.391	0.907	0.999	0.092	10
Diffusion$_{t-1}$	$Pr(Y_2 = 1)$	0.015	0.094	0.123	0.029	30
	$Pr(Y_1 = 1 \mid Y_2 = 1)$	0.050	0.514	0.822	0.308	60
Willingness variables						
Conventional threat$_{i,t-1}$	$Pr(Y_2 = 1)$	0.081	0.086	0.227	0.141	164
	$Pr(Y_1 = 1 \mid Y_2 = 1)$	0.477	0.557	0.880	0.323	58
Nuclear threat$_{i,t-1}$	$Pr(Y_2 = 1)$	0.103		0.077	–0.025	–25
	$Pr(Y_1 = 1 \mid Y_2 = 1)$	0.668		0.412	–0.257	–38
Nuclear defender$_{i,t-1}$	$Pr(Y_2 = 1)$	0.096		0.093	–0.003	–3
	$Pr(Y_1 = 1 \mid Y_2 = 1)$	0.615		0.456	–0.159	–26
Diplomatic isolation$_{i,t-(t-5)}$	$Pr(Y_2 = 1)$	0.095	0.095	0.094	–0.001	–1
	$Pr(Y_1 = 1 \mid Y_2 = 1)$	0.549	0.553	0.562	0.009	2
Domestic unrest$_{i,t-1}$	$Pr(Y_2 = 1)$	0.098	0.096	0.079	–0.017	–18
	$Pr(Y_1 = 1 \mid Y_2 = 1)$	0.546	0.552	0.571	0.019	3
Democracy$_{i,t-1}$	$Pr(Y_2 = 1)$	0.098	0.095	0.090	–0.005	–5
	$Pr(Y_1 = 1 \mid Y_2 = 1)$	0.492	0.553	0.615	0.062	11
NPT membership$_{i,t-1}$	$Pr(Y_1 = 1)$	0.103		0.080	–0.023	–23
NPT(system effect)$_{t-1}$	$Pr(Y_2 = 1)$	0.088	0.096	0.103	0.015	8
	$Pr(Y_1 = 1 \mid Y_2 = 1)$	0.585	0.553	0.530	–0.055	–4

Conclusion & Wider Implications

Criticism

Many of what they extrapolate from the figures and tables are assumptions and not explicitly stated from data.