What is an Arms Race?

POSC 3610 – International Conflict

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Goal for Today

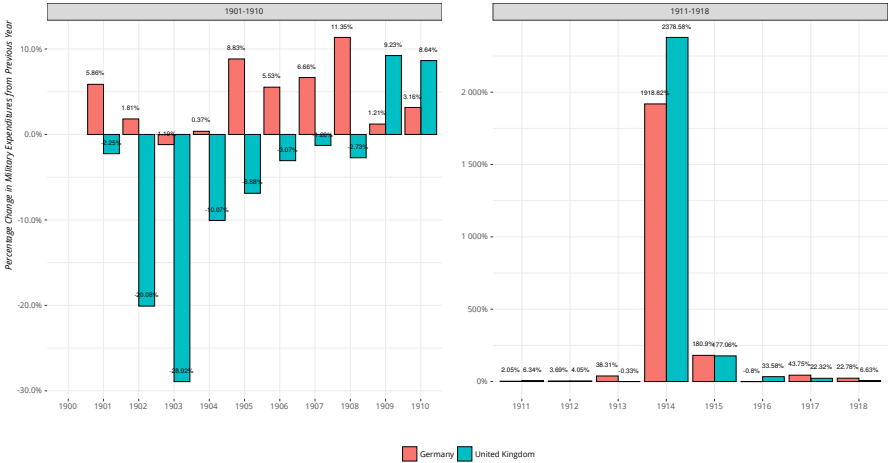
Discuss what is an arms race and what we know about when they emerge.

MIC of the Day: The Anglo-German Rivalry Comes to Norway (MIC#1733)

Independent Norway devoted its diplomatic efforts between 1905 and 1907 to securing a status of permanent neutrality. In the event, Norway had to be content with a treaty of integrity (see ch. 2, pp. 71–5). This implied that the great powers – Britain and Germany in particular – wished to reserve the right to utilise Norwegian waters, and possibly even territory, in time of war. The increasingly visible presence in Norwegian fjords of units of the High Seas Fleet (accompanied every summer by Wilhelm II on the imperial yacht *Hohenzollern*) suggested that the threat was a real one. Britain could still be expected to react with vigour to any German move against Norway, but might itself occupy Norwegian territory. And, following the massive demonstration of German naval power off the coasts of Norway at the height of the Moroccan crisis in July 1911, there were, the British minister reported, 'many Norwegians who no longer regard British naval supremacy as indisputable'.[40] The case for a strong national defence was argued publicly by such prominent figures as Fridtjof Nansen, the celebrated explorer and statesman.[41] In 1912 a further 20 million kroner was allocated to the naval defence budget to pay for more coastal defences, two more ironclads and one submarine. Even though foreign observers tended to discount Norway's military capacity, its army was equipped and armed almost entirely by Norwegian factories, and was on the whole well prepared for the kind of fighting that might have resulted from an attack on Norwegian soil.[42]

The Anglo-German Arms Race, Visualized

German military expenditures started to gradually increase in the early part of the century, resulting in a British response that carried into World War I.



Data: Correlates of War National Material Capabilities (v. 6.0)

The Concern About Arms Races

Arms races is really a sister topic to alliances in quantitative conflict studies.

- Clear association with (then recent) major conflicts
- Corollaries to antiquity
- Heightened salience midway into the Cold War
- Competing camps about how dangerous these are

However, the two diverge on two important things: conceptualization and operationalization.

Struggling with a Definition

Our understanding of arms races struggles with the concept.

- Implies something episodic, not constant.
- Implies a “race” and not an “increase.”
- Implies directionality and equivocation, not an coincidental/incidental/unilateral build-up.

We can point to the Anglo-German naval race and “know it when we see it”, but what is the “arms race” more broadly?

Richardson's (1939, 1960) "Linear Theory of Nations"

Assume two states, x and y. We can understand their rate of defense over time in these equations...

$$dx/dt = ky - \alpha x + g$$

$$dy/dt = lx - \beta y + h$$

...where:

- k and l are the defense coefficients of x and y.
- α and β are the "fatigue coefficients" of x and y.
- g and h are the "grievance coefficients" of x and y.

Arms Races, According to Richardson

Two states in an arms competition (“arms race”) are responding to three things.

- The defense of the other state (+).
- The state’s *own* defenses (-).
- The animosity toward the other side (+).

Richardson’s formulas suggest these could be estimated by statistical analysis.

- Military expenditures is basically the plug-in variable.

Validity and Conceptualization

This is an intuitive conceptualization of an “arms race”, but:

- It assumes a hostile relationship
- It simplifies the world to just x and y
- It (kinda) ignores domestic concerns affecting build-ups.

Notice: the “arms race” collides with other relevant variables (rivalry, capabilities, defense burdens)

Operationalizing the Arms Race

Operationalizing the concept of the arms race became an even bigger to-do over time.

- Major debates among the likes of Wallace (1979), Diehl (1983), and Horn (1987).

No matter, Gibler et al. (2005) basically operationalize Richardson into the arms race.

Operationalizing the Arms Race

Gibler et al. (2005) define an arms race as:

- any dyadic rivalry relationship where
- each dyadic partner is increasing their (military) expenditures OR personnel
- eight percent or more from the previous year, for at least three years.

Thereafter, the authors remove some false positives based on some historical analysis.

- End result: 71 arms races from 1816 to 1992

Table 1: American and British Arms Races, 1816-1992

Race ID	State A	State B	Start Year	End Year
1	United Kingdom	Russia	1854	1856
7	United Kingdom	Germany	1914	1917
13	United Kingdom	Italy	1934	1936
14	United Kingdom	Germany	1934	1942
25	United States	Japan	1940	1944
63	United States	Russia	1978	1981
65	Argentina	United Kingdom	1978	1980

Note:
Data: Gibler et al. (2005)

A Correlation Matrix of NATO Military Expenditures, 1960-1990

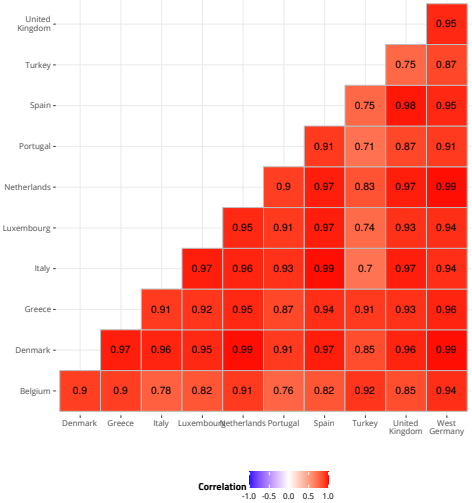


Table 2: Egyptian Arms Races and Mutual Military Build-ups, 1966-1968

Year	State A	State B	MMB	% Change Milex (A)	% Change Milper (A)	% Change Milex (B)	% Change Milper (B)
1966	Egypt	Jordan	0	12.36%	4.88%	20.93%	-9.09%
1967	Egypt	Jordan	0	24%	2.33%	37.31%	20%
1968	Egypt	Jordan	1	31.85%	-11.36%	19.33%	-8.33%
1966	Egypt	Israel	1	12.36%	4.88%	30.23%	0%
1967	Egypt	Israel	1	24%	2.33%	28.88%	15.38%
1968	Egypt	Israel	1	31.85%	-11.36%	15.82%	26.67%
1966	Egypt	Saudi Arabia	1	12.36%	4.88%	35.19%	12.5%
1967	Egypt	Saudi Arabia	1	24%	2.33%	68.45%	11.11%
1968	Egypt	Saudi Arabia	1	31.85%	-11.36%	10.91%	20%

Note:

Data: CoW NMC (v. 6.0), by way of {peacesciencer}.

[1] Gibler et al. (2005) code an Israeli arms race (1963-1971) and Saudi arms race (1962-1968) here.

What Explains the Arms Race?

This question gets neglected a lot in the literature.

- Major emphasis on whether they cause war or not (next lecture).
- Easy conflation of an explanation with a definition/assumption.

The cause of the arms race itself is worthy of some analysis (c.f. Rider, 2009).

- Major foreign policy gamble
- Major opportunity cost (guns/butter)

Research Design

- Unit of analysis: non-directed rivalry dyad-years
- *DV*: Onset of an arms race/mutual military build-up
  - Arms race: Gibler et al. (2005)
  - MMB: my recreation of Gibler et al. (2005), without any other case exclusions
  - Total *n* of interest: 71 arms races and 116 MMBs
- *IVs*: territorial rivalry, joint democracy, major power status, contiguity, CINC (W/S), min. GDP per capita, joint alliance
- *Methods/notes*: logistic regression (with rare events correction), adjustments for temporal dependence

Table 3: A Simple Model of Arms Race/MMB Onset

	Arms Races (1816-1992)	MMB (1816-1992)	MMB (1816-2010)
Territorial Rivalry	-0.019	0.200	0.197
	(0.269)	(0.215)	(0.207)
Land Contiguity	0.551	0.210	0.269
	(0.345)	(0.270)	(0.261)
CINC Proportion	0.055	0.233	0.312
	(0.500)	(0.405)	(0.394)
Both Major Powers	0.529	-0.162	0.141
	(0.345)	(0.284)	(0.270)
Major-Minor	0.182	-0.342	-0.135
	(0.420)	(0.389)	(0.371)
Joint Alliance	0.207	0.307	0.241
	(0.274)	(0.206)	(0.203)
Joint Democracy	-0.914	-1.312*	-1.485*
	(0.707)	(0.653)	(0.647)
Min. GDP per Capita in Dyad	0.553**	0.975***	0.743***
	(0.177)	(0.156)	(0.132)
Num.Obs.	5551	5664	6458

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Some Takeaways

There's not a whole lot we know about arms race onset.

- Wealthier rivals are more likely to have them
- Jointly democratic rivals seem less likely to have them.

Table 4: A Simple Model of Arms Race/MMB Onset, 1816-1945

	Arms Races	MMB
Territorial Rivalry	0.269	0.259
	(0.474)	(0.391)
Land Contiguity	0.039	0.028
	(0.526)	(0.462)
CINC Proportion	-0.635	0.007
	(0.902)	(0.720)
Both Major Powers	0.795	-0.019
	(0.575)	(0.453)
Major-Minor	0.883	0.023
	(0.608)	(0.545)
Joint Alliance	0.380	0.230
	(0.435)	(0.350)
Joint Democracy	-1.470	-1.969
	(1.394)	(1.407)
Min. GDP per Capita in Dyad	1.459***	1.940***
	(0.375)	(0.348)
Num.Obs.	3411	3448

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: A Simple Model of Arms Race/MMB Onset, 1946-1990

	Arms Races	MMB
Territorial Rivalry	0.314	0.565+
	(0.367)	(0.298)
Land Contiguity	0.830+	0.168
	(0.476)	(0.343)
CINC Proportion	0.753	0.947+
	(0.624)	(0.523)
Both Major Powers	0.497	-0.493
	(0.695)	(0.687)
Major-Minor	0.235	0.011
	(0.694)	(0.596)
Joint Alliance	0.140	0.278
	(0.362)	(0.269)
Joint Democracy	-0.861	-0.963
	(0.867)	(0.699)
Min. GDP per Capita in Dyad	0.045	0.275+
	(0.124)	(0.161)
Num.Obs.	2035	2111

+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

More Takeaways

Disaggregating by temporal domain doesn't yield any more solid insight.

- The effect of wealth in rival dyads seems concentrated to before WW2.
- Seeming effects of territorial issues and parity on MMBs during Cold War (but not arms races).
- Joint democracy has no effect in either temporal domain.

Conclusion

Arms races are a companion topic to alliances, but come with some conceptual/measurement issues.

- Important to distinguish an “arms race” from a MMB.
- Collides with other relevant variables, like rivalry and capabilities.

What explains the arms race itself? A lot here is unclear.

- Clearly rivalry/threat, but that is a definition and not an explanation.
- There’s much more interest in the effects of the arms race than the causes.

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