Online Appendix: Supporting Information for *One if by land, and two if by sea: Cross-domain contests and the escalation of international crises*

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Contents

This appendix accompanies the paper "One if by land, and two if by sea: Cross-domain contests and the escalation of international crises." It provides supplemental information concerning the data set of military domain actions introduced in the paper, and robustness checks and alternate specifications for the statistical model.

1 Summary statistics

Although data was compiled on the domains used by all actors mentioned in the ICB narratives, the statistical analysis is limited to the sample of actors that were crisis-dyad participants in accordance with pre-existing work on ICB crisis dyads (Hewitt 2003; Beardsley and Asal 2009; Levin-Banchik 2020). Table A1 present descriptive statistics of the sample used in the models provided in the main text. Missing values for the power discrepancy variable explain dropped observations in the models with all control variables.

Table A1: Covariate Summary Statistics: Crisis-actor level

Statistic	N	Mean	St. Dev.	Min	Pctl(25)	Pctl(75)	Max
Violence severity	425	2.2	1.2	1	1	3	4
Crisis duration (days)	425	163.2	214.5	1	30	203	1,461
Cross-domainness	425	0.4	0.4	0	0	0.7	1
Number of actors	425	5.6	4.0	1	3	7	34
Power discrepancy	371	8.7	13.8	0.0	2.0	11.0	179.0
Protracted conflict	425	0.6	0.5	0	0	1	1
Territorial conflict	425	0.3	0.5	0	0	1	1
Major power involv	425	0.3	0.5	0	0	1	1
Ethnic conflict	425	0.3	0.5	0	0	1	1
Contiguous	425	0.7	0.5	0	0	1	1

1.1 Great powers

Different states could be expected to take military actions in the various domains at different frequencies. The codings for great power status used here come from the original ICB coding and are defined in the original codebook. Brecher and Wilkenfeld (2000) divided power status into four categories – small, middle, great, and super – based on the scope of their potential impact in the system in which a crisis occurs. This means that "a state may be a small power in the global power hierarchy but a middle power—or even a great power—within its sub-system" as Egypt and Israel were in the Middle East during 1956 (Brecher and Wilkenfeld 2000, 29).

Table A2 shows that, consistent with expectations, superpowers use a wider variety of domains than small and middle powers. At the crisis-level, Table A3 shows that there is no significant difference in the amount of cross-domainness conditional on the number of great powers involved. This could occur if great power opponents in a crisis use the same domains as one another at the same rates as crises involving two non-great powers.

Table A2: Summary of cross-domainness by great power status

Power status	**No. of Crises**	**Pct. of Crises**	**Avg Domain Count**	**Avg Domain Pct.**
Small power	387	30%	1.14	19%
Middle power	327	26%	1.14	19%
Great power	237	18%	1.53	26%
Super power	95	7%	1.94	32%
NA	236	18%	1.12	19%

Table A3: Summary of cross-domainness in each crisis by great power involvement

Great power involvment	**Crisis Count**	**Mean Cross-domainness**
None	200	0.41
One	179	0.40
More than one	46	0.46

1.2 Domains and crisis outcomes

The number of domains in which states take actions could also be an indication of their resolve, as devoting resources to more domains may indicate a greater willingness to incur costs. This could positively correlate with an actor's probability of victory since actors who devote more resources to a conflict may be more likely to emerge victorious. Table A4 provides descriptive statistics that indicate there may be a weak positive relationship between the number of domains in which an actor takes military action and the likelihood of a positive outcome. A more sophisticated analysis would look at "relative domain count" – accounting for the number of domains their opponent used – to test theories evaluating the balance of capabilities as opposed to the balance of resolve (Powell 2015).

Table A4: Summary of Military Domains and Crisis Outcome

Actor Outcome	**Count**	**Mean Domain Count**
Defeat	224	1.21
Stalemate	229	1.33
Compromise	248	1.28
Victory	338	1.35
NA	243	1.14

2 Alternate model specifications

I run a battery of alternate model specifications for both models as robustness checks. Our results are consistent across alternate modeling specifications including different regression models. Those results are shown below.

2.1 Dependent variable: Intensity of violence

2.1.1 Odds ratios

We computer odds ratios for the two ordered probit models for more easily interpretable covariates. Those are shown in Table A5. For the full model, the odds ratio of 0.65 indicates that the odds of a crisis with a serious clash or full scale war are 45% lower than the odds of experiencing violence with a minor clash or no violence if the actors use completely dissimilar means.

	Model 1	Model 2
Cross-domainness	0.60*	0.65*
	[0.38; 0.83]	[0.41; 0.90]
No. of actors		1.08*
		[1.06; 1.11]
Power Dissimilarity		1.00
		[0.99; 1.00]
Protracted Crisis		1.32*
		[1.12; 1.53]
Territorial Crisis		1.09
		[0.87; 1.32]
Major Power Involv.		1.50*
		[1.27; 1.73]
Ethnic Crisis		1.18
		[0.96; 1.40]
Contiguity		1.31*
		[1.06; 1.55]
AIC	1109.98	920.77
BIC	1126.18	963.84
Log Likelihood	−550.99	−449.38
Deviance	1101.98	898.77
Num. obs.	425	371

* Null hypothesis value outside the confidence interval.

Table A5: Intensity of Violence: Odds Ratios

2.1.2 Ordered logit

We also run all models as ordered logits instead of ordered probits. Both are generalized linear models appropriate for an ordinal dependent variable that differ only in whether they use a logit link function as opposed to inverse normal link function (Johnston, McDonald, and Quist 2020). The results of the ordered logit in Table A6 are almost identical to those of the ordered probit, as expected.

	Model 1	Model 2
Cross-domainness	-0.86^{*}	-0.70^{*}
	$[-1.23; -0.49]$	$[-1.12; -0.29]$
No. of actors		0.14^{*}
		$[0.10; 0.19]$
Power Dissimilarity		-0.01^{*}
		$[-0.02; 0.01]$
Protracted Crisis		0.43^{*}
		$[0.10; 0.77]$
Territorial Crisis		0.16^{*}
		$[-0.21; 0.53]$
Major Power Involv.		0.69
		$[0.31; 1.07]$
Ethnic Crisis		0.31^{*}
		$[-0.05; 0.67]$
Contiguity		0.44^{*}
		$[0.02; 0.85]$
AIC	1108.82	919.46
BIC	1125.03	962.54
Log Likelihood	-550.41	-448.73
Deviance	1100.82	897.46
Num. obs.	425	371

* Null hypothesis value outside the confidence interval.

Table A6: Intensity of Violence: Ordered Logit Results

2.1.3 OLS

Although an ordered probit model is most appropriate given the dependent variable (intensity) is ordinal, we ensure that the sign on our coefficients are consistent with an OLS model that treats intensity as a continuous variable. Table A7 illustrates consistent coefficient signs and significance for all variables.

	Model 1	Model 2
Intercept	2.45^{***}	1.37^{***}
	(0.08)	(0.18)
Cross-domainness	-0.54^{***}	-0.39^{**}
	(0.14)	(0.14)
No. of actors		0.07^{***}
		(0.01)
Power Dissimilarity		-0.00
		(0.00)
Protracted Crisis		0.25^{*}
		(0.12)
Territorial Crisis		0.10
		(0.13)
Major Power Involv.		0.39^{**}
		(0.13)
Ethnic Crisis		0.18
		(0.13)
Contiguity		0.24
		(0.14)
R^2	0.03	0.17
Adj. R^2	0.03	0.15
Num. obs.	425	371

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

Table A7: Intensity of Violence: OLS Results

2.2 Dependent variable: Crisis duration

2.2.1 Other parametric hazard models

A comparison of other parametric specifications of the hazard model in Table A8 shows the lognormal to be most appropriate, as it has the smallest AIC (Slantchev 2004; Chiba and Johnson 2019). The first column here – lognormal – is identical to the main results table presented in the text. Although the log-logistic model shows a statistically significant effect for the cross-domainness variable, we do not interpret this as evidence of statistical significance since it is not the most appropriate model specification.

	Log normal	Weibull	Exponential	Gaussian	Logistic	Log-logistic
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Intercept	3.83^{***}	4.71^{***}	4.82^{***}	163.79^{***}	90.54^{***}	3.83^{***}
	(0.22)	(0.22)	(0.19)	(34.93)	(26.30)	(0.23)
Cross-domainness	-0.22	-0.04	-0.01	-15.56	-22.98	-0.31^{*}
	(0.17)	(0.16)	(0.14)	(26.60)	(19.85)	(0.17)
No. of actors	0.07^{***}	0.05^{***}	0.05^{***}	7.84^{***}	7.24^{***}	0.07^{***}
	(0.02)	(0.02)	(0.01)	(2.67)	(2.02)	(0.02)
Power Dissimilarity	0.00	0.00	0.00	-0.01	0.25	0.01
	(0.01)	(0.01)	(0.01)	(0.85)	(0.71)	(0.01)
Protracted Crisis	-0.14	-0.20	-0.22^{*}	-42.91^{*}	-16.48	-0.10
	(0.14)	(0.13)	(0.11)	(22.24)	(16.72)	(0.14)
Territorial Crisis	0.02	-0.08	-0.10	-37.44	-10.41	0.01
	(0.15)	(0.14)	(0.12)	(24.45)	(18.38)	(0.16)
Major Power Involv.	0.09	-0.04	-0.05	-26.45	1.98	0.06
	(0.16)	(0.15)	(0.13)	(25.26)	(19.20)	(0.17)
Ethnic Crisis	0.65^{***}	0.68^{***}	0.67^{***}	124.49^{***}	76.58^{***}	0.66^{***}
	(0.15)	(0.13)	(0.12)	(24.25)	(19.37)	(0.16)
Contiguity	-0.04	-0.17	-0.18	-41.49	-12.59	0.02
	(0.17)	(0.15)	(0.13)	(26.32)	(20.16)	(0.18)
Log (scale)	0.25^{***}	0.14^{***}		5.31^{***}	4.52^{***}	-0.30^{***}
	(0.04)	(0.04)		(0.04)	(0.05)	(0.04)
AIC	4462.75	4476.02	4487.10	5014.33	4911.41	4477.60
BIC	4501.91	4515.18	4522.34	5053.50	4950.57	4516.77
Log Likelihood	-2221.37	-2228.01	-2234.55	-2497.17	-2445.70	-2228.80
Num. obs.	371	371	371	371	371	371

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

Table A8: Comparison of parametric hazard models

2.2.2 Cox proportional hazard model

A Cox proportional hazard model is inappropriate given the Schoenfeld residuals shown in Table A9 and A10. The small p-values indicate time-dependent coefficients which violates the proportionality assumption that is necessary for a Cox proportional hazard model to be appropriate.

Table A9: Schoenfeld residuals: bivariate model

	chisq	df	p
crossdomain_jaccard	2.603	1	0.107
GLOBAL	2.603	1	0.107

Table A10: Schoenfeld residuals: multivariate model

	chisq	df	p
crossdomain_jaccard	6.905	1	0.009
noactr	14.279	1	0.000
powdissy	5.281	1	0.022
protrac	3.874	1	0.049
territ	1.229	1	0.268
majpwrinv	5.973	1	0.015
ethnic	0.352	1	0.553
contig	1.819	1	0.177
GLOBAL	37.122	8	0.000

2.2.3 OLS

Although an OLS model is not appropriate for duration variables since they cannot account for time-dependent covariates, we provide the results in table A11. They are consistent with the results of the more appropriate hazard models.

	Model 1	Model 2
Intercept	173.91^{***}	163.79^{***}
	(14.88)	(35.36)
Cross-domainness	-26.12	-15.56
	(25.90)	(26.93)
No. of actors		7.84^{**}
		(2.71)
Power Dissimilarity		-0.01
		(0.86)
Protracted Crisis		-42.91
		(22.52)
Territorial Crisis		-37.44
		(24.75)
Major Power Involv.		-26.45
		(25.57)
Ethnic Crisis		124.49^{***}
		(24.55)
Contiguity		-41.49
		(26.64)
R^2	0.00	0.11
Adj. R^2	0.00	0.09
Num. obs.	425	371

$^{***}p < 0.001$; $^{**}p < 0.01$; $^{*}p < 0.05$

Table A11: Crisis Duration: OLS Results

2.3 Variable codings

2.3.1 Exclude new domains

Given the rarity of military actions in space, cyber, and WMD, we re-run the analysis without them to see if the results hold. The results, shown in Table A12, are consistent with the original model specifications. The Jaccard similarity coefficients when run on all domains and when excluding the three new domains have a correlation coefficient of 0.985.

	Violence Intensity		Crisis Duration	
	Model 1	Model 2	Model 3	Model 4
Cross-domainness	-0.57^{***}	-0.50^{***}	-0.30^{*}	-0.22
	(0.14)	(0.15)	(0.16)	(0.17)
No. of actors		0.08^{***}		0.07^{***}
		(0.02)		(0.02)
Power Dissimilarity		-0.00		0.00
		(0.00)		(0.01)
Protracted Crisis		0.28^{**}		-0.14
		(0.12)		(0.14)
Territorial Crisis		0.08		0.02
		(0.14)		(0.15)
Major Power Involv.		0.41^{***}		0.09
		(0.14)		(0.16)
Ethnic Crisis		0.17		0.65^{***}
		(0.13)		(0.15)
Contiguity		0.26^{*}		-0.04
		(0.15)		(0.17)
Intercept			4.46^{***}	3.83^{***}
			(0.09)	(0.22)
Log (scale)			0.29^{***}	0.25^{***}
			(0.03)	(0.04)
AIC	1106.22	917.50	5140.75	4462.79
BIC	1122.43	960.58	5152.91	4501.95
Log Likelihood	-549.11	-447.75	-2567.38	-2221.39
Deviance	1098.22	895.50		
Num. obs.	425	371	425	371

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.
Models 1 and 2 are ordered probit models and models 3 and 4 are log-normal accelerated failure time models.

Table A12: Statistical models

2.3.2 Binary Dependent Variable

We run additional models using a binary dependent variable for violence severity, a modeling decision used in prior work on ICB crisis violence (Hewitt and Wilkenfeld 1996; Chiozza and Goemans 2004). Table A13 shows the results of that model which are consistent with the main findings.

	Model 1	Model 2
Intercept	0.14	-1.90^{***}
	(0.14)	(0.41)
Cross-domainness	-0.97^{***}	-0.84^{***}
	(0.25)	(0.29)
No. of actors		0.15^{***}
		(0.04)
Power Dissimilarity		-0.00
		(0.01)
Protracted Crisis		0.50^{**}
		(0.24)
Territorial Crisis		0.39
		(0.27)
Major Power Involv.		0.77^{***}
		(0.28)
Ethnic Crisis		0.44^{*}
		(0.26)
Contiguity		0.30
		(0.29)
AIC	571.86	461.14
BIC	579.97	496.39
Log Likelihood	-283.93	-221.57
Deviance	567.86	443.14
Num. obs.	425	371

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.1$.

Table A13: Logit results using a binary dependent variable for intensity of violence

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