Gibler and Wolford 2006 Replication Supplemental Materials: Additional Details and Replications

1 Complete Description of Gibler and Wolford (2006) Variables

Common Threat is a dichotomous variable coded 1 if each state has participated in a Militarized Interstate Dispute (MID) against the same third state sometime in the previous 10 years, 0 otherwise. *Single Major Power* is a dichotomous variable coded 1 when one member of a dyad is a major power as indicated by the Correlates of War coding of major power status.[1] *Geographic Distance* gives the square root of the capitol to capitol distance, unless states are contiguous, in which case distance is set to 0. *Learning* has a range of -1 to 1. If a country has a lesson favoring alliance, the variable is coded 1; if it has a lesson favoring neutrality, the variable is coded as -1; and if it has no lesson, the variable is coded 0. The Learning score for the dyad is the combined score of the two states, thereby creating a variable ranging from -2 to 2.[2] *Existing Alliance* is coded 1 if the dyad members were already members of the same alliance (bilateral or multilateral) entering that year, 0 otherwise.

MID between A and B over 10 yrs is coded 1 if the two states were on opposite sides of a MID during the previous 10 years. Being on opposite sides of a MID in the past ten years is expected to diminish the probability of the dyad forming an alliance. Therefore, *Amount of Threat* counts the number of MIDs in which each state participated in the previous 10 years. The *Joint Language* variable is coded 1 if the two states in the dyad have the same predominant language, 0 otherwise. The *Joint Ethnicity* and *Joint Religion* variables are coded similarly for ethnicity and religion. Using the Polity IV polity score (with a value of -10 to +10), *Polity Difference* uses the absolute value of the difference between the Polity IV scores of the two states in the dyad to create a measure of regime similarity, while *Joint democracy* is a dummy variable coded 1 if both states have polity scores of 5 or higher.[3]

[1] Gibler and Wolford (2006) actually use the Lai and Reiter (2000) coding of Major Power, which is coded 1 if *either or both* members of the dyad are major powers, 0 otherwise. However, the Lai and Reiter (2000) *Major Power* variable does not fully capture the level of asymmetry in the dyad (because it is coded 1 if the dyad contained 1 or 2 major powers), something that Morrow (1991) emphasizes is a key determinant of alliance formation. According to his argument, alliances serve as a type of "protection racket", whereby a large powerful state offers to protect a smaller state (give security) in exchange for access to the small state's territory, changes in the small states foreign policy, or other concessions (give autonomy).

[2] The coding depends in part on the Reiter (1996) coding for lessons learned by small powers after world wars. A state was coded as having a lesson in the postwar period favoring neutrality if it was neutral during World War I or II and was not invaded or if it was allied during such a war and was invaded. Conversely, a state had a lesson favoring alliance in the postwar period if it was allied during a world war and was not invaded or if it was not allied and was invaded. Only states in major theaters of war were coded as learning lessons. Similar coding logic is applied for nations following the Napoleonic wars.

[3] There is also a variable, *Trade*, that measures the bilateral trade flows between the two states. However, the inclusion of this variable in the model is problematic for two reasons. Methodologically, the limited availability of trade data means much data is lost when this variable is included in the regression model. Substantively, the literature on trade and alliances has been wrapped in a "chicken-or-the-egg" dilemma. In other words, does trade between two states lead to an alliance or does the presence of an alliance lead to trade? On one side is work such as Gowa and Mansfield (1993) who incorporate security externalities into the relative gains considerations of states. Because a portion of the wealth gained from international trade can now be spent on the military, the subsequent increase in military size proves beneficial to security allies ("my friend's gain is my gain"), but detrimental to security adversaries ("my enemy's gain is my loss"). On the other hand are studies such as Fordham (2007), who argues that the fear of losing a valuable trading relationship deters bilateral conflict between trading partners. In turn, this gives states a motive to defend their trading partners from external threats that might disrupt commerce. Consequently, trade will lead to alliances.

2 Alternative Triadic-Dyadic Dataset Simulation

A major downside to the Bilateral-Trialateral simulation in the main text is that it did not produce a mixture of bilateral alliances and multilateral alliances that matched that of a real dataset. The reality is that multilateral alliances are nearly 5 times more prominent than bilateral alliances. It is not possible for a DGP with capability ratio alone to create such a dataset. One way to compel the DGP to provide the proper distribution of bilateral and multilateral alliances is to return to the simpler model (with capability ratio as the only independent variable), but allow the parameter on capability ratio to differ for triads and dyads. Specifically, the model estimated is

$$xb = \text{cons} + \beta_1 * \text{cap ratio} * \text{dyad} + \beta_2 * \text{cap ratio} * \text{triad} + u$$

where *dyad* is a binary variable coded 1 if an observation is a dyad, 0 otherwise and *triad* is a binary variable coded 1 if an observation is a triad, 0 otherwise. The true value on β_1 is 10, while the true value on β_2 is 5 and the constant is -12. Admittedly, a model with different **cap ratio** coefficients for triads and dyads lacks a theoretical motivation. However, it allows one to test the ability of logit estimation to recover the true parameter estimates of a choice-based sample containing an accurate distribution of bilateral and multilateral alliances. Specifically, a typical simulation produces about 10 to 20 trilateral alliances and 60 to 70 bilateral alliances. Table A.1 reports the results from 500 Monte Carlo simulations of the DGP. Applying logit estimation to each simulation of the full dataset results in average parameter estimates close to the true parameter values. Additionally, the estimates from the choice-based sample perform quite well relative to the estimates from the full sample.

	Triadic-Dyadic DGP estimated with Triadic-Dyadic Data	Triadic-Dyadic DGP estimed with Choice-Based Sample
β on Cap Ratio for Bilateral Alliances ($\beta_1 = 10$)		
Bias	-0.01	0.07
Root Mean Squared Error	0.80	0.96
Over Confidence	1.07	1.64
β on Cap Ratio for Trialateral Alliances ($\beta_2 = 5$)		
Bias	-0.08	0.14
Root Mean Squared Error	5.05	5.16
Over Confidence	6.31	7.09