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Political Irrelevance, Democracy, and the Limits of Militarized Conflict

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Abstract

Although the statistical literature on conflict studies has generated strong and consistent findings on the relationship of political irrelevance and dyadic democracy to conflict, scholars have paid scant attention to the interesting theoretical issue of *how* they matter. The authors argue that additive controls and dropping irrelevant dyads constitute misspecifications of their effects. There are theoretical reasons to believe that the impact of distance on conflict is not sufficiently severe to justify the practice of simply dropping irrelevant dyads. Moreover, they argue that political irrelevance and dyadic democracy, rather than subtracting some constant quantity, interact to impose an *upper bound* on the probability of conflict initiation. They find both of these arguments to be supported in a reanalysis of a prominent study of dispute initiation.

Keywords

political relevance, democratic peace, militarized interstate disputes, Boolean statistics, multiple causal paths, interaction effects

Democracy and what scholars have come to call political irrelevance have proven to be powerful predictors of peace across multiple studies. Their impact is so substantial that they have achieved a "taken-for-granted" status: as control variables in modern large-*N* conflict studies, they are ubiquitous.

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Table 1. Studies of Militarized Disputes and War, 2000–2009

	Control technique used			
	Additive (%)	Drop (%)	No control (%)	Other (%)
Democracy	86	0	7	8
PRDs	36 23	3	11	27

Despite this fact, scholars have paid virtually no attention to *how* these two factors produce peace. A survey of ninety quantitative international relations articles in which militarized interstate dispute (MID) or war occurrence was the dependent variable (summarized in Table 1), taken from six major political science journals[1] from 2000 to 2009, is illustrative. On one hand, the results highlight their taken-for-granted status: only 7 percent and 11 percent of the articles surveyed fail to control for democracy and political relevance, respectively, in some way. On the other hand, the survey also demonstrates that, particularly in the case of politically relevant dyads, the state of the art in controlling for the variable's influence is almost entirely incoherent.[2]

The confusion regarding how exactly to model these phenomena is understandable: none of these methodological practices corresponds to a plausible substantive theory relating democracy and political irrelevance to conflict. For the most part, scholars assume that they simply add (some typically sigmoid function of) a constant quantity to the probability of peace or war and that the impact of all other variables remains the same; but democratic and irrelevant dyads are extremely nonconflictual, regardless of other circumstances, a fact that calls into question the logic of adding these variables to a vector of other independent variables in a conflict equation. The extremely low probability of conflict among these states, especially among politically irrelevant dyads, has led other scholars simply to drop them from the data set, but while it is clearly true that the weakest states cannot reach each other from halfway across the globe, somewhat stronger states have nevertheless done so fairly often from closer by. As many as 26 percent of all conflicts,[3] in fact, take place among dyads deemed "irrelevant" by these criteria.

We address this theoretical confusion by arguing that the most plausible implication of dyadic democracy and political irrelevance, based on existing perspectives on international conflict, is a continuous and gradual diminution of the impact that *other* variables have on the probability of conflict: for a variety of reasons, the causes of conflict are mitigated, and only in the extreme very nearly nullified, by distance and democracy. Simply dropping dyads coded as irrelevant based on standard criteria constitutes a "sin of omission" that should be avoided.

We then translate this interactive theoretical intuition into a suitable econometric model that allows the relationships among democracy, distance, and conflict to be estimated rather than assumed and apply it to an existing study of MID onset (Oneal

and Russett 1999). The results demonstrate the value both of mapping substantive theory to methodological practice and of estimating rather than assuming the relationship of interest: they clearly indicate that the interactive specification just described is superior to the standard additive one and that the decrease in political relevance is gradual rather than abrupt.

The Argument

The extent to which theories of conflict should be expected to hold across different pairs of states varies, sometimes substantially. Two sources of heterogeneity stand out: political irrelevance and dyadic democracy. Weak, distant states are not nearly as relevant to one another's foreign policies as are strong, adjacent states; moreover, even if the former do have a clash of interests, their inability to project military force may prevent them from being able to do anything other than talk about it. In the case of democracies, though informed opinion differs as to the cause, the empirical results demonstrate quite strongly that democratic dyads are unlike other dyads in terms of how they interact and that one implication of that fact is a much greater propensity for peace.

As a result, we argue, standard theories of conflict do not apply with full force to these two types of states. Rather, dyadic democracy and political irrelevance mitigate, and in the extreme may nearly eliminate, the causes of conflict among states. This can be conceptualized in terms of a simple expected utility model: the impact of a given set of explanatory variables (e.g., level of trade, relative power, relative economic growth, and so on) on the likelihood of conflict is attenuated by shared democracy and political irrelevance. This argument differs from the standard claim that dyadic democracy and political irrelevance *directly* reduce the probability of conflict: we argue, rather, that they do so by virtue of their effects on the impact of *other* variables.

Analyses of interstate conflict are generally not designed with this interactive relationship in mind. Accordingly, the results of those analyses may provide questionable inferences, both due to standard pathologies such as inconsistent coefficient estimates and due to the fact that the data-generating process is not being captured by the econometric technique being used. We seek to align data analysis more closely with theory by exploring the following theoretical propositions about democracy and distance:

Proposition 1: The impact of conflict-causing variables is *contingent* on political relevance and the absence of democracy. Factors such as trade, balances of power, differences over territory, and so forth, simply matter less, and at the margin virtually not at all, as states become increasingly politically irrelevant or jointly democratic.

Proposition 2a (loss-of-strength hypothesis): Capabilities decrease very abruptly as a function of distance and state strength. Even very strong states are greatly

hindered by fairly short distances; minor powers are so weakened by even short distances that they are effectively irrelevant to one another.

Proposition 2b (opportunity/willingness hypothesis): Political relevance is a function of states' desire to become involved as well as the opportunity to do so. The impact of political irrelevance is continuous, but it is far more gradual than the loss-of-strength hypothesis would suggest. Only very distant minor-power non-neighbors are completely irrelevant to one another; at the same time, even major powers experience some degradation of political relevance at great distances.

We explain the logic behind these propositions below.

Democracy

The various theories of the democratic peace strongly suggest such a formulation. The argument that democracies are peaceful because of shared liberal norms, for example, suggest that liberal democracy produces greater perceptions of equality, a greater sense of empathy, an emphasis on exchange and cooperation rather than coercion, and, ultimately, the delegitimation of violence among democratic states (see inter alia Braumoeller 1997; Russett 1993). As a result, issues that might generally lead states to use threats, clash militarily, and ultimately go to war would be expected to produce less of an impact among democratic states. Cederman's (2001) explanation of the democratic peace as a macrohistorical learning process relies on the same logic: although the process by which norms and the rule of law spread over time is the focus of the theory, they have an impact on conflict as a result of "individuals' realization that war is both destructive and immoral" (p. 16).

Similarly, theories that rely on the domestic political structure of democratic states tend to suggest that their importance lies in their impact on how potential threats to the peace are processed, regardless of what those threats might be. In *Perpetual Peace*, Immanuel Kant wrote,

> [I]f the consent of the citizens is required in order to decide that war should be declared (and in this constitution it cannot but be the case), nothing is more natural than that they would be very cautious in commencing such a poor game, decreeing for themselves all the calamities of war. . . . But, on the other hand, in a constitution which is not republican, and under which the subjects are not citizens, a declaration of war is the easiest thing in the world to decide upon, because war does not require of the ruler, who is the proprietor and not a member of the state, the least sacrifice of the pleasures of his table, the chase, his country houses, his court functions, and the like.

Here, again, the importance of democracy lies not in its direct impact on war or peace but on its impact on *other issues* that might lead to war or peace: a monarch

faces fewer constraints than the leader of a democratic state[4] and is therefore more easily provoked to war.

Finally, Bueno de Mesquita et al. (1999) argue that democratic political structures give leaders an incentive to expend more effort, ceteris paribus, on fighting a war than their autocratic counterparts possess, as well as prompting them to be more selective when choosing targets. These two factors in combination decrease the probability that disputes of any sort, regardless of their nature, will lead to war among democracies.

In each of these cases, theorists have not posited that dyadic democracy directly reduces the probability of dispute initiation. Instead, shared democracy attenuates the size of the effect of otherwise dispute-inducing variables. These arguments explain why, for example, Schweller (1992) finds that power transitions, which prompt wars among autocratic Great Powers, produce accommodation among democratic ones, and Huth and Allee (2002) demonstrate that territorial disputes, which often lead to conflict and war, are more likely to lead to talks rather than force when they occur among democracies.

Political Relevance

Theories regarding the impact of political relevance on conflict are considerably less well developed, probably for the simple reason that the relationship between the two, in very broad strokes, seems empirically obvious: the absence of conflict between Nepal and Uruguay hardly merits comment. Yet the reasons for the absence of conflict are perhaps not quite so apparent.

Most political relevance arguments are implicit or made without much explicit theorizing. Probably the most common theoretical justification offered for political irrelevance is one based on the loss-of-strength gradient proposed by Boulding (1962) and popularized by Bueno de Mesquita (1981), which suggests that changes in distance affect the costliness of using force. In general, the theory suggests that distance raises the cost of conflict. States that must pay a great price in order to attack one another will be considerably less willing to do so, given the same provocation, than will adjacent states, or states that can reach one another with little effort. An exception is usually made for Great Powers: though still suffering greater costs for using force far afield, these states are thought to possess sufficient capabilities to still entertain use of force globally. This theoretical conception might lend itself to an additive specification: greater distance adds additional costs to the other costs/benefits factored into a leader's expected utility calculation for war. The impact of distance may not be linear, of course: Bueno de Mesquita (1981, 105), in an influential formalization, suggests an adjustment of $\text{CAPABILITIES}^{\log\left(\frac{\text{miles}}{\text{miles/day}}+[10-e]\right)}$ to capture the gradient.

There is, however, another possibility, one with a solid theoretical pedigree: geography, through an analytically distinct mechanism, may influence the *willingness*

of states to engage in militarized disputes as much as, if not more than, the opportunity to do so. Rather than distance simply boosting the costliness of acting, it may moderate the importance of those other factors that created reason for conflict in the first place. Greater distance simply makes other issues less important by attenuating both the risks and the gains (or, in expected utility terminology, the magnitude of the payoffs) in both positive and negative directions. This interactive conceptualization finds support in Goertz and Diehl's (1992) analysis of the relationship between territory and conflict. They note that the "loss-of-strength gradient" understanding of the relationship between distance and war proneness is incomplete. Instead, distance also generally affects "the structure of risks and opportunities that influence the decision calculus of policymakers" (p. 6). They support the thesis that proximity magnifies the stakes involved and distance attenuates them: "States may be more willing to fight over events or issues that are closer to home because they are considered more important than those farther away. . . . Thus, territorial proximity influences both the opportunity and willingness of states to enter war" (p. 8). Maoz and Russett (1993), often cited as the original formulation, agrees: "the vast majority [of dyads] are nearly irrelevant. The countries comprising them were too far apart and too weak militarily, *with few serious interests potentially in conflict,* for them plausibly to engage in any militarized diplomatic dispute" (p. 627, emphasis added).

This second conceptualization, which we find to be a more realistic and complete explanation, implies a substantially different relationship between distance and political relevance (illustrated by the top line in Figure 1): nearby nonmajor powers (say, states within a region) could still share interests and therefore be substantially relevant to one another, while very distant dyads containing a major power might be less so. Moreover, this understanding of political irrelevance is fundamentally interactive: if political irrelevance decreases both the opportunity and the willingness of states to engage in conflict, it would have a continuous impact on any source of conflict that contributes to either—that is to say, most if not all of them (Most and Starr 1989, chap. 2).

Finally, it is worth noting in passing that nothing in either theory suggests that the impact of either democracy or political irrelevance must be symmetrical. A standard S-shaped logit or probit curve might constitute a good model of the impact of political irrelevance and democracy on other variables, but they might equally exhibit long-tailed or skewed tendencies. Political relevance would seem to be a particularly good candidate in this regard, given the abruptness with which power-projection curves can decline and foreign policy attentiveness can drop off with distance. Such a possibility, aside from being substantively interesting, could produce dramatically inconsistent coefficient estimates (see Appendix B) and should be accounted for in the econometrics.

Statistical Implications

The empirical implications of political irrelevance and dyadic democracy for statistical models of international conflict are, as Beck, King, and Zeng (1999, 22)

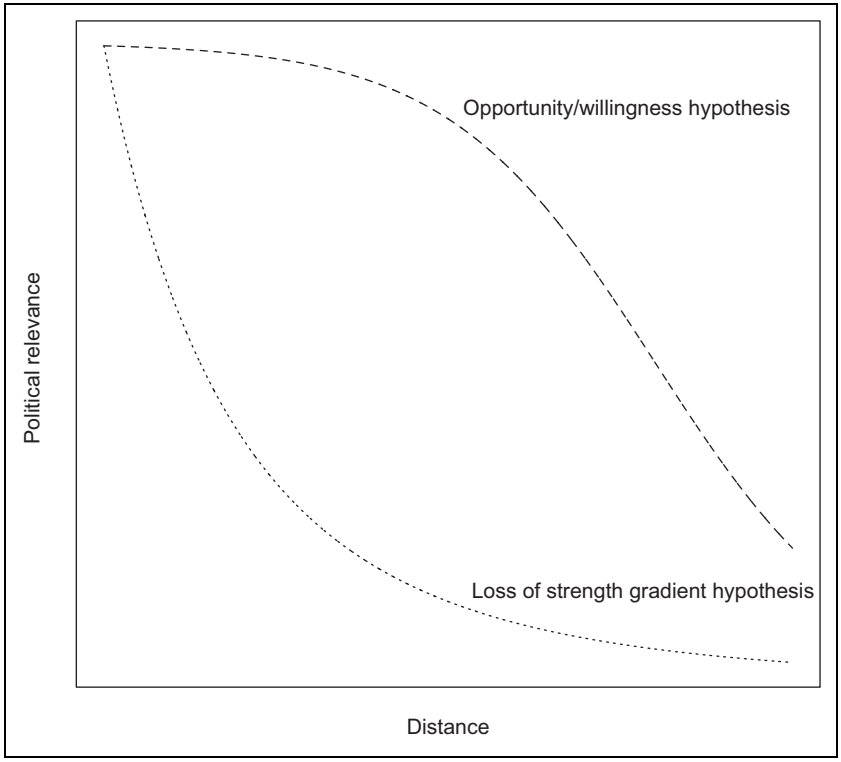

Figure 1. Comparing hypothetical implications of the loss-of-strength gradient and the opportunity/willingness arguments for political irrelevance

put it, that "the effects of most explanatory variables are undetectably small for the vast majority of dyads," or, more specifically, that "the effects of the causes of conflict differ by dyad, with trivially small effects for the vast majority and larger effects for a few." In other words, these observations do not possess the condition described by Cartwright (1979) as "causal homogeneity," which holds only when the impact of a causal variable is not attenuated or exaggerated by some other, correlated causal variable.[5]

Two existing solutions to this problem dominate the literature: domain restriction and the use of additive controls. Domain restriction is mostly used with political relevance and consists of simply throwing out dyads that are deemed irrelevant to one another. Aside from being wasteful of data, this correction is problematic in that it throws out quite a few of the dispute cases.[6] The fact that so many disputes occur among actors deemed nonrelevant by the coding procedure strongly suggests that either the criteria for relevance or the act of excluding all nonrelevant cases (or both) is very problematic.

Additive controls, used most often in the case of dyadic democracy, are better in the sense that they reduce the probability of conflict in less war-prone dyads. They do so by adding or subtracting a constant to $\Lambda(X\beta)$ (in the logit context) or $\Phi(X\beta)$ (in probit)—which is equivalent to adding or subtracting a constant to the intercept term in a regression equation. The problem is that this procedure does not map to a very compelling substantive understanding of how political relevance and dyadic democracy have an impact on conflict outcomes. For one thing, it lumps strong near-neighbors (whose conflict propensity might still be moderately high) together with small, weak states halfway across the globe from one another when calculating a single coefficient. The larger problem, however, is that, because unit heterogeneity implies that the impact of X on Y will differ across units, modeling the theoretical argument involves allowing the *slope* parameters of all of the independent variables to vary in a manner that captures the effects of unit heterogeneity—in essence, generating a very large interaction term that permits the independent variables to interact with both political relevance and dyadic democracy. While doing so literally would be unwieldy, difficult to interpret, and perhaps even impossible to implement (see Appendix A), the idea of a metainteraction term nicely captures the essence of the solution below.[7]

Three exceptions to these generalizations are worth noting. Beck, King, and Zeng (1999) proposed a potentially relevant general solution to the problem of massively interactive independent variables grounded in neural networks. The results are appealing to scholars who wish to examine variables without imposing any theoretically derived assumptions on the relationship among them, but the fact that few quantitative IR scholars fall into this category, combined with the difficulty of deriving an objectively defined "true" representation of the data,[8] the complexity of the method, and the modest increase in utility over ordinary logit (de Marchi, Gelpi, and Grynaviski 2004; cf. Beck, King, and Zeng 2004), have combined to produce few if any applications of the method in IR in the intervening seven years.

The other two studies have made some headway in terms of parsimony, though the potential for useful dialogue remains. Hegre (2008) arguably represents the state of the art in modeling the effects of political relevance in particular. The author, assuming that political relevance conforms to loss-of-strength gradient logic (pp. 568-9), utilizes a gravity model to capture the contingent relationship between relevance and the other variables of interest:

$$\ln(\Pr[y]) = \Lambda(\beta \ln[X]), \tag{1}$$

which is simply the log-additive (and therefore easier to estimate) version of

$$\Pr(y) = \Lambda(X^{\beta}). \tag{2}$$

This interactive specification does capture the contingency of every relationship on political relevance, which makes it a substantial advance, but because *everything* in a gravity model is interactive, it creates a potentially undesirable side effect in which

every relationship is contingent on every other one. This was the goal of the original gravity model but often not of quantitative IR scholars.[9] Moreover, hard-wiring a gravity model into the analysis could be dangerously inflexible, and produce incorrect inferences, given that opportunity/willingness logic (Proposition 2b) could also produce political irrelevance.

Another study, by Xiang (2010), seeks to model MID onset as a function of trade and other variables, utilizing a split-population binary dependent variable model similar to the one proposed in an earlier version of this article[10] to capture the contingent effects of political relevance. The differences remain substantial, however, aside from the fact that the effects of democracy are not modeled in the same fashion as those of distance and the possibility of a diminishing contingency is not taken into account, the vectors of independent variables utilized in the relevance and conflict equations are nearly identical, a fact that makes identification and interpretation problematic.[11]

Finally, two recent studies, while not outlining specific methodologies for handling dyadic democracy or political irrelevance, nevertheless report findings that support our argument that other relationships are contingent on them. Reed and Chiba (2010), using an innovative and straightforward decomposition analysis, demonstrate that the overwhelming majority of the difference in conflict behavior between contiguous and noncontiguous dyads can be attributed to "behavioral" rather than "observable" traits—that is, to differences in the β coefficients rather than differences in observed values of the independent variables. Similarly, Bennett (2006) expands the definition of political relevance by allowing for less restrictive forms of contiguity, factoring in historical relationships, lowering the criterion for a power-projecting state's material capabilities, and permitting more distance (up to 3,000 miles) between states in order to capture a larger percentage of militarized disputes. Though conflicts among nonrelevant dyads remain even under the most generous definition of irrelevance—a testament to human ingenuity, no doubt—the exercise neatly illustrates the interactive relationship between continuous measures of political relevance and the independent variables of interest.

A Proposed Solution

For the most part, scholars have taken little notice of the mismatch between the additive specification of a standard linear-in-variables model and interactive arguments relating democracy and political relevance to conflict. To date, inclusion of some measurement of democracy as an additive control is the typical method of capturing its effects. Political relevance, however, presents such a stark problem that politically irrelevant dyads are often simply omitted from the data.

Our approach, by contrast, is to model the heterogeneity among dyads rather than assuming it and throwing out the majority of the data in order to achieve homogeneity. It therefore improves on studies that take the latter approach because it permits

the use of all of the data rather than requiring that the bulk of it be omitted. Unlike the Beck, King, and Zeng (1999) approach, the method is computationally relatively simple, and it fits quite well with researchers' desire to engage in deductive theory testing. Indeed, if the researcher's original model is a logit or probit specification, as the vast majority of conflict models are, existing statistical software can incorporate the solution proposed here "out of the box." Nevertheless, the technique is flexible enough to permit us to test the loss-of-strength gradient assumption underlying Hegre's (2008) gravity model and the functional-form assumptions of Xiang (2010). It therefore constitutes a middle ground, one that allows us to estimate important theoretical relationships rather than assuming them while remaining comfortably within the context of deductive theory testing.

Modeling the sources of dyadic heterogeneity necessarily reflects a theory of how political irrelevance and dyadic democracy produce heterogeneity. That theory, as the sections above suggest, is grounded in a fundamentally interactive understanding of variables and their impact. Simply put, political irrelevance and dyadic democracy attenuate the impact of variables that capture the sources of conflict, and they have an impact on the probability of conflict that those variables generate to roughly the same degree.[12] How might such an understanding of the causes of heterogeneity be captured mathematically? Start with a very standard logit equation,

$$\Pr(y = 1) = \Lambda(X\beta), \tag{3}$$

where $\Lambda(X\beta) \equiv \frac{1}{1+e^{-X\beta}}$. Now imagine a very simple case in which two sets of dyads exist and the impact of a change in X in the second set of cases is exactly half of what it is in the first set. The simplest way to model this situation would be

$$\Pr(y = 1) = \Lambda(X\beta) \times f(Z), \tag{4}$$

where $f(Z) = 1$ in the first set of cases and $f(Z) = 0.5$ in the second set. As a result of the multiplication by $f(Z)$, a change in X has exactly twice the impact on $\Pr(y = 1)$ in the first set of cases that it has in the second—for all independent variables X.[13]

Typically, of course, we are not nearly so certain that a given change in Z will produce such an exact change in the outcome of interest, so we estimate it rather than assuming it. In order to do so, we multiply Z by a coefficient, call it γ, and find a concrete functional form that fits our idea of how changes in Z relate to changes in the probability that $y = 1$. We could, for example, use a second logit density to model the relationship, as in

$$\Pr(y = 1) = \Lambda(X\beta) \times \Lambda(Z\gamma), \tag{5}$$

to capture the assumption that the attenuation of $\Pr(y = 1|X, \beta)$ will be a smooth, sigmoid, and symmetrical function of changes in $Z\gamma$. This is equivalent to assuming that each of the individual logit CDFs, models an unobservable dependent variable, y^*, and the product of the y^* equals the observable probability $\Pr(y = 1)$

(hence the term "partial observability" [Poirier 1980] to describe this category of models):

$$\Pr\left(y^*_{X\beta} = 1\right) = \Lambda(X\beta), \tag{6}$$

$$\Pr\left(y^*_{Z\gamma} = 1\right) = \Lambda(Z\gamma), \tag{7}$$

$$\Pr(y = 1) = \Pr\left(y^*_{X\beta} = 1\right) \times \Pr\left(y^*_{Z\gamma} = 1\right). \tag{8}$$

This is a straightforward application of Boolean logit (Braumoeller 2003).[14] It is, of course, possible to go further, by disaggregating $\Lambda(Z\gamma)$ into two separate functions to capture the effects of democracy and political relevance, so,

$$\Pr\left(y^*_{W\xi} = 1\right) = \Lambda(W\xi), \tag{9}$$

$$\Pr(y = 1) = \Pr\left(y^*_{X\beta} = 1\right) \times \Pr\left(y^*_{Z\gamma} = 1\right) \times \Pr\left(y^*_{W\xi} = 1\right), \tag{10}$$

where Z represents a vector of covariates that captures dyadic democracy and W represents a vector of covariates that captures political relevance, on a data set that includes all dyads. Additive variables in standard logit are, of course, interactive to some extent due to logit's curvilinear functional form; this extension is appropriate for exactly this situation—each of the constituent logits corresponds to a conceptually coherent unobserved dependent variable, and each modifies (here, attenuates) the impact of the variables in the other. To the extent that these effects are modeled correctly, they will capture the sources of dyadic heterogeneity and permit asymptotically unbiased estimates of β.

The probability of the onset of a MID $\Pr(y = 1)$ is, to sum up, the product of the probabilities of three unobserved, discrete outcomes: the probability that the impetus for conflict will exist in the first place, $\Lambda(X\beta)$; the probability that conflict will be unhindered by the domestic political systems of the states involved, which is a function of their dyadic nondemocracy, $\Lambda(Z\gamma)$; and the probability that the states' political relevance will permit conflict, $\Lambda(W\xi)$. Each probability is independent of the others, discounting the impact of any independent variables that are common to their c.d.f.s; each is modeled as a continuous logit curve; only MID onset, the dependent variable, is actually observed, and assumed to be the binary realization of the product of those probabilities.

Finally, it might be wise to relax the assumption of symmetry in the logit c.d.f., $\Lambda(W\xi)$, if we wish to capture the intuition that the effects of political irrelevance are small over short distances but increase over medium to long ones. To model such a possibility, we can estimate

$$\Pr\left(y^*_{X\beta} = 1\right) = \Lambda(X\beta), \tag{11}$$

$$\Pr\left(y^*_{Z\gamma} = 1\right) = \Lambda(Z\gamma), \tag{12}$$

$$\Pr\left(y^{\alpha*}_{W\xi} = 1\right) = \Lambda^{\alpha}(W\xi), \tag{13}$$

$$\Pr(y = 1) = \Pr\left(y^*_{X\beta} = 1\right) \times \Pr\left(y^*_{Z\gamma} = 1\right) \times \Pr\left(y^{\alpha*}_{W\xi} = 1\right), \tag{14}$$

where Λ^{α} represents Nagler's (1994) scobit estimator

$$\Lambda^{\alpha}(W\xi) \equiv \frac{1}{1 + (e^{-W\xi})^{-\alpha}}, \tag{15}$$

a generalization of logit that permits skew in the c.d.f. As we demonstrate in Appendix B, estimating scobit models constitutes a wise robustness check, regardless of whether one wishes to test the theoretical proposition, as skew in the c.d.f. can have a dramatic impact on the consistency of the coefficient estimates. An α coefficient close to 1 represents a symmetrical, logit-like curve.

Interpretation

It may seem difficult for all but the most mathematically minded to get a clear grip on how to understand the impact of democracy and political relevance in these models. Doing so is actually surprisingly straightforward: their predicted values, $\hat{y}^*_{Z\gamma}$ and $\hat{y}^*_{W\xi}$, represent, not the predicted value of the outcome variable $\hat{y}$ (as is usually the case with logit and probit analysis),[15] but rather an *upper bound* on the value of $\hat{y}$.

To take a simple illustration, assume a nondemocratic dyad consisting of weak states at a great distance from one another. Their lack of democracy does not hinder conflict in any way ($\hat{y}^*_{Z\gamma} \approx 1$), but their weakness and distance suppress the impact of other variables on conflict fairly substantially ($\hat{y}^*_{W\xi} = 0.05$). The overall probability of conflict $\hat{y} = y^*_{X\beta} \times y^*_{Z\gamma} \times y^*_{W\xi}$ obviously cannot exceed 0.05, given that $y^*_{X\beta}$ is bounded at 0 and 1, so $\hat{y}^*_{W\xi}$ defines the upper bound of $\hat{y}$.

In substantive terms, as that upper bound approaches zero, the variable in question suppresses the potential impact of all other variables X in the model.[16] The extent to which that upper limit changes—in particular, the extent to which it approaches zero—tells us how much impact a particular variable has on the ability of *other* variables to produce change in the dependent variable. This interaction captures the theoretical claims made above about the impact of dyadic democracy and political irrelevance: regardless of the cause of war, its impact is dramatically attenuated in democratic or politically irrelevant dyads.

Now that we have derived an appropriate statistical model based on the logic of political irrelevance and democracy, we can state our propositions as more concrete hypotheses:

Hypothesis 1: Dyadic democracy and political irrelevance attenuate the impact of other independent variables on the probability of conflict initiation.
Hypothesis 2a: Distance will effectively preclude conflict initiation, unless states are either practically adjacent or extremely powerful.
Hypothesis 2b: Distance will not effectively preclude conflict initiation except among the most distant states in the system, but it will do so to some degree even among major powers.

The first hypothesis implies that an interactive model of conflict that allows dyadic democracy and political irrelevance to reduce the impact of other conflict-producing variables will produce a better fit to the data[17] than a standard additive model. The second, based on the loss-of-strength gradient, implies that the relationship between distance and conflict will be similar to that which has largely been assumed in the literature so far, that is, that contiguous or major-power dyads are completely relevant, others are not; while the third argues that issues and interests comprise the greater part of relevance, implying that it degrades more gradually and renders only the most distant states irrelevant.

Application: Initiation of Militarized Disputes

In order to demonstrate the utility of capturing the interactive, Boolean theoretical logic underlying existing theories, we have reanalyzed a prominent study that capture the effects of democracy and distance on conflict: Oneal and Russett's (1999) evaluation of the impact of trade on the initiation of MIDs. In this study, we model democracy and political irrelevance as distinct paths to peace, testing this specification against the baseline specification described in the model. As a robustness check, we test the trivariate Boolean logit specification against a specification in which the distance and democracy c.d.f.s are modeled as scobits, allowing us to test the hypothesis that the relationship is asymmetric or skewed. In all cases, we calculate Akaike's information criterion (AIC), which rewards both model fit and parsimony, as a way of adjudicating among the models.

In Oneal and Russett's (1999) contribution to the literature on trade and conflict, the main conflict-producing variables of interest are levels of trade dependence, though a number of control variables have been thrown in—including joint democracy, contiguity, distance, and a dummy variable indicating whether the dyad in question is a major-power dyad. In order to test these hypotheses, we first replicate the original study (Table 2, column 1), in order to provide a baseline. The variables and their codings are identical to those in the original

Table 2. Reanalysis of Oneal and Russett's (1999) Findings on the Relationship Between Interdependence and Conflict

		Boolean logit		
	Logit	Original	Democracy	Pol. relevance
Allies	–0.421* (0.100)	–0.432* (–0.47/–0.39)		
Cap. ratio	–0.124* (0.036)	–0.178* (–0.22/–0.13)		
Lower dep.	–20.851 (13.913)	–8.810* (–8.81/–8.81)		
Higher dep.	0.995 (1.429)	1.900* (1.90/1.90)		
Joint dem.	–0.003* (0.000)		–0.017* (–0.02/–0.01)	
Contiguity	2.239* (0.116)			4.500* (4.49/4.51)
Distance	–0.386* (0.046)			–1.051* (–1.08/–1.02)
Maj. dyads	1.163* (0.112)			2.901* (2.88/2.92)
Constant	–0.510 (0.373)	–0.462* (–0.49/–0.42)	5.500* (5.50/5.50)	4.801* (4.80/4.81)
AIC	5399.099		5238.253	
N	107,339		107,339	

Note: (Numbers in Parentheses for Logit Model are Standard Errors; for Boolean Model are Bootstrapped 95% Confidence Intervals)

study and most (existence of an alliance, joint democracy from the Polity dataset, etc.) will be familiar to students of the conflict literature. Capability ratio refers to the log of the ratio of the stronger state's Correlates of War capability index to that of the smaller state, while the trade-dependency statistics refer to the extent to which each state depends on their joint trade (bilateral trade divided by the state in question's GDP, the lower being the less dependent of the pair), and distance is logged.

Next, we estimate a trivariate Boolean logit model (column 2).[18] In such a model, which variables to include (and exclude) from which c.d.f.s is an important decision, as each must represent a quantity of theoretical interest; here, the first represents the alliance, capability, and trade variables posited to have an impact by Oneal and Russett (1999), the second captures joint democracy, and the third captures variables that are related to political relevance. This gives a model of the form

$$\begin{aligned}\Pr(\text{onset}=1) =& \Lambda(\beta_0+\beta_1\ \text{Allies}+\beta_2\ \text{CapRatio}+\beta_3\ \text{LowerDep}\\ &+\beta_4\ \text{HigherDep})\times\ \Lambda(\gamma_0+\gamma_1\ \text{JointDemocracy})\\ &\times\ \Lambda(\xi_0+\xi_1\ \text{Contiguity}+\xi_2\ \text{Distance}+\xi_3\ \text{Maj.Dyad}).\end{aligned}\tag{16}$$

The substantive differences between the interactive Boolean model and the original are considerable. The results of the main variable of interest, the minimum level of dependence, was attenuated fairly drastically in the interactive model, while the impact of the democracy and political-relevance variables increased dramatically: the coefficient on contiguity doubled in size, while the coefficient on joint democracy quintupled, and the AIC metric bears out Hypothesis 1: the Boolean model is the preferable one. Analysis with scobit specifications for the democracy and political relevance c.d.f.s (not shown) produce α coefficients close to 1 and, accordingly, result in no improvement in the AIC metric, so a Boolean logit specification rather than scobit is most appropriate here.

It is also possible that an alternative theoretical specification might produce an equivalent or better fit. Accordingly, we estimated two additional Boolean models. In the first, we assume that trade, rather than constituting a primary conflict-reducing variable, attenuates the impact of conflict-causing variables in the same way that democracy does. In the second alternative model, we posit that, since democracy and political relevance both have mitigating or attenuating effects on the utility of conflict, it might be possible to model their effects additively, within the same c.d.f., rather than in separate c.d.f.s. Neither model improved on the fit and parsimony of the Boolean specification, and the first was inferior to the additive logit specification as well.[19]

Impact

What is the impact of distance and democracy on conflict initiation? To answer this question, we must turn to plots of the predicted values of the key independent

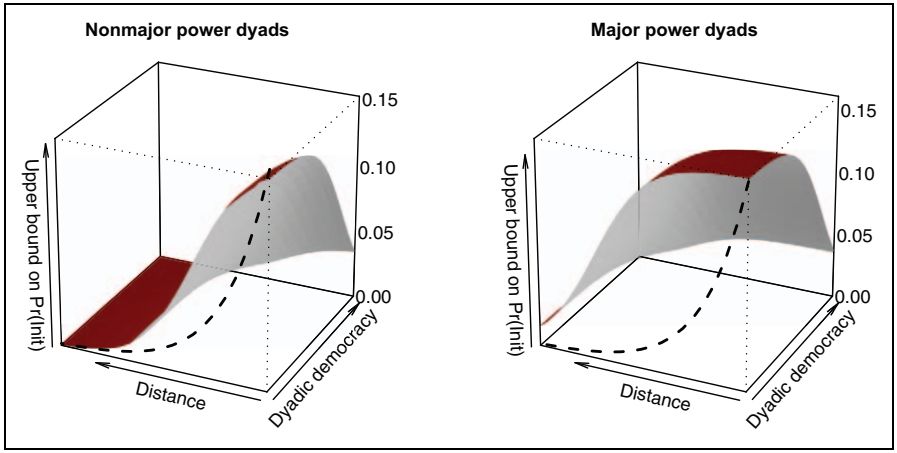

Figure 2. Distance, democracy, and dispute initiation
Note: dashed lines illustrate standard loss-of-strength gradient.

variables derived from the model. In Figure 2, we examine the extent to which distance and dyadic democracy constitute an upper bound on the probability of dispute initiation in nonmajor power and major power dyads, respectively.[20] We also compare this upper bound to the current standard in the field, the loss-of-strength gradient (Hypothesis 2a), an assumption that both justifies the omission of noncontiguous nonmajor power dyads and informs theoretically more sophisticated attempts to solve the problem of political relevance (e.g., Hegre 2008, 568–9).

As Figure 2 makes clear, estimating rather than assuming the impact of distance on conflict produces very different results. The ability to initiate disputes even among nonmajor powers considerably exceeds what the loss-of-strength gradient would suggest; among dyads containing major powers, the discrepancy is dramatic. Moreover, dyadic democracy attenuates the impact of distance, as it attenuates the impact of everything else; so the upper bound becomes flatter as dyads become more democratic.

In qualitative terms, these implications differ from our standard interpretation of political irrelevance in a few important ways. First of all, nearby states are simply not as irrelevant as they are typically assumed to be. The upper bound on conflict among nonmajor power dyads *does* approach zero, but only at the very greatest distances. Dropping noncontiguous nonmajor power dyads amounts to an assumption of a step function—$\Pr(y = 1) = 0$ when distance > 0—that is more severe even than the loss-of-strength gradient would justify. Such an assumption is neither necessary, given that we can actually estimate the relationship of interest rather than assume it, nor particularly justifiable. In short, Hypothesis 2b, the opportunity/willingness hypothesis, appears to be the better of the two political-relevance hypotheses, especially in the case of major power dyads.

Second, that said, even major powers have their limits. The upper bound on the probability of conflict initiation does drop off, and fairly dramatically, in the case of major powers. The standard assumption that any dyad containing a major power is a politically relevant dyad, therefore, is equally flawed: at great distances even major powers may be marginally relevant at best.

Third, especially among major powers, the results for democracy are nearly as striking as those for distance. Dyadic democracy dramatically attenuates the impact that other variables have on the probability of dispute initiation. As low-distance dyads approach fully democratic, the upper bound on the probability of dispute initiation drops off sharply. It cannot reach zero due to functional-form assumptions, but it comes fairly close, dipping below 0.05. What this result means in substantive terms is that, no matter how much the deck is stacked against peace in fully democratic dyads,[21] even the most warlike of them will never experience a probability of initiation greater than about one in twenty, and for most it will be far less.

The impact of dyadic democracy and political relevance on the other independent variables of interest is illustrated in a series of conditional marginal-effects plots in Figure 3. The relationship of each to dispute initiation is shown under four conditions: nondemocratic, politically relevant dyads; nondemocratic, minimally politically irrelevant dyads (i.e., noncontiguous non-Great Power dyads at a minimal distance from one another); democratic, politically relevant dyads; and nondemocratically, politically irrelevant dyads.[22] The figure illustrates the intuition from Proposition 1: the impact of conflict-causing variables is contingent on political relevance and the absence of democracy. Here, alliances, capabilities, and trade matter less as sources of conflict when the two combatants are democratic or (especially) when they are politically irrelevant.

The graphs in Figure 3 illustrate the extent to which dyadic democracy and political irrelevance attenuate the impact that different independent variables have on dispute onset. To understand these relationships more precisely, we can also gauge and compare the influence of democracy and political irrelevance on the impact of other variables by, first, calculating the change in the predicted value of y given a change in each independent variable x from its maximum to its minimum value—$\Delta\hat{y}/\Delta x$, the equivalent of a slope coefficient in a regression equation—in the case of nondemocratic, politically relevant dyads, and second, examining the effect of different variables (dyadic democracy, political irrelevance, etc.) on changes in that quantity. This gives us a direct measure of the extent to which political irrelevance and democracy attenuate the impact of other variables.

Table 3 presents the result of this exercise. Each cell reports the change from the baseline $\Delta\hat{y}/\Delta x$ when only the condition in the leftmost column is introduced; so, for example, minimal political irrelevance attenuates the impact of the independent variables in the Oneal and Russett (1999) study (alliances, capabilities, and economic interdependence) on MID onset by 31.99 percent.

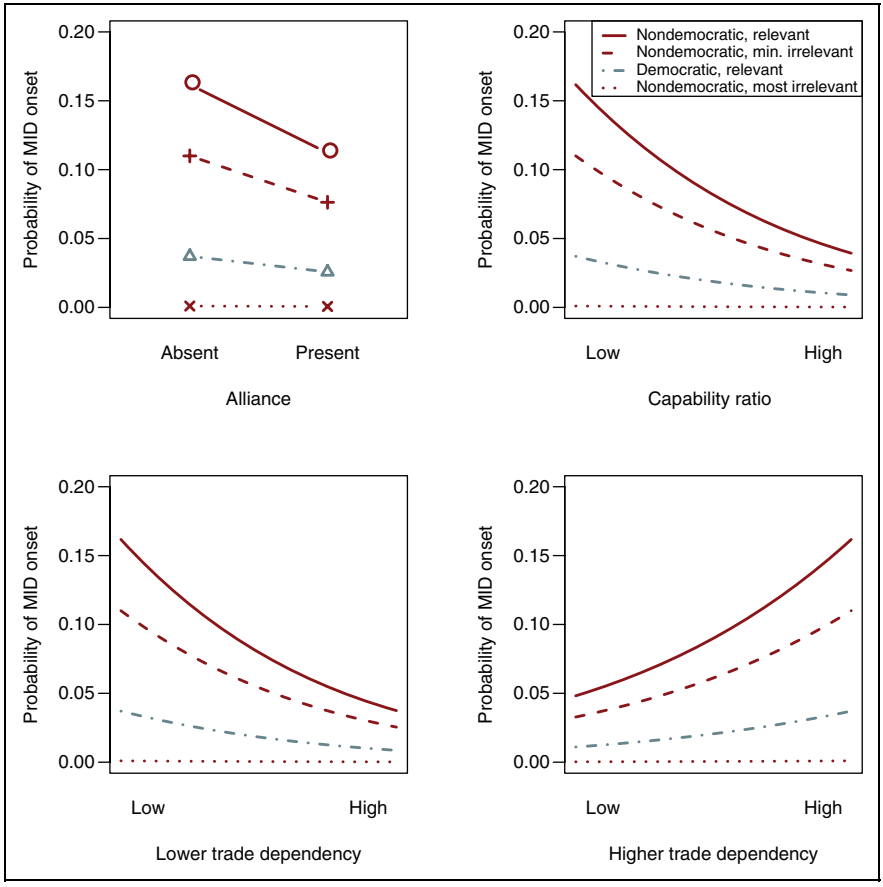

Figure 3. Political relevance, democracy, and dispute initiation

Table 3. The Extent to Which Dyadic Democracy and Political Irrelevance Attenuate the Impact of Other Variables on MID Onset

$y = \Pr(\text{MID Onset})$; $z =$ ...	Effect of z on $\Delta\hat{y}/\Delta x$
Minimal political irrelevance	31.99%
Dyadic democracy	77.07%
Maximum political irrelevance	99.39%
Democracy and max. irrelevance	99.86%

The table suggests a few conclusions. First, it underscores the point already made that simply dropping politically irrelevant dyads, or introducing them as additive controls, is not an optimal strategy. Minimally irrelevant dyads—those containing no Great Powers but only separated by a minimal distance—remain quite relevant: far from being sufficient for the absence of conflict, *minimal* political irrelevance only attenuates the impact of other conflict-causing variables by about a third.

Second, political irrelevance *does* render dispute onset extremely unlikely by removing other sources of friction between states—but only in the extreme. The intuition that "Bolivia–Botswana" dyads do not fight does hold, but mainly in cases like that of Bolivia and Botswana: only the most irrelevant dyads are extremely unlikely to witness dispute onset.

Finally, dyadic democracy, viewed as a suppressor of the other sources of conflict, would appear to be a better guarantor of peace than a minimal, or even moderate, degree of political irrelevance.

Conclusion

The overarching goal of this article has been to offer a more substantively satisfying explanation of the impact of political irrelevance and dyadic democracy on conflict than have previously been available in the conflict literature. In particular, we have argued that there are good theoretical reasons to believe that dyadic democracy and political irrelevance constitute variable upper bounds on the probability of conflict, that the two interact with the other sources of conflict rather than simply subtracting some constant quantity from them, and that the impact of distance on political irrelevance, even among nonmajor powers, is substantially less severe than the majority of present studies assume. Our reexamination of a study of militarized dispute onset supports all of these arguments.

We hope to have demonstrated that this formulation is both substantively interesting in its own right and of considerable theoretical interest to conflict research. The choice between the strategies of adding a political-relevance variable or omitting dyads deemed politically irrelevant has long been one of the lesser of two evils; these findings suggest a theoretically informed, statistically straightforward, and empirically superior alternative. Because the interactive Boolean model provides a better fit, the data support the argument that democracy and political irrelevance attenuate the impact of other conflict-causing variables. Moreover, the fact that the effect of political irrelevance is far from absolute in moderate degrees calls into question the common practice of simply dropping those dyads deemed politically irrelevant.

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Appendix A

Why Not Use Interaction Terms?

The Boolean logit functional form,

$$\Pr(y = 1) = \Lambda(X\beta) \times \Lambda(Z\gamma), \tag{A1}$$

along with the conditional form of the article's conclusions, naturally raise the question of whether it would not be possible, and more parsimonious, to estimate an interactive model within a single logit c.d.f. of the form

$$\Pr(y = 1) = \Lambda(X\beta \times Z\gamma) \tag{A2}$$

that would accomplish the same result. If X and Z represent single independent variables, the answer is most likely "yes": a model of the form

$$\Pr(y = 1) = \Lambda(\beta_0 + \beta_1 x + \gamma_1 z + \beta_2 xz) \tag{A3}$$

will capture the same intuition. But given that the functional form of the Boolean equation in this study actually contains *three* separate logit c.d.f.s

$$\Pr(y = 1) = \Lambda(X\beta) \times \Lambda(Z\gamma) \times \Lambda(W\xi), \tag{A4}$$

and that each of the vectors of variables contains up to four independent variables, using multiplicative interaction terms to capture their interaction is not a trivial issue.[23] Below we describe three ways in which one might capture the interactions of vectors of variables using interaction terms. Only two are actually feasible; neither improves on the fit of the Boolean model, but equally important, we argue that neither is an improvement in terms of clarity of interpretation.

The Boolean model as tested in the text, fully specified, was

$$\begin{aligned}\Pr(\text{MID Onset} = 1) = \Lambda(&\beta_0 + \beta_1\ \text{Allies} + \beta_2\ \text{CapRatio} + \beta_3\ \text{LowerDep} \\ &+ \beta_4\ \text{HigherDep}) \times\ \Lambda(\gamma_0 + \gamma_1\ \text{JointDemocracy}) \\ &\times\ \Lambda(\xi_0 + \xi_1\ \text{Contiguity} + \xi_2\ \text{Distance} + \xi_3\ \text{Maj.Dyad}).\end{aligned} \tag{A5}$$

The advantage of a Boolean model is that each of the variables in each separate c.d.f. interacts with each of the variables in the other c.d.f.s; in order to render this as an interactive model, therefore, one would have to multiply each variable in each c.d.f. by every variable in every other c.d.f. Assuming for the moment that the constant term is only added at the end, we get

$$\begin{aligned}\Pr(\text{MID} = 1) = \Lambda(&\beta_0 + \beta_1\ \text{Allies} \times \text{JointDemocracy} \times \text{Contiguity} \\ &+ \beta_2\ \text{Allies} \times \text{JointDemocracy} \times \text{Distance} \\ &+ \beta_3\ \text{Allies} \times \text{JointDemocracy} \times \text{Maj.Dyad} \\ &+ \beta_4\ \text{CapRatio} \times \text{JointDemocracy} \times \text{Contiguity} \\ &+ \beta_5\ \text{CapRatio} \times \text{JointDemocracy} \times \text{Distance} \\ &+ \beta_6\ \text{CapRatio} \times \text{JointDemocracy} \times \text{Maj.Dyad} \\ &+ \beta_7\ \text{LowerDep} \times \text{JointDemocracy} \times \text{Contiguity} \\ &+ \beta_8\ \text{LowerDep} \times \text{JointDemocracy} \times \text{Distance} \\ &+ \beta_9\ \text{LowerDep} \times \text{JointDemocracy} \times \text{Maj.Dyad} \\ &+ \beta_{10}\ \text{HigherDep} \times \text{JointDemocracy} \times \text{Contiguity} \\ &+ \beta_{11}\ \text{HigherDep} \times \text{JointDemocracy} \times \text{Distance} \\ &+ \beta_{12}\ \text{HigherDep} \times \text{JointDemocracy} \times \text{Maj.Dyad}.\end{aligned} \tag{A6}$$

If, however, the constants in the Boolean model are retained, representing the interaction among the variables in an interaction becomes somewhat more complex, because the constants are multiplied by each of the independent variables, producing

$$\begin{aligned}\Pr(\text{MID} = 1) = \Lambda(&\beta_0 + \beta_1\ \text{Allies} + \beta_2\ \text{CapRatio} + \beta_3\ \text{LowerDep} \\ &+ \beta_4\ \text{HigherDep} + \beta_5\ \text{JointDemocracy} + \beta_6\ \text{Contiguity} \\ &+ \beta_7\ \text{Distance} + \beta_8\ \text{Maj.Dyad} \\ &+ \beta_9\ \text{Allies} \times \text{JointDemocracy} \times \text{Contiguity} \\ &+ \beta_{10}\ \text{Allies} \times \text{JointDemocracy} \times \text{Distance} \\ &+ \beta_{11}\ \text{Allies} \times \text{JointDemocracy} \times \text{Maj.Dyad} \\ &+ \beta_{12}\ \text{CapRatio} \times \text{JointDemocracy} \times \text{Contiguity}\end{aligned}$$

$$
\begin{aligned}
&+ \beta_{13}\ \text{CapRatio} \times \text{JointDemocracy} \times \text{Distance} \\
&+ \beta_{14}\ \text{CapRatio} \times \text{JointDemocracy} \times \text{Maj.Dyad} \\
&+ \beta_{15}\ \text{LowerDep} \times \text{JointDemocracy} \times \text{Contiguity} \\
&+ \beta_{16}\ \text{LowerDep} \times \text{JointDemocracy} \times \text{Distance} \\
&+ \beta_{17}\ \text{LowerDep} \times \text{JointDemocracy} \times \text{Maj.Dyad} \\
&+ \beta_{18}\ \text{HigherDep} \times \text{JointDemocracy} \times \text{Contiguity} \\
&+ \beta_{19}\ \text{HigherDep} \times \text{JointDemocracy} \times \text{Distance} \\
&+ \beta_{20}\ \text{HigherDep} \times \text{JointDemocracy} \times \text{Maj.Dyad}. \qquad \text{(A7)}
\end{aligned}
$$

Even this specification, however, is incomplete, because it omits a very large number of lower order terms (Joint Democracy × Contiguity, for example), thereby forcing their coefficients to zero. Recent articles on the subject of multiplicative interaction terms (e.g., Braumoeller 2004, 811, Brambor, Clark, and Golder 2006, 69) are unanimous in rejecting this practice because forcing lower order coefficients to zero, like forcing the intercept to zero in a basic regression equation, makes inferences based on the remaining coefficients inherently suspect, if not substantively meaningless. And in this case, the fully interactive model, which requires estimation of *an additional 240 coefficients,* will not converge due to the large number of highly collinear variables.

Even if we were to ignore the red flags raised by political methodologists and estimate a restricted model of one of the two forms above, we would find (Table A1) that neither is superior to the Boolean model in terms of fit and parsimony. The second of the two models is the better of the two by far, with an AIC of 5373.2, but it only barely beats the simple additive logit (5399.1) and falls well short of the Boolean model (5238.3).

Table A1. Restricted Multiplicative Models

	Model 1	Model 2
Allies		–0.710*
Capability ratio		–0.155*
Trade dep (low)		5.208
Trade dep (high)		–0.423
Joint democracy		–0.005*
Contiguity		2.403*
Distance (logged)		–0.401*
Major power dyads		1.255*
Allies × Demo × Contig	0.001	–0.001
Allies × Demo × Distance	0.000	0.000*

(continued)

Table A1 (continued)

	Model 1	Model 2
Allies × Demo × MajorPwrDyads	–0.001	–0.001
CapabilRat × Demo × Contig	0.003*	–0.000
CapabilRat × Demo × Distance	–0.000*	0.000*
CapabilRat × Demo × MajorPwrDyads	0.002*	–0.000
TradeDepLow × Demo × Contig	0.784*	0.136
TradeDepLow × Demo × Distance	–0.123*	–0.021
TradeDepLow × Demo × MajorPwrDyads	0.006	–0.144
TradeDepHi × Demo × Contig	–0.082*	–0.025*
TradeDepHi × Demo × Distance	0.004	–0.002
TradeDepHi × Demo × MajorPwrDyads	0.032	0.049
Constant	–2.135*	–0.382
AIC	6318.4	5373.2

Note: AIC = Akaike information criterion.
*$p < .05$.

Appendix B

Does Skew Matter? Monte Carlo Simulations

The difference between the logit and the scobit curve can be fairly subtle and potentially only of theoretical rather than practical interest. Is it, or can it be, substantial enough to warrant concern? That is, if we do not really care to take into account the possibility that the c.d.f. will be skewed, are the results of logit models likely to be similar enough to the results of scobit models that we can safely ignore it? Or, as an alternative, since the situation under examination is one in which changes in political relevance have a larger impact than linear distance would suggest at close range but rapidly diminishing impact thereafter, could we simply transform the distance variable itself, into a variable that conforms to this expectation? If such a transformation succeeds in recovering the original parameters, it would be a simple and—relative to the techniques just described—computationally inexpensive solution. The danger, however, is that making a transformation like logging distance may be mathematically specific enough that it would fail to capture the exact form of the relationship, resulting in an unknown degree of bias.

To answer these questions, we turn to a series of Monte Carlo simulations. We simulated a data set of 50,000 observations with four independent variables: expected utility (EU, drawn from a Normal density with mean zero and standard deviation 1); democracy (drawn from a uniform distribution on the $-10 \ldots 10$ interval); scaled distance (each observation consisting of a zero with 20 percent probability and a draw from a uniform distribution with an 80 percent probability); and a variable reflecting whether one state or another is a Great Power (GP status; a Bernoulli trial with a 10 percent chance of success). The simulated dependent variable was MID initiation, and the data-generating process was

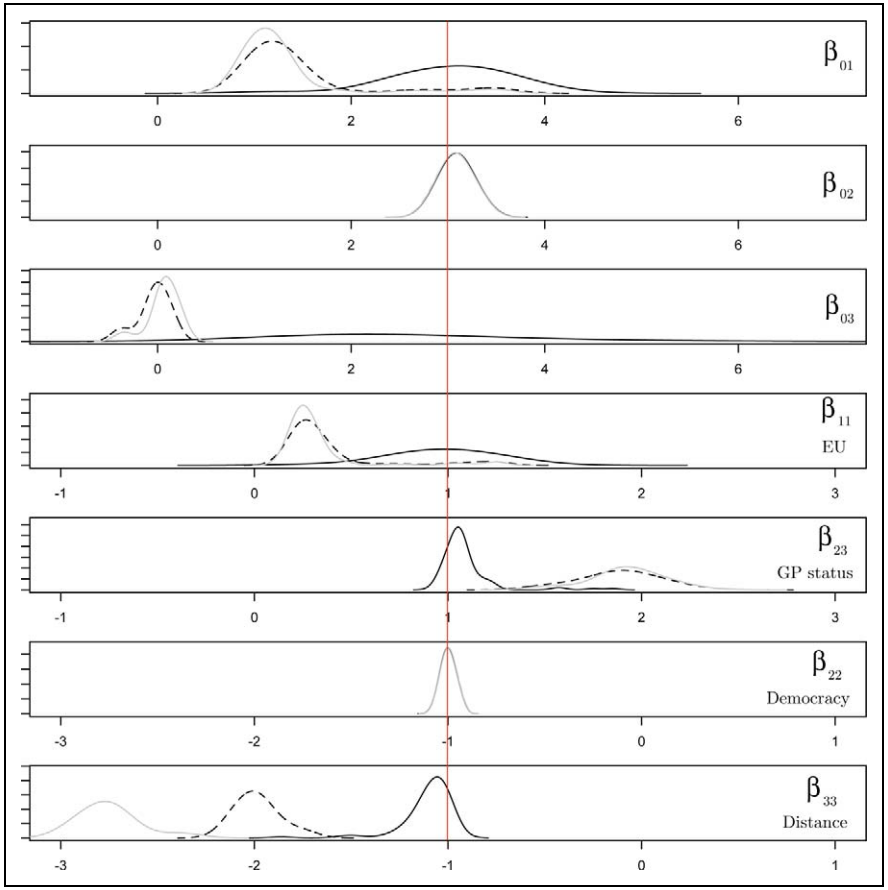

Figure B1. Coefficients for 100 Monte Carlo simulations
Note: (solid line: Boolean logit/scobit; dashed line: Boolean logit untransformed; grey line: Boolean logit with distance logged). Vertical line bisecting all coefficient graphs indicates population parameter values.

$$\begin{aligned}\Pr(\text{MID}=1) = {} & \Lambda(\beta_{01}+\beta_{11}\text{EU})\times \\ & \Lambda(\beta_{02}+\beta_{12}\text{democracy})\times \\ & \Lambda^{-\alpha}(\beta_{03}+\beta_{13}\text{GPstatus}+\beta_{23}\text{distance}).\end{aligned}$$

For sample values, for ease of illustration we chose $\beta_{01}=\beta_{02}=\beta_{03}=3$, $\beta_{11}=\beta_{13}=1$, $\beta_{12}=\beta_{23}=-1$, and $\alpha=7$. We then generated 100 different data sets of 50,000 observations each, using these parameters, and analyzed those data sets using three different techniques:

- standard Boolean logit, without any adjustment for skew or recoding of the distance variable;

- standard Boolean logit, without any adjustment for skew but with the distance variable logged to capture the diminishing-returns argument; and
- a Boolean combination of logit (in the first two densities) and scobit (in the third, capturing political relevance).

The third captures the data-generating process and should produce the most accurate answers; the question is whether either of the first two will do so as well.
As the results in Figure B1 demonstrate unequivocally, the specifications without scobit do not perform as well. The figure illustrates the fact that the violation of the functional-form assumption has serious implications for the consistency of coefficients throughout the model, not just those in the single subequation implicated by the skew (e.g., political relevance vector).[24] The Boolean logit/scobit model, as anticipated, recovers the parameters well on average; the Boolean logit model with distance untransformed and the Boolean logit model with a log transformation for distance, on the other hand, do not. In fact, the log transformation makes little difference at all in the consistency of the coefficient estimates, except in the case of the coefficient on the distance variable itself, β_{33}—which actually becomes *more* biased rather than less.

Notes

1. These are the *American Political Science Review, American Journal of Political Science, Journal of Politics, Journal of Conflict Resolution, International Studies Quarterly, and the Journal of Peace Research*. We are grateful to Chaekwang You for his work on part of this survey.
2. The percentages do not sum to 100 because of rounding error. In the case of politically relevant dyads fully 27 percent of the cases fall into the ''other'' category. Many of these studies control for shared borders or contiguity, but not distance more generally; others implement more creative coding rules or case-selection mechanisms. Perhaps, the most surprising finding is the number of studies (23 percent of the total) that both drop irrelevant dyads and include a strictly additive control. Doing so makes the results difficult, if not impossible, to interpret clearly. In cases in which the sample is limited to politically relevant dyads—defined as contiguous dyads or those in which at least one state in the pair is a Great Power—and an additive contiguity dummy variable is included, for example, the contiguity dummy will capture the effect of being contiguous. It will also, however, serve as an excellent proxy for non-Great Power status, since in this subset of cases only Great Power dyads will be noncontiguous.
3. Maoz and Russett (1993) report dropping 26 percent of all conflict cases when using only politically relevant dyads; Bennett (2006) reports 17 to 25 percent using different methods and an updated data set. Bennett (2006) examines different operationalizations of political relevance in an attempt to mitigate exactly this problem but concludes that capturing all disputes is exceptionally difficult.

4. By which, in Kant's terms, we intend to connote a republic, as do virtually all of those who seek to translate his meaning into the context of modern democratic peace theory.
5. It is worth emphasizing that this understanding differs from the one described in Seawright (2002), who argues that causal homogeneity requires that any given case be able, with fixed probability, to take on any value on both the independent and the dependent variable. Cartwright's (1979) variant assumes, as do most IR conflict studies, that the values of the independent variables are fixed and only the probability of the outcome conditional on the covariates be constant across units.
6. Lemke and Reed (2001) used a censored probit to evaluate the extent to which using only politically relevant dyads introduces bias as a result of selection—that is, whether the correlation between the error terms of two probit equations, one predicting political relevance and the other predicting conflict, biases the estimates in the latter equation. Their conclusion is that the coefficients are not substantially biased. While that alleviates concern that studies based on politically relevant dyads suffer from selection bias, however, selection bias is not the argument here: we are arguing that coefficients are biased due to model misspecification, a claim that cannot be evaluated in any manner save by specifying the correct model.
7. It is worth noting that the curvilinear functional form of logit and probit make it possible to adjust the slope by adjusting the intercept, in a crude fashion: for $X < 0$, the slope of the integral at $\Phi(X\beta)$ will be greater than the slope of the integral at $\Phi(X\beta - Z\gamma)$ for any dummy variable Z (such as political relevance) and arbitrary positive constant γ. Nevertheless, a coefficient β on X will not vary but will represent a weighted average of two quantities: the coefficient on X when $Z = 0$ and the coefficient on X when $Z = 1$. In general there is no reason to believe that those two quantities will equal one another, even approximately. If, for example, the probability of conflict is 0.0001 for all irrelevant dyads, regardless of the value of X, when $Z = 0$, then the reported value of β will reflect a combination of (a) the value of β when $Z = 1$ and (b) zero. Because irrelevant dyads predominate, β would probably be heavily biased toward zero—an outcome that would appeal to few researchers.
8. To see this problem, one need only run a lowess regression with different bandwidths on random data: it is meaningless to ask whether the flattish line derived from a high-bandwidth pass or the meandering line derived from a low-bandwidth pass is a "better" representation of the data.
9. More ominously, while the log-additive transformation works unproblematically for abstract two-dimensional curves, its behavior in statistical models, which potentially contain poorly behaved error terms that also undergo transformation, has received no attention at all in the applied literature.
10. Braumoeller and Carson (2009).
11. Specifically, the only variables distinguishing the relevance equation from the conflict equation are joint democracy, relative capabilities, and a set of peace-year splines, which are part of the latter equation; trade, major power status, the presence of an alliance, contiguity, and distance are common to both. This fact makes it difficult to distinguish

between the two posited mechanisms, because statistically speaking, very little information exists that would help to distinguish between the two.

12. We see no compelling theoretical reason to suspect shared democracy or political irrelevance would have less of a ''suppression effect'' on some causes of war rather than others. For the former, shared democracy is postulated to build tendencies toward tacit or explict conflict resolution that should mitigate sources of hostility, regardless of type. For the latter, greater distance is postulated to reduce the number and intensity of issues over which states disagree, which seems an ''equal opportunity'' dispute mitigator.
13. It is important to emphasize the proportionality in the reduction of coefficients across variables. This assumption is made purely for the sake of parsimony in the absence of specific theoretical reasons to dootherwise: it is possible that the impact of some variables would be reduced more than the impact of others in, say, irrelevant dyads, and while it would be possible to model such an outcome, it would add considerably to the complexity of estimation.
14. In situations in which we would expect the error terms in equations (6) and (7) to exhibit substantial correlation, as for example when they represent unmodeled constituents of utility common to multiple strategic actors (Smith 1999), it would be preferable to utilize a single bivariate logit or probit distribution with a joint error distribution, rather than the product of two individual logits, in order to capture the correlation between the error terms. It should be kept in mind, however, that doing so can substantially increase the amount of information that must be extracted from an already information-poor vector of 0s and 1s.
15. Where $\hat{y} = \Pr(y = 1)$.
16. For this reason, predicted values should generally be calculated with other independent variables set to the values most permissive of variation—in this case, those with positive coefficients to their maximum, and those with negative coefficients to their minimum—rather than to mean or median values.
17. Taking into account the additional parameters needed to estimate it.
18. Peace-year splines have been included in the analysis summarized in column 2, as in the original, but the coefficients have been omitted to save space.
19. We are grateful to an anonymous reviewer for suggesting these alternatives. Their AIC statistics were, respectively, 7906 and 5271; in the latter model, the more plausible of the two, the sign and significance of the variables did not differ at all from our Boolean model. Accordingly, we have not reproduced the results, though they are available upon request.
20. Contiguity is set to 0. Were it not, these graphs would be discontinuous, with the probability of conflict jumping at the minimum distance value by 0.00051 in nonmajor power dyads and 0.00887 in major power dyads—a very minor, but unnecessary, complication.
21. At least, stacked using the other variables in the model—proximity, capabilities, and trade.
22. Relationships for democratic, politically irrelevant dyads were omitted, as they would have been indistinguishable from those in the latter category.

23. Especially given that the opportunity costs of implementing Boolean logit and probit are low: both are available as pre-packaged commands in Stata and R.
24. The exceptionally wide distribution of coefficients for β_{03} reflects the fact that the skew coefficient and the constant term are, in general, fairly collinear, so one might reasonably expect greater uncertainty in estimating either when estimating both.

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