The Diffusion of
International Border Agreements

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Abstract[1]

Can actors' interactions affect similar, future interactions between those initial actors and others? We investigate this broad question through the lens of international border agreements. In particular, we propose that border agreements can emerge through a previously overlooked mechanism: diffusion. Because border territory is salient, leaders are expected to misrepresent their positions and therefore have difficulty credibly conveying information to their counterpart. To overcome this problem, actors require a costly signal, and we argue that border agreements can serve this purpose. When a state signs a border agreement with a neighboring state, it signals to its other neighbors about both the existence of a bargaining range and the potentially acceptable provisions, thereby helping these other neighbors successfully conclude border agreements with the original signatory states. An analysis of all contiguous dyads during the period 1816-2001 uncovers substantial support for our argument.

Keywords: diffusion, international negotiation, international law, border delimitation, territory

In 1960, China settled its border with Burma by signing an international border agreement that delimited the entirety of this border. Within the next three years, it similarly settled its borders with Mongolia (1962), Afghanistan (1963), and Pakistan (1963). We observe similar patterns within, *inter alia*, Latin America (e.g., both Colombia [1925-1929] and Bolivia [1887-1892, 1904-1910]) and Africa (e.g., both Algeria [1971-1973] and Ethiopia [1971-1973]). This behavioral pattern raises a yet unexplored question: why do border agreements appear in close temporal and spatial proximity to one another? Is it possible that the signing of one border agreement – i.e., an interstate agreement that delimits the entirety of a dyad's mutual border – affects the likelihood of successfully reaching similar agreements with additional neighboring states? More broadly, how do actors' interactions affect similar, future interactions between those initial actors and others?

We argue that border agreements diffuse geographically through a signaling process – that is, the successful conclusion of a border agreement in one dyad "systematically conditions" the likelihood of successfully concluding a subsequent border agreement in another, related dyad (i.e., diffusion; Simmons, Dobbin, and Garret 2008:7). An initial border agreement sends a costly signal to other neighboring states that have not yet delimited their borders with the signatories to the initial agreement. This signal gives the neighbors two pieces of information. First, it conveys that a bargaining range exists on border territory issues for the signatories to the initial agreement. Because border territory is salient to states, leaders spend time trying to convince each other that concessions are difficult or impossible. This helps leaders' bargaining positions (Schelling 1960), but may prevent them from successfully beginning or concluding negotiations over border territory (Fearon 1998). To overcome this obstacle, states can employ a costly signal that credibly informs others that a bargaining range exists – i.e., that they are capable of reaching agreement on this salient issue. A border agreement with another neighbor offers such a signal.

Second, border agreements relay to neighbors the types of provisions that the initial signatories find acceptable. This is critical because it is one thing to say that a bargaining range exists, but quite another to find mutually acceptable agreement terms within it successfully. Border agreements, however, by virtue of being very public documents, offer assistance in completing this task. These successfully

concluded agreements contain provisions accepted by the very state(s) with which the neighbor(s) need to negotiate. By reviewing the definitions, principles, terms, decisions, and processes contained within the initial agreement's provisions, neighbors increase the likelihood that they can find acceptable terms when negotiating the status of *their* border with (one or both of) the initial signatory states.

The sections that follow build and test a theoretical argument about the diffusion of border agreements. We believe this argument (and the results that support it) contributes to research and policy in four ways. First, this study offers a unique addition to the scholarly research of diffusion processes in political science. Most previous studies of diffusion have focused on the diffusion of institutions, policies, or practices from one municipality, state, or country to another (e.g., Greenhill 2010; Shipan and Volden 2008; Simmons and Elkins 2004), or on much rarer occasions, the diffusion of interstate or civil conflict (e.g., Buhaug and Gleditsch 2008; Siverson and Starr 1990). This work has produced many valuable insights, particularly about how a given event affects the subsequent decisions of actors (e.g., adopt a policy or fight). Our work, however, shifts the focus slightly from these actor-level *decisions* to dyadic-level *interactions*. We demonstrate that an actor's separate negotiations with distinct actors can be interrelated in a theoretically meaningful way. More specifically, we argue that, when actors conclude negotiations (e.g., settle their borders), they can provide important information (i.e., a costly signal) to others not involved in those negotiations, thereby subsequently easing negotiations over similar issues between the original actors and others. This argument shares similarities with the learning mechanism of diffusion described in previous work (e.g., Shipan and Volden 2008; Simmons Dobbin, and Garrett 2008), but we believe the combination of such a mechanism with the dynamics of bargaining and negotiation is novel. Furthermore, the general signaling process described here is likely to apply at many different levels of analysis and across many different types of actors.

Second, scholars find that settled borders contribute to both peace (Gibler 2012; Owsiak 2012) and democratization (Owsiak 2013). Yet these effects only emerge if states successfully conclude a border agreement. Although research on the management of territorial claims offers potential insight into the border settlement process (e.g., see Huth 1996), it overlooks the possibility of interdependence (i.e.,

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diffusion) among border negotiations. Through original data collection and analysis, our project begins to investigate this possibility directly. In the process, our study fills a gap in our understanding of border settlement processes, suggests that further work along this front is worthwhile, and better informs those seeking a more peaceful, democratic world.

Third, our project further incorporates research on territorial disputes with that of international cooperation, particularly institutions. Much work in this area stresses the role of formal institutions (e.g., Mitchell and Hensel 2007; Simmons 2002). We propose, however, that border agreements function as *informal* institutions for states that share unsettled borders with the parties to the agreement. Indeed, these treaties offer signatories the benefits commonly highlighted by institutional theorists, which include providing information, reducing transaction costs, and establishing focal points for cooperation (Keohane and Martin 1995:42). By reframing border agreements in this light, we generate expectations for how border negotiations might be both interdependent and successfully concluded. Finally, we uncover additional evidence in support of several prominent strands of research, including both the territorial peace and steps-to-war research traditions, and contribute to research on the effects of international law (e.g., border treaties), conflict management, and signaling.

In the end, we find that (all else equal) border agreements diffuse geographically – that is, contiguous states during the period 1816-2001 are more likely to sign a border agreement after at least one of those states has settled a border with another neighbor. Yet three caveats are in order. First, the increased likelihood of additional agreements does not last indefinitely; rather, the initial agreement creates a "window of opportunity" following that agreement, much as our signaling argument suggests. Second, diffusion is not the *only* mechanism by which border agreements might appear; we therefore also control, *inter alia*, for the possibility that repeated interaction and third-party assistance can help states overcome negotiation obstacles, thereby facilitating border agreements. Finally, we find that salience conditions the effects of both diffusion and our alternative theoretical explanations. The negotiating behavior of states with highly salient territorial claims seems unaffected by diffusion. This, however, may fit well with a signaling argument – for a signal may be of less value when an issue is extremely salient.

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Despite such caveats, by controlling for potential alternative theoretical explanations, conducting a plausibility probe (see online appendix), and verifying the robustness of our results through a battery of additional empirical tests (see online appendix), we are confident that the results are consistent with our argument that states can and do credibly signal one another through border treaties. Such findings suggest that, in neighborhoods with multiple outstanding border disputes, those seeking to build a more peaceful, democratic world might focus on settling *any* outstanding border issue. This not only contributes directly to peace and democracy, but raises the likelihood of indirect effects as well – as that initial successful effort contributes to the probability of successfully concluding additional settlement agreements.

Negotiating over Border Territory

A territorial dispute presents states with a particularly dangerous situation; these disputes are more likely than non-territorial disputes to become militarized and escalate to war (Vasquez 2009). For this reason, scholars have expended much energy to understand the origins (e.g., Huth 1996; Vasquez 2009) and management (e.g., Hensel, Mitchell, Sowers, and Thyne 2008; Huth 1996; Huth and Allee 2002) of territorial disputes better. Yet not all territorial disputes are alike. Disaggregating the larger category of territorial disputes reveals that many territorial disputes involve *border territory* in particular (Huth and Allee 2002). Moreover, it is contention over this border territory that seems to produce danger, including militarized conflict and war (Gibler 2012; Owsiak 2012; Vasquez 2009).

The danger inherent in territorial disputes, particularly those involving interstate borders, derives from the organization of the interstate system. Territory lies at the heart of state identity, as possessing a territorial jurisdiction over which to exercise sovereignty constitutes a defining characteristic of states. Although territorial disputes can theoretically involve any piece of land, the most frequent and salient threats to state identity will occur along international borders for two reasons (Most and Starr 1989; Vasquez 2009). First, states have a greater opportunity to fight over border territory. It is much less costly for a state to reach, obtain, and defend territory that is contiguous, as opposed to non-contiguous, to its homeland. Whereas few states can project their military power over expansive distances to non-contiguous land, the vast majority can move their military forces throughout their homeland and,

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therefore, to border territory. Second, states have a greater willingness to fight about border territory (Hensel 2001; Vasquez 2009). Territory (of all types) often contains resources that states want. Yet states' greater willingness to fight specifically over border – as opposed to noncontiguous territory – occurs because a state not only can threaten a neighbor's sovereignty along its interstate borders, but it can also propose a simple, viable alternative to its neighbor's sovereignty– namely, that it absorb the disputed territory within its homeland territory by moving the border's placement. Such an option is unavailable for non-contiguous lands, which makes neighboring states particularly threatening when borders remain unsettled. This threat to a neighbor's homeland, in turn, increases the willingness of the threatened state(s) to fight militarily as well.

Because border disputes are prone to violence and perceptions of extreme threat, it seems plausible to expect that leaders will want to resolve these disputes as quickly as possible. Indeed, leaders regularly convey this desire to one another (e.g., see Ireland 1938; Whittam 1961), and we find three reasons why such incentives exist. First, successfully settling the status of a border – by signing an international agreement that delimits the entirety of neighboring states' mutual border(s) – makes a state safer by removing a salient external threat, thereby decreasing the likelihood of militarized conflict. Second, settlement allows the state to clear an issue from its foreign policy agenda that likely took precedence over other, less salient issues and, therefore, diverted resources from other foreign policy or domestic goals (e.g., see Fravel 2008).

Finally, neighboring states are locked in an interdependent relationship that encourages *some* level of cooperation regarding border territory. Trade, people, and issues (e.g., security, health, resources, or environmental concerns) traverse borders, even when borders are unclear. To address such issues, neighboring states can try to isolate themselves or cooperate. Isolation, however, is difficult; states cannot move their geographic location, and commerce, people, and concerns may cross borders even when states desire isolation. Such conditions create the foundation for and expectation of repeated interaction, even if just to establish minimal working arrangements to handle joint issues (Axelrod 1984; Blum 2007). This leads to cooperation, even though the border dispute may produce hostility (see Axelrod 1984). The

reason is simple: cooperators fare better than the uncooperative (Bendor, Kramer, and Stout 1991), making cooperation a more stable policy than always being uncooperative (Bendor and Swistak 1997). And as cooperation is introduced into a relationship, it often expands (Axelrod 1984; Blum 2007).

Of course, incentives to cooperate on border settlement need not imply that cooperation will be easy. States often struggle to settle their mutual borders via agreements, and we identify three obstacles that might contribute to this struggle (Fearon 1998; Putnam 1988; see Dai and Snidal 2010 for an overview). First, domestic politics can complicate border settlement. Leaders ultimately negotiate international agreements, including those involving border delimitation. These leaders, however, whether in democratic or autocratic states, retain power by satisfying a coalition of constituents more than an alternative leader would (Bueno de Mesquita, Smith, Siverson, and Morrow 2003). It therefore matters what a leader's key constituency wants, particularly on issues that are highly salient to that constituency. Border territory possesses this salience. Domestic constituents recognize that territory defines the state and often contains material or symbolic value. Any attempt to compromise on border territory may therefore be seen by a leader's constituency as a sign of weakness – an unwise decision to "give away the state," which could undermine the state's sovereignty, security, or identity. In response to such compromises, the key constituency can threaten to replace the leader, installing an alternative leader that willingly adopts the more hard-line, non-conciliatory position that it wants (Chiozza and Goemans 2011; Vasquez 2009).[1] Assuming that a leader wants to maintain office, this threat constrains a leader's negotiating position.[2] Under these conditions, the leader will not only be compelled to adopt a more hard-line (i.e., less conciliatory) position with respect to border territory, but will also be less able to back away from that position later unless domestic attitudes change. In this way, domestic audiences limit opportunities for international compromise (Putnam 1988).

Second, commitment problems interfere with border settlement processes. Commitment problems occur when a state cannot credibly agree to honor tomorrow an agreement they reach today. Powell (2006) maintains that this occurs because of rapid (potential) shifts in relative power, and expectations about these shifts condition states' willingness to sign agreements (see Fearon 1998). States that might

gain in power know they can get better agreement terms in the future, so they either do not sign or renege upon signed agreements. States that might lose power recognize the rising state's incentives, which can cause them to abort the negotiation process, particularly if they think any agreement reached will not last. In both cases, unwillingness to abide by an agreement in the future complicates reaching one today.

Numerous issues can theoretically create the potential, rapid, future shifts in power that drive the incentives underlying commitment problems (e.g., disarmament; see Walter 1997). Yet the problem is particularly acute when states negotiate *directly* over an issue that itself serves as a source of power. Border territory possesses this quality. It often contains strategic (e.g., the Golan Heights to Israel), economic (e.g., oil in Argentina-Uruguay or access to waterways in Iraq-Iran), or human value (e.g., well-populated parts of Kashmir that can provide labor, revenue, or military personnel for the state or access to fresh water in Burkina Faso-Mali). In a number of rarer cases, a state can also attempt to deny its neighbor the right to exist, which threatens to remove all benefits afforded to that neighbor as a member of the international community (e.g., Israel's neighbors or Ghana-Togo). Gaining (losing) possession over valuable border territory through an agreement can therefore threaten to shift capabilities to one's advantage (disadvantage), providing reasons to suspect that the agreement will not persist.

Finally, a lack of perfect information clouds the ability of rational actors to find the bargaining range (i.e., the set of agreements [terms] that both parties prefer to non-agreement, given the costs of non-agreement) and encourages them to delay reaching agreement (Fearon 1998; Hopmann 1996). Although this suggests that actors could simply reveal their preferences to one another in order to prevent negotiation from breaking down (Fearon 1998), such an option is not possible for two reasons. On the one hand, actors have incentives to misrepresent their preferences in order to obtain better agreement terms. An actor, for example, that convinces its opponent that it can live without an agreement (i.e., that non-cooperation is "less costly," or that it has higher resolve) might demand better agreement terms to convince it to settle. On the other hand, actors with weaker resolve might *think* they possess greater resolve than their opponent, leading to demands for better agreement terms as well. Such demands hinder negotiators' ability to locate the bargaining range needed for negotiations to succeed. The (seemingly)

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stronger actor demands more from the negotiations. This, in turn, pushes the settlement terms they request closer to their ideal point and farther from their opponent's, thereby decreasing the likelihood that these requested terms lie within the bargaining range. Thus, a dilemma arises: actors need credible information to find the bargaining range and avoid a non-cooperative outcome, but they cannot easily reveal that information to one another. Rational actors therefore need costly signals that might help send this information credibly to their opponent; in the absence of such signals, the likelihood of successfully reaching a negotiated agreement falls.

The empirical evidence suggests that border disputes regularly suffer from one or more of these obstacles. Hensel (1994), for example, finds that a militarized dispute involving territory is both more likely to end in a stalemate (rather than a negotiated compromise) *and* more likely to be followed by a subsequent militarized dispute over the *same* territory. This is consistent with the obstacles outlined above, which predict that salient disputes should fester and preclude negotiated agreement. Furthermore, because the vast majority of territorial disputes involve interstate borders (Hensel 2001; Huth 1996; Vasquez 2009), border disagreements in particular will suffer from these obstacles as well. Indeed, Owsiak and Rider (2013) find that border disagreements frequently persist for many years, which they claim occurs because of commitment problems. They find that when neighboring, rival states sign a border agreement (thereby overcoming the commitment problem), they behave much less violently in subsequent crises and militarized disputes, *even if the rivalry continues.* This suggests that commitment problems may complicate border negotiations and fuel interstate rivalries in the process. In short, both theory and empirical evidence suggest that states face a series of obstacles when negotiating over border territory, each of which can undermine the prospects for a successful settlement.

The Diffusion of Border Agreements

If the foregoing discussion is accurate, then border territory will be difficult to negotiate. Indeed, this seems to be the case. Border negotiations often occur in fits and starts (e.g., Colombia and Venezuela), and a border's status may remain unsettled for decades (e.g., India and Pakistan). Nonetheless, the emergence of border agreements suggests that states regularly find the means to overcome the negotiation

obstacles outlined above. We focus here on *one* such mechanism – one that has been previously overlooked by much conflict management research and therefore serves as our primary focus: diffusion.[3] For our study, *diffusion* occurs when the successful conclusion of a border agreement in one dyad "systematically conditions" the likelihood of successfully concluding a subsequent border agreement in another dyad (Simmons, Dobbin, and Garret 2008:7). We propose that the conclusion of an initial border agreement[4] – that is, a formal interstate agreement that delimits the entirety of a dyad's mutual border – conveys critical information to other states that neighbor one of the signatory states to this initial agreement. This information, in turn, increases the likelihood that these neighboring states also sign border agreements with the signatories to the initial agreement.

As noted above, when first confronted with a salient, un-delimited border, leaders err on the side of adopting a less conciliatory (or more hard-line) stance. This helps the leader retain support among key domestic constituencies, particularly if the issue is salient to the constituency. Yet such a position has a critical drawback: it destroys area within the bargaining range. As Schelling (1960:29) notes, "if national representatives can arrange to be charged with appeasement for every small concession, they place concession visibly beyond their own reach." Although Schelling here provides advice to policy-makers on how to strengthen their negotiating position, the same outcome applies to leaders who find themselves in a similar position because of circumstances beyond their control. If a leader can offer minimal or no concessions in a negotiation, the likelihood rises that the negotiation fails. Furthermore, if *both* leaders find themselves in a constrained position – perhaps because the issue is salient, as with border territory – the bargaining range disappears, causing negotiations to fail.

Nonetheless, even in tough negotiations, a bargaining range should exist theoretically, even if side payments and issue linkages must create it (Fearon 1998). This alters the above problem somewhat; it is not that there is no room to negotiate, but that actors cannot *find* the bargaining range in which negotiations might occur (sometimes believing that none exists). One solution to this problem involves a simple information exchange. Actors could share their bargaining range with one another, identify the overlap in their individual ranges, and proceed to negotiate within that common range. Unfortunately,

incentives to misrepresent and perceived differences in resolve interfere with this process. Actors

therefore often need another mechanism by which to obtain *credible* information about one another's

bargaining range. Other, related border agreements provide one means of credibly signaling about the

existence and content of this range.[5]

For analytical purposes, it is helpful to think about two distinct characteristics of border

agreements as signals: their credibility and content. First, border agreements are credible signals because

they are costly to conclude (Schelling 1960). Not only do they involve the resolution of a salient,

distributive issue, but they can also threaten a leader's tenure or alter the relative power balance between

states by reapportioning advantages associated with the territory. Furthermore, the resolution of territorial

disputes (i.e., border settlement) requires at least one disputant to make concessions on its original claim;

otherwise, the overlapping claims persist. Such concessions, however, can carry reputation costs,

particularly when there exist other actors making territorial claims similar to the actor receiving the

concession (e.g., border delimitation or secession claims; see Toft 2003, Walter 2006). In such cases, the

concessions might create an unwanted precedent or reputation for conceding (see Crescenzi 2003).

Finally, the international system discourages the revision of border delimitations once border agreements

are concluded (e.g., Ecuador and Peru; see also Zacher 2001), producing the expectation that settlement is

final. Each of these points implies that border negotiations can be arduous and that a state unsure about

whether it wants to sign a border agreement should opt for no or a weak agreement, as opposed to a

formal one (Abbott and Snidal 2000; Fearon 1998). They also suggest that states do not sign border

agreements frivolously – that is, states will not generally "bluff" by signing an agreement they do not

intend to honor – which underscores their value as a costly signal and conduit of credible information.

Second, border agreements – as institutions – signal two pieces of information, particularly to the

remaining neighbors with whom the signatory states still have un-delimited borders (Keohane and Martin

1995; Simmons 2002).[6] On the one hand, the appearance of a border agreement suggests that leaders are

capable of reaching agreement.[7] More specifically, they indicate that a state has cleared the domestic

audience obstacle noted earlier – at least with respect to one border. Whether this occurs because the

leader convinced the domestic audience to support border delimitation (i.e., garnered domestic support) or because the leader took a political risk (i.e., proceeded without domestic support) cannot always be discerned from the signal itself.[8] Nonetheless, states that observe the conclusion of a border agreement between one of its neighbors and another, third state can reasonably conclude that the leader within the neighboring state possesses the *ability* to strike a border agreement (see also Huth and Allee 2002).

From the observing state's view, the time may therefore be ripe to delimit its border with that neighbor as well. This is not an unreasonable conclusion to reach. Although domestic costs to signing a border agreement can be high, they should fall in the wake of another, previous border agreement (i.e., the marginal costs of successive agreements should be lower). If the leader signing the initial agreement acted with domestic support, this support can be applied to addressing any remaining un-delimited borders as well. Alternatively, if that leader acted without domestic support, the marginal cost of signing an additional border agreement should be lower than when signing the initial one. For example, once a leader has shocked audiences by "giving away the state," an additional agreement is merely one more instance of an already shocking behavior. Regardless, then, of *how* the leader handled its domestic audience, the observing state should believe that there is a "window of opportunity" in which the likelihood of successfully concluding a border agreement with the neighbor increases.

Importantly, the initial signatory state should *also* be motivated to conclude additional border agreements (after its initial one) for the same reasons. Having either garnered domestic support or incurred the costs associated with signing one agreement, the conclusion of an additional agreement should cost marginally less (see above). This creates a similar "window of opportunity" for the initial signatory state(s), in which the likelihood of successfully concluding a border agreement with other neighbors increases. This window, however, like that discussed above, is not open forever. Domestic support or shock fades over time, pushing the costs associated with signing an additional border agreement to return to the levels present for the initial agreement.

The second piece of information signaled by a border agreement involves the bargaining range.[9] When negotiating over border territory, actors often take less conciliatory positions (see above). By

definition, such positions reduce the existence of a bargaining range. The emergence of a border agreement, however, signals that a bargaining range exists; the leaders within the signatory states were able to find a compromise of some kind. Furthermore, because these agreements are public (and must be to delimit the mutual international border), observers also know the *terms* of agreement (definitions, principles, etc.) to which the signatory states agreed. In other words, they know one point that must be within the bargaining range of the two, initial signatory states. Although this does not help them identify the *entire* bargaining range for the observed states, it does provide one point that resides within that range, which they can then use to craft similar acceptable terms in their own negotiations an initial signatory.

Observing states therefore get two content benefits from the emergence of a border agreement involving (at least) one of their neighbors. First, they know that a bargain can be struck – that despite incentives to misrepresent (i.e., enhance one's bargaining position), a state is the type of negotiator with the capability to conclude an agreement. That is, because they observe the signatory states make concessions to reach agreement, they know a bargaining range exists – not just in theory, but also in practice (see Hopmann 1996). Second, they know what *terms* (definitions, principles, etc.) might be acceptable to their neighbor based upon the deal the neighbor reached with the third state. This allows them to find substantive terms in their own negotiations with the neighboring state that might lie within the neighbor's bargaining range.

As before, however, these benefits decay over time. Immediately following an initial agreement, observing states can confidently conclude that a bargaining range exists and can identify a point that is within its neighbor's bargaining range – at least with the third state. As time persists, however, noise again enters the process. Domestic support, obstacles, preferences, and regimes may change. This, in turn, causes the opportunity and willingness of states to conclude border agreements to change as well (Most and Starr 1989). Mindful of such noise, states are less confident about the existence and location of the bargaining range as they get further away from the initial agreement. Once again, this implies that there is a "window of opportunity" to conclude an additional border agreement in the wake of an initial one.[10]

The preceding discussion therefore points repeatedly to the following two expectations:

Hypothesis 1: All else being equal, any given dyad has a higher probability of signing an agreement that delimits the entirety of their mutual border if at least one of its members signed (a) similar agreement(s) with other neighboring states than dyads in which neither member has done so.

Hypothesis 2: The diffusion effect decays as the time since signing a "similar agreement" increases, all else equal.

These hypotheses suggest a clear signaling mechanism that results in the diffusion of border agreements. To ensure the mechanism might operate as we propose, we offer a "plausibility probe" (Chinese negotiations during the 1960s; see online Appendix A1). This probe is not an empirical evaluation of our argument, but rather an illustration of the causal mechanism's workings. Space constraints preclude us from presenting the probe within the text. Nonetheless, we note the two main conclusions we derive from it. First, leaders claim to use border agreements as signaling devices; in particular, they say that they use these agreements to signal to other neighbors both the fact that bargaining range exists and the specific terms that might be acceptable to them. Second, the signals exist whether or not the sender intends to signal or the receiver accurately interprets them. Thus, the *intent* of signatories is irrelevant; once states sign an agreement, the signal (and potential for diffusion) exists. In the end, we conclude that our causal mechanism is empirically plausible, providing a solid foundation for the large-*n* analysis that follows.

Of course, we recognize that diffusion is not the *only* mechanism by which states might overcome their negotiation obstacles and conclude border agreements. Alternative mechanisms exist, and we classify them into two broad camps: repeated (cooperative) interaction and third-party assistance. The former can create a reputation for cooperation that increases the likelihood that information can be credibly conveyed between neighbors with unsettled borders (e.g., Colombia-Peru or United Kingdom-Ireland; see also Blum 2007). The latter relies upon a party external to the conflict to help convey information credibly to a neighbor (e.g., Colombia-Venezuela, Iran-Afghanistan, or Czechoslovakia) or to guarantee a potential agreement impeded by a commitment problem (e.g., Ecuador-Peru; see Walter 2002). Space constraints prevent us from developing the full logic of these mechanisms here, and doing

so would detract from our focus on diffusion. Nonetheless, we include a development of this logic in the online appendix (Part A2) so that future research might build further upon it. We also operationalize and control for these alternative explanations in the analysis that follows – to be sure that the diffusion mechanism we propose works after accounting for these alternatives.

Research Design

In order to evaluate the diffusion of border settlements, we predict the emergence of a border agreement within a given dyad-year.[11] This dependent variable (described below) requires us to account for two sets of characteristics. First, we must consider attributes of a given dyad that may affect the likelihood that this dyad signs a border agreement. Second, a study of diffusion demands that we account for the number and timing of related border agreements – i.e., those that contain either one of the members within the dyad being examined. We then use logistic regressions to conduct several tests of discrete time models that estimate the likelihood that a dyad with unsettled borders will reach a border agreement in a given year (Box-Steffensmeier and Jones 2004).[12]

Because we are interested in predicting border agreements, we focus on contiguous dyads only. Contiguous dyads include any two states that share an inland land or river boundary (e.g., India-Pakistan) according to the Correlates of War Project's Direct Contiguity Data (Stinnett, Tir, Schafer, Diehl, and Gochman 2002). Non-contiguous dyads (e.g., India-Mexico) do not share a border and therefore do not sign border agreements; their borders are determined by other factors (e.g., water or intermediate states). Our unit-of-analysis is therefore the contiguous dyad-year during the period 1816-2001. Dyads exit our analysis after signing a border agreement.

Dependent Variable

We operationalize border settlement through the signing of border agreements. Using Owsiak's (2012) data, a dyad *settles* its international border(s) when it signs an agreement that delineates the entirety of its mutual border(s). Three of the coding rules for these data are worth mentioning for the interpretation of our analysis. First, if a border settles in pieces (e.g., Iran-Afghanistan), settlement occurs after the final agreement that completes the border's delimitation. Our model therefore does not predict partial

settlements, although future research might examine these. Second, states cannot unsettle their borders. This is consistent with international law (see Zacher 2001). Thus, once a state settles its borders, it drops from our analysis, as there is no longer any settlement to predict. Finally, if a state requires ratification of an agreement for it to take effect, ratification must occur for the border to be settled. A full list of border settlement coding rules and examples of each can be found in Owsiak (2012).[13]

It is worth noting that dyads sometimes enter the system with settled borders. Many colonial borders, for example, are determined by colonial powers and then accepted by the new colonial states upon their independence (i.e., *uti possidetis*; e.g., Burkina Faso-Togo). We cannot, in effect, predict the settlement of borders within these dyads, since the dyad never exists with unsettled borders post-independence. These dyads are therefore excluded from our analysis, thereby reducing the number of observations. Nonetheless, we hasten to note that these borders may influence the diffusion of other, related border agreements (e.g., by signaling the acceptability of colonial delimitations).

Key Independent Variable

To test our expectations about border settlement diffusion, we must account for the occurrence and timing of related, "relevant" border agreements. We consider a border settlement "relevant" to a given dyad-year observation if that settlement involves one of the two members within that dyad-year observation. Based on this premise, we construct a measure of the *proportion of the given dyad's borders that are settled –* i.e., the ratio of settled to total borders (excluding the dyad's shared border) among all contiguous dyads containing one of the states within the contiguous dyad being examined. We generate this variable using a connectivity matrix, which assigns a weight of 1 to each contiguous dyad that includes one of the referent dyad's members and a weight of 0 to all other dyads. This matrix is then row-standardized and multiplied by the border agreement data, creating a measure of the proportion of a dyad's borders (other than the dyad's shared border) that were settled prior to the current year. As such, this variable serves as a spatial lag of the dependent variable (e.g., Beck, Gleditsch, and Beardsley 2006; Franzese and Hays 2007). The connectivity matrix is created using contiguity data obtained from EUGene (Bennett and Stam 2001; Stinnett et al. 2002) and is row-standardized by using the spatwmat command in Stata 12 (Pisati 2001).

Our theory, however, suggests not only that the settlement of other, relevant borders increases the likelihood of a given dyad settling its own border, but also that this effect will be largest in the immediate aftermath of such a relevant settlement. Using the above data on "relevant agreements," we therefore generate a time counter that measures the number of *years since at least one of the dyad-members settled a relevant border*. Because we suspect that the effect of border agreements on additional border settlements is non-linear – and possibly non-monotonic – with regard to time, we also include the *squared* and *cubed* versions of this variable.

Alternative Explanations

Earlier, we noted two general alternative explanations for border agreements: repeated (cooperative) interaction and third-party assistance. We capture repeated interaction in three ways. First, we employ a running sum of the total *number of negotiations* a dyad has over a disputed border. This measure derives from original data collection and captures only repeated interaction specifically *over the disputed border territory*. Second, we control for the *age of the dyad*. Dyads with longer histories experience greater interaction, which may raise the likelihood of border settlement (see Ireland 1938). Furthermore, newly independent dyads may enter the system in waves at roughly the same time, which might create the appearance of diffusion (*uti possidetis;* see Senegal-Mali or Laos-Myanmar). Mindful of these considerations and their possible non-monotonic effects, we control not only for dyad age, but also the *squared* and *cubed* versions of this variable. These data derive from the Correlates of War Project's (2008) State System Membership Data.[14] Third, new leaders might have greater flexibility to pursue agreements because a leadership change creates a possible structural break with past policies (e.g., see President Abadía Méndez in Colombia, 1926-1930). We consequently control for the time (in years) since either state in the dyad experienced a *leadership change* (Goemans, Gleditsch, and Chiozza 2009).

We employ three additional variables to account for third-party assistance. First, we collect original data on third-party involvement in the border settlement process and construct a variable to denote whether a *third-party assisted* a given dyad with this process in a given year – through mediation, arbitration, adjudication, a post-war conference, or an administrative delimitation of a border by a

colonial power (e.g., see Colombia-Venezuela, Ecuador-Peru, or Afghanistan-Iran). Second, the international community often creates new states and delimits their borders in the aftermath of world wars (e.g., Czechoslovakia). Two dichotomous variables, *post-World War I* and *post-World War II* therefore denote whether a dyad-year falls within the immediate aftermath of World War I (1918-1923) or World War II (1945-1950) respectively.

<center>*Control Variables*</center>

In addition to the above variables, we include seven control variables that may also affect the emergence of border agreements. First, *jointly democratic* dyads may resolve their border disputes more easily than dyads containing at least one non-democratic state, primarily because democratic states share peaceful conflict management norms (Huth and Allee 2002). We therefore code a variable to capture whether both states in a given dyad are democratic in the given dyad-year. We consider a state democratic if it scores +6 or higher on the Polity scale (Marshall and Jaggers 2013). Second, disputants' *relative power capabilities* may affect the success of bargaining over borders. States with more equal capabilities may find it more challenging to reach a negotiated settlement, since each side might conclude it will obtain a larger settlement by fighting. We therefore create a ratio of disputant capabilities using the Correlates of War (COW) National Military Capabilities' Composite Index of Military Capabilities (CINC) score (Singer, Bremer, and Stuckey 1972). After dividing the weaker state's capabilities by the stronger one's, we then take the natural log of the ratio to account for diminishing effects at extreme values of the ratio.

Third, *allies* may be more likely to resolve border disputes than non-allies. Based upon alliance data from the Alliance Treaty and Obligations and Provisions dataset (Leeds, Ritter, Mitchell, and Long 2002), we generate a dichotomous variable to denote whether a dyad possessed an alliance of any type within a given dyad-year. Fourth, international *rivals* may find it more challenging than other dyads to resolve the delimitation of their mutual borders. These rivals have a history of hostility that may impede successful negotiations. A dichotomous variable therefore considers whether members of each dyad were rivals in a given dyad-year (Colaresi, Rasler, and Thompson 2007). Fifth, if a dyad member has rivals besides the other dyad member, it may motivate that state to seek a border agreement within the dyad

more quickly in order to turn its attention toward the other, external rivals. As such, we include a count of the *total rivals of the dyad members*, which excludes the dyad members themselves (Colaresi et al. 2007).

Sixth, the *salience* of border territory may alter settlement patterns. More salient territory may be more difficult to settle, and our diffusion mechanism may have less signaling value in such contexts. We therefore use the Issue Correlates of War (ICOW) data to track the salience of (border) territorial claims. This index ranges from 1 (low salience) to 12 (high salience); if there is no legal claim in a given dyad-year, we code this variable 0.[15] Finally, states might settle one or more borders to focus on internal instability instead. We therefore employ a dichotomous variable to track whether *intrastate conflict* exists within either state in the dyad using data from the Correlates of War Project (Sarkees and Wayman 2010).

Empirical Results

We begin our empirical analysis with an attempt to answer a seemingly simple question: how common are the temporal and spatial clusters of border agreements that motivate our study? That is, how often do we observe states signing more than one border agreement in a short period of time? Of the 156 unique states that appear in our analyses – and excluding borders that are settled immediately upon a state's entry into the international system – 26 states (i.e., almost 17%) have signed more than one agreement within a 6 year period, with some having done so on multiple occasions. Indeed, of the 99 *borders* settled by these 156 states *post-independence*, 40 (i.e. about 40%) were signed within 6 years of at least one signatory state having settled another border with a different, neighboring state. Thus, our data suggest that the behavior we seek to explain here occurs with some regularity.

Of course, without accounting for the alternative explanations and control variables mentioned above, it is difficult to determine if these spatio-temporal clusters of agreements result from the diffusive mechanisms we propose. Table 1 addresses this point; it shows the results of four logistic regression models that predict border settlements within contiguous dyads. Model 1 includes only the dyad age variables (included to account for time dependence) and our key independent variables of theoretical interest – that is, the proportion of relevant borders settled within the dyad and the polynomial variables

capturing the number of years since at least one of the dyad's members settled a relevant border. In Model 2, we add several control variables, focusing particularly on our primary alternative explanations for border settlement. Model 3 adds two additional control variables (i.e. years since leadership change and total rivals of dyad members), and Model 4 incorporates our measures of civil conflict and issue salience.

Across Table 1, we find strong, consistent empirical support for our hypotheses. First and foremost, the coefficient on the variable measuring the proportion of relevant borders settled is positive and statistically significant in all models in which it is included. In other words, as a given dyad's members settle their borders with *other* neighboring states, the likelihood that the dyad members successfully conclude a border agreement with each other increases significantly. This evidence strongly supports our first hypothesis. It also underscores the larger diffusion argument, for it suggests that border settlements are not independent events. Rather, the settlement of a dyad's border is, to some degree, affected by dyad members' border settlements with other states.

Our argument suggests, however, that diffusion effects will not last indefinitely. The results in Table 1 appear to support this expectation. Across all models, the variable capturing the years since a relevant settlement occurred has a negative and statistically significant coefficient. However, the squared term is also positive and significant in Models 1, 3, and 4. The cumulative, substantive meaning of these results is best illustrated graphically via a hypothetical example.[16] Imagine three fictional countries: Country A and its two contiguous neighbors, Countries B and C, each of which, for simplicity, has no neighbors other than A. For these hypothetical states, we use the results from Model 4 in Table 1 to predict the probability (over time) that the non-rival, non-allied dyad A-B reaches a border agreement. We set all other variables at their mean (for continuous) or median (for dichotomous) values to generate predicted probabilities for border settlement.

Figure 1 displays the results from this exercise. The solid line and dark confidence band in the figure show the predicted probability (over time) that A and B settle their mutual border, given that the dyad consisting of A and C *never* reaches a border agreement. In contrast, the dotted line and lighter confidence band show the predicted probability over time that A and B settle their mutual border, given

that the dyad consisting of A and C *successfully reach* a border agreement in year 13 (the mean year

during which a "relevant settlement" is reached in our data). Thus, we increase the proportion of relevant

borders settled in the hypothetical dyad from 0 (its minimum; dark shading) to 1 (its maximum; light

shading) in the thirteenth year of the dyad's existence.

As the figure shows, the probability of A and B reaching a border agreement is the same across

both scenarios until year 13, at which point the predicted probability of border settlement is

approximately 0.006. If A and C then settle their border that year, the probability that A and B will settle

their border in year 14 is nearly 13 times larger than in the previous year, increasing to approximately

0.076. As noted above, however, this effect decays over time until (in year 22) the predicted probability

of an agreement between A and C is no longer significantly greater than its predicted probability of

settlement in year 13. Notice, however, that this still *underestimates* the length of time that the A-C

agreement exerts a significant influence on the likelihood of an agreement between A and B. The

increased likelihood of an A-B agreement in the wake of an A-C agreement (dotted line, lighter area) does

not return to the levels predicted in the *absence* of an A-C agreement (solid line, darker area) until year 28

(where areas overlap). These results indicate substantively that the positive effect of related agreements

on the likelihood of a dyad signing its own agreement decays over time. That is, the positive effect of a

related agreement is highest in the immediate aftermath of that agreement, and this effect creates a

"window of opportunity" during which the dyad experiences an increased likelihood of reaching a border

agreement. Such findings lend strong support to our second hypothesis.[17]

Importantly, the above main findings are robust to model specifications that account for all of the

potential alternative explanations and control variables discussed above. We highlight four such findings

here. First, in Models 2-4 of Table 1, we find that both third-party assistance and repeated interaction (in

the form of negotiations) statistically significantly increase the likelihood of border settlement. It

therefore seems that dyads can use both of these mechanisms to overcome the obstacles inherent in border

negotiations. Second, we suspected that contiguous dyads might be more likely to settle their shared

borders early in the dyad's existence. This appears to be the case; the first term of the dyad age

polynomial is consistently negative and statistically significant across all models. That said, the squared dyad age polynomial also achieves statistical significance in three models, suggesting that the likelihood of settlement may begin to increase again the longer the dyad exists, providing some evidence that long-term interaction may yield increases in the likelihood of settlement over time. Third, we proposed that the international environment in the immediate aftermath of World Wars I and II might contribute to an increased likelihood of border agreements. The results do not support this position. Neither the post-World War I nor II periods significantly increase the likelihood of border settlements. Given that our third-party variable accounts for post-war conferences (among other third-party assistance), this makes sense; border agreements are facilitated in post-war periods by third-parties that redraw the map. Finally, although we suspected new leaders to have greater negotiation autonomy to conclude agreements, new leaders are no more or less likely to successfully conclude agreements than their counterparts.

Our findings are also robust to the inclusion of numerous control variables. First, rivals are significantly less likely to conclude border agreements with one another. However, the results of Model 3 suggest that dyads with a greater number of external rivals may be more likely to conclude border agreements with each other. As Fravel (2008) and Akcinaroglu, Radziszewski, and Diehl (2014) argue, this may be because rivals are managing the number of outstanding threats they face. Second, as dyad members become more equal in capabilities, they are more likely to conclude a border agreement with one another. This admittedly runs counter to our expectation. It may result from the fact that greater uncertainty over who would win a militarized dispute encourages disputants to negotiate so that they control the terms of an agreement and prevent a winner-takes-all scenario, which would be their least preferred outcome. Alternatively, powerful states in asymmetric dyads may prefer to adopt a more hard-line position than is found in symmetric dyads, as this would set a precedent for *not* conceding and reduce the likelihood of having to offer concessions in negotiations with other neighbors (see the "chain store paradox"; Selton 1978). Future research might examine this finding in greater detail. Third, jointly democratic dyads are more likely to conclude border agreements, as democratic peace research predicts. Fourth, allies seem no more or less likely to sign border agreements with one another. This may occur

because alliance formation significantly increases *after* border agreements (Gibler 1996). Our research design, however, unfortunately cannot address this possibility. Fifth, intrastate conflict does not significantly alter the likelihood of border settlement. This suggests that states separate external and internal threats, although future qualitative research might investigate that possibility further.

Finally, issue salience exerts a unique effect. High salience borders are significantly less likely to be settled than low salience borders (Model 4, Table 1). Furthermore, these high salience borders appear to be less affected by the diffusion mechanism discussed above, with the proportion of relevant borders settled exerting no significant effect on the most salient borders (see Part B5, online appendix). Similarly, salience conditions the effect of many of the other significant variables in the model, particularly third-party assistance, bilateral negotiations, and relative capabilities (see Part B5, online appendix). This suggests two things. First, we do not yet have a good theoretical argument for how states settle highly salient borders (a minority of cases), as most theoretical arguments we test are overwhelmed by high issue salience. Future research might examine the cases of high salient borders that settle to discern what factors facilitate settlements in such cases. Second, although our work demonstrates a clear *mean* diffusion effect, future work might consider *variance* of this effect around its mean in more detail. On both scores, we hope that this work serves as a foundation upon which future research might build.

Additional Robustness Checks

Given the relative paucity of previous studies on the determinants of border settlement, one may rightfully question if our findings are robust to other model specifications. We have therefore conducted numerous robustness checks, the results of which appear in our online appendix (Appendix B). First, we add several additional controls to Model 3 of Table 1, focusing particularly on: the major power status of the dyad members, the interaction between relative capabilities and the proportion of relevant borders settled, the total number of the dyad members' borders, the dyad members' number of unsettled borders, total dyadic trade, domestic instability, interstate war, civil war, and the hostility level of militarized interstate disputes (Part B1). Second, we re-analyze our models using the total number – rather than the proportion – of relevant border settlements as our key independent variable (Part B2). Third, we estimate

our models using the discrete time version of the Cox proportional hazards model (i.e., conditional logit model) suggested by Box-Steffensmeier and Jones (2004: 80-83; Part B3).[18] Fourth, we operationalize the key independent variables differently – replacing the proportion of relevant border settlements and the time counters since the last settlement agreement with measures of the number of relevant border agreements signed in the previous year, the previous 2-6 years, the previous 7-11 years, and the previous 12-16 years (Part B4). We find that the variables for the previous year and the previous 2-6 years are statistically significant and positively related to the likelihood of a border settlement, while the other two time period variables are not. Although this finding suggests a shorter window of opportunity than that suggested by the results in Table 1, it still confirms our theoretical expectations.

Fifth, we consider the effects of territorial claim legal strength on border settlement (Part B5). Borders lacking or with a weak legal claim experience a diffusion mechanism like that presented earlier, while borders with strong legal claims may face a muted diffusion effect (Huth, Croco, and Appel 2013). It is, however, difficult to say much about this latter finding, as data limitations restrict the time period of (1945-2001) and widen the confidence intervals in this analysis. Sixth, we investigate whether a shared colonial background between dyad members affects border settlement or conditions our diffusion effect (Part B7). Seventh, we entertain the possibility that our results are an artifact of a selection process in which states that settle borders are more likely to enter negotiations or receive assistance from third-parties in their settlement attempts, recognizing that some sort of negotiation process is likely a necessary condition for border settlement. We see little evidence that selection bias exists or biases our results.

Eighth, we consider whether diffusion results from states willing to settle at all costs – that is, granting major concessions on a number of borders in close temporal proximity (Part B9). We find no evidence of this proposition. Ninth, we run fixed effects and random effects versions of our model to ensure our findings are robust to excluded panel-level factors (Part B10). Finally, we account for time by running models that interact the natural log of time with our diffusion variable, employ restricted cubic splines, and run a generalized additive model with automated smoothing cubic splines (separately; see Part B11). Throughout each of these robustness checks, our main empirical findings remain. We therefore

have great confidence that the diffusion mechanism we propose exists and that it is different from potential alternative theoretical explanations.

Conclusion

We asked at the outset of this study whether border agreements diffuse geographically. In pursuit of this question, we advanced a theoretical argument that relies upon cooperation theory, particularly signaling logic. Neighboring states, according to this argument, face a bargaining problem. They repeatedly tell one another that negotiation over the border is impossible. In other words, they effectively deny the existence of a (or shrink the) bargaining range. Such statements (and the related use of domestic constraints to reinforce them) may strengthen the bargaining position of the involved neighboring states, but they also undermine the ability of the states to negotiate border agreements successfully.

This obstacle, however, can be overcome. Cooperation theory suggests that two mechanisms for doing so involve third-party assistance and repeated interaction. We, however, propose another: conveying information through costly signals. If a dyad signs a border agreement, this agreement serves as a costly signal that conveys two pieces of information to other states that both neighbor and have unsettled borders with one of the signatories to the initial agreement. First, it conveys that a bargaining range exists and that a state is capable of reaching agreement on such a salient issue. This message diverges from previous dyadic interactions that suggested a limited or non-existent range, and the costly aspect of border agreements makes this message credible. Second, this initial agreement also identifies specific agreement terms (definitions, principles, etc.) that potentially fall within the bargaining range of the initial signatory states. In other words, by revealing the types of provisions that the initial signatory states find acceptable (in the signatory states' dispute), the likelihood increases that observing states can design provisions that fall within the bargaining range between themselves and the initial signatory state(s) they border. Through the revelation of this information, we maintain that border agreements diffuse geographically – as an initial agreement raises the likelihood that states that observe and neighbor initial signatories will strike border agreements with these signatories as well.

The empirical evidence strongly supports the logic of this argument. Our quantitative analysis of the period 1816-2001 reveals that third-party assistance and repeated interaction facilitate border agreements. Even after accounting for these factors, however, we also uncover clear evidence of a diffusion effect; all else equal, an initial dyadic border agreement significantly raises the likelihood of additional border agreements between the members of the initial dyad and states that border those members. Furthermore, two additional findings strengthen the support for our argument. On the one hand, we find that the diffusion effect we uncover decays over time as we expect, ultimately creating a "window of opportunity" in the aftermath of an initial border agreement for diffusion to occur. Such a finding reinforces our signaling argument. If a signal conveys information, that information should be most interpretable in the immediate aftermath of the signal itself. As time persists, noise will interfere with the signal or its information will become outdated. Our findings are consistent with this point. On the other hand, mindful of the limitations of our statistical analysis, we conduct a plausibility probe to determine if the signaling argument works as we propose. The results of this exercise (see online appendix) confirm the logic of our argument. Through examining leader statements, we find once again that states use an initial border agreement to signal to other neighbors both that a bargaining range exists and the exact provisions that it would find acceptable. These results suggest that border agreements diffuse geographically by revealing information used by neighboring states to strike additional agreements.

Through such findings, our study offers numerous contributions. First, our project brings together the existing literatures on international cooperation and diffusion in a way that we believe will be useful far beyond the current study. By combining the learning mechanism of diffusion (e.g., Simmons Dobbin, and Garrett 2008; Shipan and Volden 2008) with the importance of costly signals in the bargaining model (Fearon 1998; see also Dai and Snidal 2010), we have produced a theory of the diffusion of cooperation that scholars studying interactions between actors at many different levels of analysis should find useful. Indeed, at the outset, we asked whether actors' interactions affect similar, future interactions between those initial actors and others. At least in the case of border agreements, it appears that such "interactive diffusion" takes place. Second, our work further incorporates research on territorial conflict with that of

international cooperation – specifically, institutions. Border agreements function as informal institutions, and as such, they convey important information to signatories and observers. Third, we contribute to several prominent strands of research, including the territorial peace, the steps-to-war, the effects of international law (e.g., border treaties), conflict management, and signaling.

Finally, and perhaps most importantly, our study augments both research on the factors that contribute to border settlement (e.g., see Hensel et al. 2008; Huth 1996; Huth and Allee 2002), as well as the nascent work that suggests conflict (management) behavior depends – at least in part – on what states observe in related dyads (e.g., see Melin and Grigorescu 2014). More specifically, we identify an overlooked mechanism that might produce border agreements: diffusion. Of course, diffusion and conflict management (e.g., bilateral negotiations or third-party assistance) can only do so much for border settlement. The settlement of the most salient borders, for example, may not be helped by diffusion, just as they are not helped by conflict management strategies (see online appendix). This suggests that scholars need better theories for how states settle the most salient, contentious issues. Despite this caveat, our study demonstrates that diffusion exerts a significant, mean affect on border settlement. This advances not only the study of how border agreements arise, but also fills an important gap in our understanding of border settlement processes and offers additional assistance to those that want to create the peaceful, democratic world that lies behind territorial or democratic peace.

Notes

[1] This behavior occurs empirically in democratic (e.g., the United Kingdom in 1974; see Campbell 1993:615) and non-democratic (e.g., Egypt in 1981; see Finklestone 1996) states. Leaders also occasionally advertise border disputes to a less-informed public, which then constrains leaders' ability to negotiate (see Whittam 1961:17 8-9).

[2] This is a generally accepted assumption (see Bueno de Mesquita et al. 2003).

[3] We consider alternative theoretical mechanisms in the online appendix and control for them below.

[4] "Initial" does not necessarily mean "first." We use the term simply to denote an agreement that (immediately) temporally precedes the one under consideration.

[5] In line with existing theories of diffusion in political science, we argue that border agreements diffuse via learning (Simmons, Dobbin, and Garrett 2008:25) – in particular, what Levy (1994:285) refers to as "diagnostic learning" (i.e., "changes in beliefs about the definition of the situation or the preferences, intentions, or relative capabilities of others"). Overall, when there are strategic incentives to misrepresent one's own position , costly signals (e.g., border agreements) are likely needed to produce a change in beliefs.

[6] Uncertainty about the other (i.e., third) states' preferences may still remain for the initial signatories. Nonetheless, uncertainty in subsequent dyadic negotiations will necessarily decline, which increases the likelihood of agreement.

[7] Border agreements therefore separate state types: those that are/not capable of reaching settlement.

[8] The data we use come from Owsiak (2012). In these data, states that require ratification must ratify (i.e., not reject) any agreement before the border is considered delimited. In cases of ratification, the signal about domestic support or opposition is therefore clearer.

[9] For an example of how institutions credibly convey information, see Chapman (2007).

[10] Our argument is probabilistic, not deterministic. Note also that the initial agreement has two signatories. Diffusion might occur within one member's dyads, but not the other's – e.g., after the Colombian-Venezuelan agreement in 1924, Colombia experiences diffusion, while Venezuela does not.

[11] We generate dyad-year data using EUGene (Bennett and Stam 2000).

[12] A discrete time model "conveys the same information" as a continuous time model that uses duration as the dependent variable (Box-Steffensmeier and Jones 2004:70).

[13] Schultz (2014) has a similar, distinct dataset, but requires a dyad to experience a militarized interstate dispute before entering that dataset. Because settlement does not always involve MIDs, we opt for Owsiak (2012), which includes border settlement data independent of how states handle the disputed border territory.

[14] These time counters also serve to account for duration dependency in our models (Box-Steffensmeier and Jones 2004). Robustness tests using the non-parametric conditional logit discussed by Box-Steffensmeier and Jones (2004:80-83), restricted cubic splines, a generalized additive model with automated smoothing cubic splines, and an interaction between our diffusion variable and the natural log of time produce similar results (see online appendix). Given the robustness of our results, we opt for the simplest specification to present here.

[15] A full explanation of this variable's coding appears in Hensel et al. (2008). Two points are worth noting. First, claims require explicit statements that contest territorial ownership; claims and the lack of border settlement are therefore not identical, although they may be related. Second, if a dyad has more than one claim in a dyad-year, we use the highest salience index score that exists within any of its claims for this variable.

[16] Graphs that illustrate these effects using the real-world example of China and Pakistan's border agreement appear in the online appendix (Part B11).

[17] Beyond simple statistical significance, we conduct several tests that demonstrate that models including our chief independent variables outperform versions that exclude those variables in both in-sample model fit, as well as out-of-sample prediction. These tests are described in more detail in the online appendix (Part B8).

[18] Because we have theoretical expectations for the relationship between time and the likelihood of border settlement, we prefer the specifications presented in Table 1.

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Table 1. Effects of Relevant Border Settlement on Likelihood of Border Settlement

	(1)	(2)	(3)	(4)
Proportion of relevant borders settled	1.126***	1.526***	1.765***	1.824***
	(0.354)	(0.378)	(0.427)	(0.431)
Years since relevant settlement	-0.103**	-0.0721*	-0.0813*	-0.107*
	(0.0380)	(0.0391)	(0.0410)	(0.0468)
Years since relevant settlement^2	0.00256*	0.00161	0.00225*	0.00310*
	(0.00124)	(0.00135)	(0.00136)	(0.00185)
Years since relevant settlement^3	-1.24e-05	-1.46e-06	-8.08e-06	-1.29e-05
	(1.07e-05)	(1.15e-05)	(1.14e-05)	(1.72e-05)
Third-party assistance		2.622***	2.493***	2.654***
		(0.443)	(0.463)	(0.483)
Bilateral negotiations (total)		0.644***	0.655***	0.765***
		(0.103)	(0.112)	(0.116)
Salience				-0.265***
				(0.0369)
Intrastate conflict				-0.566
				(0.408)
Joint democracy		0.816*	0.860*	1.240*
		(0.413)	(0.434)	(0.585)
Relative capabilities (ln)		0.198**	0.255**	0.260**
		(0.0815)	(0.0870)	(0.0978)
Alliance		-0.0450	0.0464	0.0801
		(0.261)	(0.278)	(0.298)
Rivalry (dyad)		-1.329***	-1.567***	-0.765*
		(0.283)	(0.334)	(0.379)
Years since leadership change			-0.0230	-0.0153
			(0.0260)	(0.0295)
Total rivals of dyad members			0.196*	0.165
			(0.0986)	(0.101)
Post WWI		0.135	0.0141	0.383
		(0.500)	(0.510)	(0.553)
Post WWII		0.508	0.453	0.401
		(0.549)	(0.551)	(0.562)
Dyad age	-0.0650*	-0.0813**	-0.0908**	-0.0800**
	(0.0297)	(0.0321)	(0.0331)	(0.0314)
Dyad age^2	0.000985	0.00109*	0.00119*	0.000875
	(0.000636)	(0.000650)	(0.000667)	(0.000586)
Dyad age^3	-3.94e-06	-5.12e-06	-5.35e-06	-3.53e-06
	(3.50e-06)	(3.47e-06)	(3.54e-06)	(3.02e-06)
Constant	-2.932***	-2.913***	-3.020***	-2.148***
	(0.301)	(0.362)	(0.504)	(0.487)
Observations	3,312	3,312	2,746	2,746

Notes: Robust standard errors in parentheses. One-tailed tests: *** $p<0.001$, ** $p<0.01$, * $p<0.05$

Figure 1. Predicted Probability of Border Agreement between Hypothetical States A & B
(95% Confidence Intervals)