

Theoretical and Empirical Approaches to Uncertainty and Conflict in International Relations

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Summary: Uncertainty is pervasive in international politics. This uncertainty can have many sources. Each source has different origins and implications for the likelihood of conflict. Existing theories focus on three sources. These are (1) uncertainty due to asymmetric information about adversary traits that affect war payoffs, (2) uncertainty about adversary intentions, and (3) fundamental uncertainty about conflict relevant processes. Scholarship details the implications of each type of uncertainty for war and peace as well as the prospects for reducing the uncertainty. While theoretical work is quite rich, empirical studies generally lag behind due to measurement challenges and difficulties specifying clear testable implications. Nonetheless, using novel proxies for different forms of uncertainty has generated notable progress.

Keywords: Uncertainty; War; Conflict; Bargaining; Information; Intentions

Introduction

Uncertainty is pervasive in international politics. This common refrain is likely true, yet not particularly illuminating for understanding the causes of conflict. The statement's truth and obfuscation stem from the multitudinous forms and sources of uncertainty in international politics. Each form of uncertainty has different origins and implications for conflict likelihood. Consequently, it is imprecise and insufficient to merely invoke "uncertainty" to explain military conflict. Scholars have made tremendous strides delineating the various characteristics of the international system (including traits of other actors) that states may be uncertain about. These strides, largely theoretical but increasingly empirical as well, demand greater precision when discussing uncertainty and conflict.

This chapter aims to facilitate this call for precision. It surveys the state of scholarship on the relationships between various sources of uncertainty and conflict. Broadly, it groups sources of uncertainty into three categories. These are (1) uncertainty due to asymmetric information about adversary traits that affect war payoffs, (2) uncertainty due to asymmetric information about adversary intentions, and (3) fundamental or irreducible sources of uncertainty. The first uncertainty about war payoff-relevant attributes—e.g., a state's military capabilities—is most commonly associated with the bargaining theory of war. The second, uncertainty about intentions, is canonically linked to security dilemmas and the escalatory spirals and deterrence failures they produce. The third, fundamental uncertainty, emerges from stochastic features of international politics, such as elements of chance that sway war outcomes.

A survey of each broad category enumerates its theoretical origins (e.g., asymmetric information), content (e.g., about opponent military capabilities), remedies (e.g., costly signals), and consequences (e.g., increases the probability of war). After highlighting the theoretical work, the discussion turns to evaluating the evidentiary basis for the theoretical propositions. Each type of uncertainty entails its own empirical hurdles. As a result, empirical findings tend to lag behind theoretical propositions. At

the extreme, there are arguments to suggest that all empirical efforts pertaining to uncertainty are misguided. They may be misguided because either the theoretical implications are too contingent to yield systematic predictions, or because measurement is fundamentally impossible based on the theory's own contentions. For instance, how can observers hope to measure private information when by definition it is private? This chapter offers a generally more optimistic account. Several studies overcome these empirical hurdles and offer guideposts for future work.

The body of scholarship on uncertainty, in its many forms, and conflict is voluminous. Major portions and perspectives are necessarily omitted from this chapter. For cohesion, our survey privileges rationalist as opposed to psychological approaches to understanding the role of uncertainty in conflict. Additionally, the term “uncertainty” refers to Knightian *risk* (Knight, 1921). In this usage, uncertainty refers to contexts where actors do not know the outcome or realization of a trait or event but do know the range of possible outcomes and their associated probabilities. Of course, much of international politics faces the added complication that the range of possible outcomes is unknown and potentially wider than imagined, and the associated probabilities of each outcome is a matter of subjective estimation.¹ Though beyond the scope of this chapter, the concluding section touches upon these omissions and their implications for conflict.

Adversary Traits Affecting War Payoffs

The first broad source of uncertainty concerns an adversary's traits that are relevant for war and crisis bargaining outcomes. Within this framework, the vast theoretical literature on the topic has focused on uncertainty about military capabilities, resolve, war effort, or armament decisions, which are important in determining war's attractiveness. In turn, war's attractiveness affects the negotiated settlements states are likely to accept. In a given interaction, when actors lack sufficient information about such war-related traits, actors' beliefs play an important role in crisis decision

¹ Knight (1921) uses the term *uncertainty* to refer to such situations.

making. The accuracy of these beliefs, and how they are updated based on relevant information, are inherently linked to the overall likelihood of war between the involved actors. The following section reviews the main theoretical approaches that link different forms of uncertainty about war payoffs and conflict. The theoretical literature on this broad source of uncertainty is very rich. The empirical literature is less so. Difficulties measuring actor beliefs and uncertainty *ex ante* make it hard to assess the role of uncertainty empirically. Several exceptions are noted, which generally find that greater uncertainty about war-relevant traits is associated with a higher risk of conflict.

Theory: Locating Preferable Settlements

Private, and thus asymmetric, information drives uncertainty about adversary characteristics relevant for war outcomes. A state's resolve, usually theorized as its cost to fighting, is one of the most commonly studied sources of uncertainty of this form (Powell, 1988; Fearon, 1995; Schultz, 1999; Kydd, 2003; Wolford, Reiter and Carrubba, 2011). Highly resolved states face lower costs from war, while low resolve states face higher costs. War costs affect the concessions that states are willing to offer at the bargaining table. Fearon (1995) provides the canonical framework laying out the rationalist mechanism linking uncertainty about resolve to bargaining failure and conflict. War's costs render it *ex post* inefficient compared to a negotiated settlement. An actor, optimizing the settlement it secures from negotiations, offers an adversary just enough to make them prefer accepting the offer over war. However, uncertainty about the adversary's resolve obscures the precise offer that achieves this objective. Thus, the state making the offer faces a dilemma: offering too much unnecessarily forfeits resources to the adversary, while offering too little risks war. In the latter case, the uncertainty cannot be eliminated when a high resolve state dissatisfied with the offer tries to convince the other that a larger offer is necessary to avoid conflict. This holds because states have incentives to misrepresent their true resolve. Low resolve states have incentives to claim that they are indeed high resolve states. Unable to distinguish between types of opponents, proposing states balance a "risk-return tradeoff," which can lead to war.

In the above framework, uncertainty alone does not cause war. Rather it is a permissive condition. War only occurs when a state is more resolved than anticipated. If less resolved than anticipated, then uncertainty and peace simultaneously prevail. Uncertainty causes war conditional on the uncertain actor's beliefs and the other actor's actual type or characteristics.

As discussed in more detail below, uncertainty about actors' war payoffs may be resolved through fighting and bargaining as individual battles and bargaining over the course of the interaction can provide information about the involved actors' payoffs (Slantchev, 2003; Powell, 2004). However, uncertainty about resolve may interact with other rationalist sources of conflict and affect the likelihood and the duration of wars in interesting ways. One such source is commitment problems due to shifting relative power over time. Wolford, Reiter and Carrubba (2011) show that, when both uncertainty about resolve and power shifts are present in a dynamic model of war, resolution of uncertainty may in fact increase the duration of wars rather than leading to their termination.

A closely related type of uncertainty is about actors' military capabilities, which many regard as one of the main sources of war (Blainey, 1988; Morrow, 1989; Wagner, 1994; Van Evera, 1999; Smith and Stam, 2004; Johnson, 2004; Slantchev and Tarar, 2011). Blainey (1988), for instance, notes that "war is usually the outcome of a diplomatic crisis which cannot be solved because both sides have conflicting estimates of their bargaining power." This form of uncertainty concerns either domestic military capabilities or external military capabilities—for instance, potential ally support in a war. Within the rationalist framework, the mechanism through which uncertainty about relative capabilities may cause bargaining failure and war is similar to that about state resolve (Slantchev and Tarar, 2011). Powell (2004) finds that states' strategic learning behavior in crisis bargaining is also similar regardless of whether the source of uncertainty is costs of war or military capabilities. However, Fey and Ramsay (2011) argue that when uncertainty is about relative capabilities, peace can be more difficult to guarantee compared to more "benign" uncertainty about costs of war.

Even when states' capabilities are known with certainty by their adversaries, how effectively those capabilities will be employed on the battlefield can be a source of uncertainty. Arena (2013) analyzes such a scenario, in which uncertainty about martial effectiveness can lead to conflict. What distinguishes this form of uncertainty from those about resolve or military capabilities is that costly signaling cannot reveal actors' private information and in certain conditions can increase the likelihood of war (Arena, 2013).

Finally, uncertainty about capabilities may endogenously arise due to strategic behavior by the actors when they have incentives to avoid being predictable (Baliga and Sjöström 2008; Meiorowitz and Sartori, 2008; Jackson and Morelli, 2009; Debs and Monteiro, 2014; Lindsey, 2015). Meiorowitz and Sartori (2008) describe incentives for an arming state to intentionally generate strategic uncertainty about its capabilities. This uncertainty may then lead to bargaining failure and war. Similarly, Debs and Monteiro (2014) look at a state's decision to invest in additional military capabilities such as through a nuclear weapons program. Confronting a state that might be arming, adversaries have incentives to launch a preventive war to eliminate the shift in relative capabilities. Because arming choices follow a mixed strategy, preventive attack may sometimes be "mistaken" in the sense that it occurs despite the absence of an actual arms investment program (Debs and Monteiro, 2014).

Psychological approaches emphasizing misperceptions can affect the relationship between uncertainty and conflict in the bargaining framework. Misperceptions compound or alleviate the dangers of war due uncertainty. Differential effects follow from differential misperception. If states incorrectly estimate that the opponent is weak despite information indicating that they are strong, then misperceptions fan the flames of war. However, the misperception could run in the opposite direction, causing the assessing state to believe the adversary is strong when available information suggests they are weak. Thus, whether misperceptions exacerbate the risks of uncertainty depends on the type and content of the misperception

(Jervis, 1988).²

Reducing Uncertainty

If uncertainty about adversary traits can lead to bargaining failures and war as the above literature suggests, how can this source of uncertainty be reduced? Since uncertainty stems from a lack of information, the rationalist model expects that as relevant information becomes available, actors update beliefs and uncertainty dissipates.

What sources of information can reduce or eliminate uncertainty? First, the simplest solution would be to have the actor with private information reveal their true type to avoid a costly war. A strong state whose strength or resolve is underestimated by its adversary should state their true strength to secure a better bargaining share and avoid war. As discussed above, however, this is frequently impossible due to the actors' incentives to misrepresent their private information. For instance, weaker types of the adversary will be unwilling to truthfully reveal their strength, and will instead mimic stronger types in hopes of achieving better bargaining outcomes. Alternatively, there could be instances in which stronger states possess incentives to conceal their true strength and mimic weaker or unresolved types to gain a tactical advantage in war (Slantchev, 2010; Trager, 2010). Thus, to reduce or eliminate uncertainty, actors use (1) signaling mechanisms (costly or costless) that effectively separate strong adversaries from the weaker ones or (2) new information sources (endogenously generated or exogenously received).

Costly signals are one potential way to reduce uncertainty. Some actions are sufficiently costly that only certain types of the adversary—e.g., high resolve—will take them. These costly signals can be in the form of tying hands or sinking costs or a combination of them (Fearon, 1997). In crisis interactions, examples include troop mobilizations, limited uses of force, making statements that

² A related rationalist debate concerns whether states hold common priors about the uncertain parameters and how this affects the likelihood of conflict (see Fey and Ramsay (2006) and Smith and Stam (2006)). For an analysis incorporating misperceptions into rationalist approaches, see Kurizaki (2016).

generate domestic or international audience costs (Fearon, 1994), or Schelling (1960)'s idea of brinkmanship, such as taking actions that increase the likelihood of accidental war. Upon observing such behavior by an adversary, an actor deduces that the opponent's expected war payoff is higher than anticipated, and hence updates its assessment of its opponent's type and revises the bargaining offer.

Similarly, battlefield outcomes during the course of a war can reduce or eliminate some forms of uncertainty (Slantchev, 2003; Powell, 2004). If one state wins a series of individual battles, the opponent is likely to update its belief about the state's strength. Given the stochastic nature of the fighting process, a weaker type cannot manipulate battlefield outcomes to appear stronger.

More broadly, scholars have shown that messages and diplomacy which do not have immediate costs to the sender state could also convey information and reduce uncertainty (Morrow, 1994; Guisinger and Smith, 2002; Ramsay, 2011). In longer term interactions, a reputation for honesty could make cheap talk informative (Sartori, 2005). In crisis bargaining, costless diplomatic threats or messages to allies can influence beliefs about actors' intentions (Trager, 2010, 2015). Private threats that do not generate audience costs can still be informative and facilitate settlements when they are made in the shadow of costlier public alternatives (Kurizaki, 2007). Note that in these "cheap-talk" models, there are usually multiple equilibria, not all of which are informative. For instance, the so-called "babbling" equilibria exist, in which messages are ignored and no information transmission occurs. That said, crisis diplomacy rarely resembles babbling (Trager, 2015).

Beyond the sender state signaling its private information, another method to reduce uncertainty is for the receiver state to acquire new information. For instance, states could endogenously invest in information acquisition. Assuming intelligence is costly and states have limited resources, tradeoffs exist on how much to allocate to intelligence improvements versus other payoff relevant options. Arena and Wolford (2012) analyze a scenario in which states can use their resources either

for arming or for intelligence collection. While investment in intelligence can reduce the risk of war as the conventional wisdom predicts, it can also promote war, depending on the pessimism of a state's prior beliefs and what the new information reveals (Arena and Wolford, 2012).

Similarly, Bas and Coe (2016) find that the quality of intelligence plays an important role in monitoring an adversary's nuclear program. In this framework, a commitment problem underpins conflict logic as the monitor deems an adversary's weapons development unacceptable because of the adverse bargains the former must endure after a power shift occurs. The amount of uncertainty about the progress of an opponent's program has implications for the likelihood of conflict. In particular, the effect of better intelligence can go both ways on the likelihood of preventive war and proliferation. In some cases, it can make proliferation less and preventive war more likely overall because it makes it easier to detect a program's progress and prevent proliferation from happening when the program is close to fruition. On the other hand, under other conditions, it can also increase the chances of proliferation and make preventive war less likely as improved intelligence capabilities of a state removes the state's sense of urgency, and gives the adversary more opportunities to succeed in its proliferation efforts before being stopped with a preventive war (Bas and Coe, 2016).

Third parties can provide information that reduces uncertainty. When information asymmetries lead to conflict, Horner, Morelli and Squintani (2015) find that a mediator who only makes non-binding recommendations to disputants can prevent conflict as effectively as an arbitrator who can make and enforce binding decisions. Kydd (2003) finds that, for a third party to prevent war by reducing an actor's uncertainty about an opponent's resolve, the third party should be biased towards the actor. If the only preference of the third party is to prevent conflict, mediation is ineffective and no information transmission occurs (Kydd, 2003). Smith and Stam (2003) argue, on the other hand, that biased mediators cannot provide information about an opponent's capabilities, while Rauchhaus (2006) find that mediators can be effective whether they are biased or not, but impartial ones are expected to be more effective. Kydd (2010) argues that the main reason for the

difference in these conclusions is the way the mediator's bias is defined by the various authors. Moreover, Fey and Ramsay (2010) finds that if the only source of the mediator's information is what it can acquire from the disputants, third party mediation is no more effective than bilateral diplomacy between the two parties.

Finally, international organizations can also be important sources of information in reducing actors' uncertainty in crisis interactions (Morrow, 1994; Dai, 2002; Keohane, 2005; Chapman, 2007; Fang, 2008). International organizations can provide information about participating actors' behavior or traits (Koremenos, Lipson and Snidal, 2001). Institutions and cooperation agreements can be tailored to various levels of uncertainty in the future (Koremenos, 2005). For instance, the "nuclear watchdog" IAEA provides an important role in monitoring compliance to the Nuclear Non-proliferation Treaty. The United Nations and NATO provide venues for communication and information exchange among participating states on capabilities or commitments. Similarly, institutions like the IMF or WTO can provide information about the current and projected future states of the global economy. At the extreme, it is possible that tools for reducing uncertainty are so abundant that informational causes of war are largely implausible or irrelevant. For instance, provided that actors are sufficiently patient to remain at the bargaining table, a series of offers and counter-offers can resolve information asymmetries (Leventoglu and Tarar, 2008). Alternatively, actors can use a variety of mechanisms, including the costly signaling devices noted above, to restructure the information environment. This possibility, for Slantchev (2011, p. 36), makes the informational approach which emphasizes uncertainty problematic because it treats the strategic environment as fixed. While recognizing the theoretical importance of these claims, there are reasons to be less sanguine about whether actors can restructure the international arena into one of informational abundance.

Empirics: Hurdles and Findings

In the realm of uncertainty about adversary attributes, theoretical progress outpaces empirical

progress. The bargaining model's prominence extends mainly from its compelling logic, not necessarily from a strong evidentiary basis validating its propositions.

There are multiple reasons for the limited progress on the empirical front. Consider the ideal conditions for testing. Ideally, (1) theory generates clear empirical predictions linking uncertainty and the opponent's actual type to conflict probability, (2) the opponent's type is measurable *ex ante*, and (3) the assessing state's beliefs are measurable. Each of these conditions poses a problem. First, the implications to "test" are often not obvious. Certainty due to complete information produces peace, in theory. However, international politics is rarely a realm of complete information. Instead, there are plausibly gradations of uncertainty across contexts and time. In some theoretical accounts, these gradations do not yield clean monotonic implications. Under some conditions greater intelligence and new information increase the probability of conflict (Arena and Wolford, 2012; Fey, 2015; Krainin, Thomas and Wiseman, 2016). For instance, initially pessimistic states make generous bargaining proposals that yield a low risk of war. If they subsequently acquire favorable—less pessimistic—information, they can adopt riskier bargaining positions that increase the chance of war (Arena and Wolford, 2012). Second, the very source of the uncertainty, private information, makes measurement difficult. Uncertainty arises from one actor knowing something that it does not or cannot credibly convey to another. The latter actor is unable to observe the true value of the former's characteristics—e.g., how militarily capable it is. Yet empirical researchers must somehow measure what other actors cannot. Third, strategic behavior in the theories follow from the uncertain actor's beliefs. An actor's beliefs constitute a full distribution of probabilities assigned to the opponent being a variety of types, such as a high or low resolve type. Beliefs are difficult, if not impossible, to accurately measure (Morrow, 1989).

There are three possible responses to the challenges. First, scholars could abandon empirical efforts due to the fundamental difficulties in satisfying the above conditions for empirical testing.³

³ In a similar vein, Gartzke (1999) argues that our ability to predict wars is inherently limited based on the rationalist framework. If wars occur due to actors' incomplete information and incentives to misrepresent, among a set of dyads

Pessimists might suggest that the theoretical results are too contingent and the measurement challenges too severe to allow for credible inferences.

However, there are reasons for cautious optimism that lead to the second and third options. Second, indicators can serve as proxy measures for observers' beliefs, especially their uncertainty. The general logic is that some conditions make information more scarce, which means that observers should be more uncertain provided that their beliefs reflect the information available. Several studies take this approach. Greater media transparency may grant observers greater insight into an opponent's characteristics (Bell, 2013). Third party mediators that possess more information about disputants' resolve or capabilities and are biased towards the disputants tend to be more successful in reducing the likelihood of conflict (Savun, 2008). The existence of a domestic opposition in a democratic state can reduce the uncertainty about that state's resolve in a crisis (Schultz, 1998). Similarly, uncertainty about a leader's resolve likely diminishes with her time in office (Wolford, 2007; Rider, 2013). Estimates tracking arms spending indicate the extent of uncertainty to observers (Kaplow and Gartzke, 2013). The balance of military capabilities can serve as a proxy for uncertainty with more balanced dyads having greater uncertainty (Reed, 2003; Slantchev, 2004).⁴ Battlefield outcomes, under specified conditions, reduce uncertainty about relative military prowess and facilitate war termination (Slantchev, 2004; Weisiger, 2016). Honesty in past statements reduces an observer's uncertainty regarding the credibility of new statements (Sartori, 2005). With each proxy, greater uncertainty is associated with more conflict and more time to conflict resolution. This set of results generally accords with the theoretical propositions given that a few conditions hold. Actor beliefs must accord with the uncertainty indicator. For example, if there is a new leader, observers' beliefs should convey more un-

certainty. This condition will not hold if perceptual errors are rampant—e.g., in which there is a possibility for war, which ones will experience war or remain peaceful will ultimately be determined by stochastic process that are not observable or measurable ex ante.

⁴ While there is definitionally a greater possibility for the actual military balance to diverge in either direction when capabilities approach parity, this is not necessarily equivalent to a dearth of information and thus greater uncertainty, as discussed further in Section 4.

observers are certain when information is scarce and vice-versa. Additionally, whether the opponent (say, the new leader) is a tough or weak type should be roughly randomly distributed. Recall, conflict only occurs when there is uncertainty, the observer believes the opponent is sufficiently weak, and the opponent is actually sufficiently strong. Uncertainty alone is insufficient to generate war. Finally, uncertainty leads to more conflict provided that countervailing factors that introduce non-monotonicities are not rampant (Arena and Wolford, 2012; Fey, 2015). This final point is untestable without very rich information about the shape of an observer's beliefs.

The second approach, thus, is to suggest that beliefs, at least the uncertainty embedded in them, are measurable. This aligns with the vast qualitative literature which relies on archival sources, memoirs, historical accounts, etc. to reconstruct actors' beliefs (Jervis, 1976; Blainey, 1988). A pessimistic view that beliefs are not measurable implicitly downgrades the contribution of much of this work. A third approach is to focus on the content of private information as opposed to the extent of uncertainty. Put differently, rather than use a proxy for uncertainty, use a proxy for whether the opponent is actually the tough or weak type. The assumption here is that there is almost always some uncertainty. Whether the opponent is tougher than expected is the key determinant of whether that uncertainty leads to conflict. The challenge is that researchers must measure private information—that is, whether the opponent is the tough or weak type. Thanks to the passage of time and historical inquiry, what was once private information often becomes publicly knowable. Again, qualitative scholars go to great lengths to reconstruct and discern a state's type. Some forms of military strength are amenable to this approach. For instance, having a secret ally is a source of private information about one's own capabilities. Observers at the time are not privy to this information and are consequently uncertain about which states have secret allies (i.e., are the tough type). However, secret alliances often become publicly known after they expire (Leeds et al., 2002). Accordingly, researchers can use secret allies as an indicator of type. Consistent with theoretical expectations, states that are tougher than observers expect are more likely to get into conflicts (Bas and Schub, 2016b).

In sum, it is difficult to assess whether uncertainty due to asymmetric information about states' characteristics leads to conflict. Doing so requires assumptions about monotonic comparative statics coupled with proxies for belief uncertainty or assumptions about the extent of uncertainty coupled with proxies for a state's type. While each approach poses challenges, qualitative and quantitative research has proven useful. In nearly all studies, the evidence suggests that greater uncertainty about an opponent's war related characteristics increases the probability of conflict.

Adversary Intentions

A second form of uncertainty concerns intentions. Is a potential adversary a status quo or revisionist power? Are a state's new arms designed to defend or to attack? As with the first source of uncertainty, theoretical richness outpaces empirical results in this vein of work. The rest of this section discusses the origins and implications of uncertainty about intentions. It then turns to the evidentiary support, or lack thereof, for the theories.

Theory: Trust or Mistrust

Asymmetric information is the source of uncertainty over intentions. A state or its leadership has particular aims. These aims are often unobservable to outsiders. Outsiders, consequently, must attempt to infer the state's aims from observable indicators—such as statements, military mobilizations, or past behavior. Barring extreme conditions where a state's actions make its aims or intentions clear, observers will be uncertain.

What exactly are observers uncertain about? In typical accounts, the uncertainty concerns whether a state is (1) a status quo or security seeking actor or (2) a revisionist or "greedy" state (Jervis, 1976; Glaser, 1992; Kydd, 1997). Each state is uncertain of the other's type. Problematically, anarchy and self-help arming make it difficult to differentiate between status quo and greedy states. A state can build arms for either defensive (security-seeking) or offensive (greedy) purposes. Uncertainty due to an inability to differentiate security-seekers from greedy

states underpins the security dilemma. The dilemma, in turn, opens the door to escalatory spirals or deterrence failures. In spirals, two security-seeking states misattribute the motives for each others' arming choices, ratcheting up tensions to the point of either great inefficiency in the form of an arms race or worse yet to war. In the deterrence failure, a greedy state goes unchecked as the observer mistakenly attributes the greedy actor's arming choices to self-preservation rather than expansionist reasons. The spiral and deterrence paths to conflict are canonically associated with World War I and World War II, respectively (Jervis, 1976). Perceptions of an opponent's type that are mistaken, ex post, could stem from a psychological misattribution mechanism or through a strictly rationalist mechanism. In the former, states assume others can clearly infer their own, presumably security-seeking, intentions but fail to bestow that same inference on others (Jervis, 1976). In the latter, uncertainty and beliefs about the opponent's intentions can incentivize actions consistent with the spiral model (Kydd, 1997). The problem is again not simply that states are uncertain about one another. It is that they are uncertain and hold particular beliefs— e.g., that the other is greedy when in fact it is not. Some conditions attenuate escalatory risks. For instance, if defense is dominant on the battlefield then the consequences of being “suckered” by the opponent declines (Jervis, 1978).

Reducing Uncertainty

Can states reduce the amount of uncertainty about intentions? Kydd (2006) finds that unbiased mediators can be effective in reducing uncertainty if its main source is actors' mistrust about each other's intentions. Rosato (2014) claims states cannot infer intentions. Past actions are a poor guide to future behavior because no two situations are alike. Efforts to reduce arming are likely to be thought as a ploy to cheat the other side as opposed to a genuine signal of intention. He concludes that the persistence of uncertainty militates against cooperative behavior. Glaser and Kydd (2016) unpack and vociferously challenge the logic. Intentions are decipherable for a variety of reasons. Arms control agreements can be attractive for reasons beyond generating an opportunity to defect or cheat the opponent. For instance, states can allocate resources toward productive consumption (butter) rather than the tools of predation (guns). Additionally, past actions can shed light on future behavior under

the right conditions. If the same states meet in similar situations, prior behavior may be illuminating. Indeed, this is precisely why reputations can matter (Sartori, 2005; Weisiger and Yarhi-Milo, 2015). Even if these uncertainty-reduction measures fail, Rosato's pessimistic conclusion does not follow. Cooperative behavior is optimal provided that states think there is a sufficiently high probability that opponents are security-seeking rather than greedy. That is, they need not be certain the opponent is security-seeking, they simply must place a high-enough probability on that possibility.

Can battlefield outcomes be effective in providing information about opponents' intentions and reducing uncertainty in crisis bargaining? In a recent study, Spaniel and Bils (2016) show that uncertainty about an opponent's aims in crisis bargaining can be a source of war. Unlike the uncertainty about an opponent's resolve or capabilities that are discussed in the previous section, when uncertainty is about the extent of an opponent's aims, fighting is less effective in reducing such uncertainty, and wars are expected to last longer.

Yarhi-Milo (2014) identifies heterogeneity among actors in how or whether they can infer intentions. Decision-makers, such as leaders, often rely on personalized or emotionally-salient indicators. Face-to-face interactions with an adversary might sway perceptions of the adversary's intentions. In contrast, for organizational reasons an intelligence agency is more liable to use material indicators, such as arming choices, to gauge intentions. Unilateral military reductions, such as those Gorbachev implemented, are a notable way to reduce uncertainty about incentives.

Empirics: Qualitative Cases

Discerning the effects of uncertainty over intentions and preferences on conflict likelihood faces many obstacles, similar to those noted for uncertainty about war payoff-relevant attributes. Intentions are private information and yet scholars must discern the content of this information. Inferring intentions from behavior risks tautology whereby greedy states are hostile and all observably hostile states are thus greedy. This is problematic for the standard reasons that tautologies are problematic, but even more so in the case of the security dilemma. Theory tells us that even security-seekers, uncertain of others' intentions, can fall into conflict. Thus, behavior is explicitly non-determinative

of intentions. An alternative approach, as in the prior section, is to gauge when uncertainty about intentions is high or low. However, this is difficult to capture in a systematic fashion.

Uncertainty about intentions is particularly well-suited for qualitative work.⁵ Reconstructing beliefs about an adversary's intentions is a classic approach in security studies (Jervis, 1976; Goddard, 2015). How did Chamberlain assess Hitler's intentions in 1938? How did British estimates change in the ensuing year? Did these assessments cause or enable war? Careful evaluation of the historical record is particularly useful for answering these questions. This is not to say that the empirical hurdles are easily surmounted. Scholars still must reconstruct beliefs which is non-trivial. Doing so entails estimating an actor's degree of uncertainty and her expectations about the opponent's type (security-seeking or greedy). Moreover, ideally the evidence is sufficient to identify the opponent's actual type without invoking the opponent's subsequent behavior. Kydd (2005) studies the start and end of the Cold War to elucidate the role of uncertainty over intentions, with a focus on whether states "trust" one another, where trust refers to a belief that the adversary prefers to cooperate rather than exploit an actor's cooperative actions. For instance, Soviet unilateral disarmament signaled a change in intentions. Reducing uncertainty and shifting the US beliefs toward trust rather than mistrust helped end decades of bipolar rivalry. Yarhi-Milo (2014) delves into the analytical processes different domestic actors use to assess adversary intentions. She focuses on British assessments of German intentions in the 1930s and US assessments of Soviet intentions in the 1970s and 1980s. Actors rely on different sources of information to discern intent amidst uncertainty. Leaders lean on pre-existing beliefs or personalistic impressions while intelligence organizations rely on changes in military capabilities. Overall, this is a topic that merits additional qualitative research

⁵ That being said, one strand of the literature offers a potential quantitative alternative in a structural estimation approach to estimating actor preferences and intentions in dyadic crisis interactions. In this approach, based on a specified game structure and with additional identifying restrictions, actor preferences for various crisis outcomes can be estimated using regressors like relative capabilities, trade dependency, regime type, or alliance portfolio similarity (Signorino, 1999; Bas, Signorino and Walker, 2008; Lewis and Schultz, 2003). In these models, variation across dyads in the amount of uncertainty can also be modeled with regressors, some of which can be proxies for actor intentions (Bas, 2012). Alternatively, the amount of uncertainty actors may have about their future preferences in longer term interactions can also be estimated (Bas, Signorino and Whang, 2014).

and requires novel approaches to expand the breadth of results.

Fundamental and Irreducible Uncertainty

A third form of uncertainty differs because it does not stem from a lack of information about an adversary trait or intentions. Instead, uncertainty emerges from randomness, or stochastic processes, inherent to international politics. As the outcome of a coin flip or roll of dice entails uncertainty, so too do some features of international politics. This section details processes that fit this description, limitations on reducing this form of uncertainty, the theoretical implications for conflict, and what conclusions can be drawn from the existing evidence.

Theory: Grappling with Randomness

Several facets of international politics approximate random, or probabilistic, processes. More information does not eliminate this source of uncertainty. It may allow for more precise estimates of the probabilities associated with different outcomes—e.g., that a coin is 50/50 versus another possibility—but the fundamental uncertainty persists.

What features of international politics fit this mold? War is the canonical example. Clausewitz deems it the “province of chance” (von Clausewitz, 1976, p. 101-102). Outcomes are intrinsically uncertain. This is distinct from uncertainty due to perceptual difficulties - i.e., the “fog of war”—and instead more closely follows from unforeseen “friction” in executing military plans (p. 119). Schelling (1966, p. 93) dwells on a similar point, stressing that “[v]iolence, especially war, is a confused and uncertain activity, highly unpredictable, depending on decisions made by fallible human beings organized into imperfect governments, depending on fallible communications and warning systems and on the untested performance of people and equipment.” Formal theorists treat war as a costly lottery (Fearon, 1995) or series of probabilistic battles (Smith, 1998; Wagner, 2000; Slantchev, 2003; Powell, 2004) to capture war’s stochastic elements. Policy-makers recognize conflict’s unforeseen paths. For instance, Churchill warned, “The Statesman who

yields to war fever must realize that once the signal is given, he is no longer the master of policy but the slave of unforeseeable and uncontrollable events.”⁶

A more balanced distribution of power, whether conceived of bilaterally or multilaterally, is associated with more uncertainty over war outcomes. The intuition is immediate: if one side’s capabilities dwarf those of the other, the variance of the outcome is low relative to an instance when sides are evenly matched. Scholars contest whether greater uncertainty over conflict outcomes increases the risk of conflict. Balance and the uncertainty it generates may promote caution. Leaders, uncertain of their fate in war and concerned that parity will lead to a costly conflict, exercise prudence (Waltz, 1979; Mearsheimer, 2001). To Waltz, conflicts occur when military capabilities are lopsided “because there is nothing to prevent them” (Waltz, 1959, p. 232). In contrast, a balanced distribution could incite conflict if actors assess their prospects in an overly optimistic way (Blainey, 1988). As Bueno de Mesquita (1981) clarified, much of this debate rests on unstated assumptions about risk tolerance. Greater uncertainty leads to more conflict if actors are risk acceptant and the inverse holds if they are risk averse.

Other features of international politics that affect conflict likelihood entail stochastic elements. These elements include the shifting costs of making concessions to an adversary (Yared, 2010) and fluctuations in the benefits to peace (Chassang and Padro i Miguel, 2010)—for instance due to variation in land productivity which affects the opportunity costs to fighting (Chassang and Padro i Miguel, 2009). Exogenous factors can make the evolution of the power balance resemble a random process. These factors encompass economic (up)downturns, leader deaths, technological progress, or severe weather events. Fearon (2004) models the balance of power between a government and domestic opposition as a random process that fluctuates over time (see also Acemoglu and Robinson (2001); Bas and Coe (2012)). Fluctuations can produce commitment problems and an incentive for

⁶ Quoted in Mitzen and Schweller (2011).

conflict when a temporarily strong actor expects to revert to a weaker position in the future. This dynamic which produces conflict generalizes to multilateral settings as well (Krainin and Wiseman, 2016) but attenuates when actors are uncertain about the precise random process dictating power balance fluctuations (Bas and Schub, 2017).

Unlike the prior two forms of uncertainty, more information does not eliminate this section's fundamental uncertainty. More or better information clarifies the stochastic process governing the source of uncertainty. For instance, better information may reveal that a side has a 30% chance of winning a war whereas with worse information it believed its chances to lie between 20 and 40%. Despite the better information, the actual war outcome remains uncertain.

Empirics: Heterogeneous Effects

Theories link fundamental uncertainty to conflict through two distinct paths. Empirical approaches for evaluating each path differ. The first path ties the uncertainty of the stochastic process directly to conflict. For instance, does greater uncertainty about conflict outcomes make conflict more likely? An empiricist's challenge is to approximate the uncertainty of the data-generating process. Doing so is straightforward in a bilateral context where the variance of a Bernoulli process—e.g., which side wins and which side loses—is representative of its uncertainty. Typically, greater dyadic parity and thus greater fundamental uncertainty, increases the probability of conflict (Reed, 2003; Bennett and Stam, 2004). Interpreting this result is tricky. For Reed (2003), the bilateral balance serves as proxy for uncertainty due to private information as opposed to a proxy for fundamental uncertainty. While theoretically distinct, these two sources of uncertainty are difficult to disentangle empirically. Regardless of the precise pathway, bilateral balance is associated with more conflict.

Extending the bilateral approach to measuring fundamental uncertainty in a multilateral setting poses empirical challenges. In theory, states may respond to fundamental uncertainty about war outcomes while accounting for how multiple states will respond. For instance, will third-parties enter a conflict and if so on which side? A multilateral approach is essential for tackling such

questions. Huth, Bennett and Gelpi (1992) propose a measure of systemic uncertainty. The measure is a composite that includes the number of great powers, number of alliance “clusters,” diffusion of military capabilities across the greater powers, diffusion across the clusters, and prevalence of cross-cluster alliance ties. Employing this measure, the study finds that risk propensities moderate the effects of systemic uncertainty for conflict likelihood, in accordance with proposals from Bueno de Mesquita (1981). Bas and Schub (2016a) adopt a different strategy for generating a multilateral measure of uncertainty over war outcomes. The approach generalizes the basic bilateral setup—using the variance of a Bernoulli trial—to multi-actor settings. Within a given set of k -states, uncertainty increases as more of the constituent dyads within the set approach parity. Uncertainty diminishes as the set approaches strict hierarchy. That is, uncertainty is lowest when the strongest state dominates the second strongest and the second strongest dominates the third and so on. Uncertainty is low in hierarchy as a single state’s entry and alignment choice can dictate war’s outcome. More uncertainty, measured this way, is associated with less conflict. As uncertainty increases, wars are more likely to expand and become more costly. States, deterred by the prospect of war expansion, are less likely to fight when this form of uncertainty is high. Thus, greater multilateral outcome uncertainty is associated with less conflict while greater bilateral outcome uncertainty is associated with more.

The second path linking fundamental uncertainty to conflict concerns the prospects for changes in the power balance and the commitment problems they generate. The variance of the data-generating process must be sufficiently high but it is not the central focus. Rather, the current value of the parameter of interest (e.g., the military balance) and its likely future value structure actors’ incentives. Fearon (2004) studies civil war duration through this lens. Conflicts in which the central government will consolidate power after war termination are particularly difficult to resolve. Rebels, fearful the government will renege after consolidating power, opt to continue fighting to forestall this shift in power. A similar dynamic affects interstate war initiation. Temporarily advantaged states attack rivals during the latter’s window of vulnerability. That is, when a stochastic

process yields a favorable power balance—say, due to domestic turmoil in a rival—states seize the opportunity to attack rather than suffer adverse bargains once the rival’s turmoil dwindles (Bas and Schub, 2017). However, this result attenuates when the privileged state is uncertain whether its newfound advantage is temporary or likely to endure. Should it endure, the incentive to attack diminishes because the commitment problem is less biting.

Conclusion and Future Directions

Uncertainty pervades international politics, in part, because there are so many different attributes to be uncertain about. Ample information can generate certainty about an opponent’s military capabilities while a simultaneous dearth of information generates uncertainty about its intentions. Different sources of uncertainty have different implications. When arising from private information about war-relevant attributes, uncertainty obscures the range of mutually preferable peaceful settlements. Absent exogenous information or effective signals, this form of uncertainty creates a positive probability of war. Uncertainty about intentions similarly emanates from private information. But its consequences can differ. Escalatory spirals and deterrence failures follow from difficulties distinguishing between security seekers from greedy actors. To further complicate the assessment challenge actors confront, some sources of uncertainty are fundamentally irreducible. Randomness, whether due to weather or battlefield performance, introduces a range of possible outcomes.

This chapter’s perspective and taxonomy of uncertainty is merely one possible arrangement. Rathbun (2007) situates a discussion of uncertainty in terms of the IR paradigms. Friedman and Zeckhauser (2012) and Friedman and Zeckhauser (2015) emphasize uncertainty in the realm of intelligence. How does greater precision in intelligence estimates affect interpretability and accuracy? The answers may affect how policy-makers use that information in their decisions for war and peace.

Another approach might stress distinctions between Knightian risk (generally referred to as uncertainty throughout this chapter) and Knightian uncertainty. In the former, actors know the range of outcomes—e.g., the opponent is low or high resolve—and have some basis for assigning common probabilities to each outcome. Games of chance fit this model well. International politics frequently does not. Actors must form subjective assessments about the range of possible outcomes and their associated probabilities. Sometimes they must do so while in the realm of Rumsfeld’s “unknown unknowns.” Misperceptions become a possibility which may only exacerbate the problems that situations of risk pose for peace (Jervis, 1976). For instance, states may be certain despite a lack of sufficient information to justify that certainty (Mitzen and Schweller, 2011). Or they may place greater weight on favorable outcomes than available information warrants (Johnson, 2004).

At the risk of further complicating matters, several additional sources of uncertainty merit mention. Theories of conflict typically assume actors know their own capabilities, resolve, and intentions. However, some of these attributes are tricky to assess *ex ante*. Will the public be resolved in the face of casualties? How will new military technologies perform on the battlefield? Additionally, states may be uncertain about their ability to consolidate battlefield gains into political objectives. Lake (2010), in a study of the bargaining failure preceding the Iraq War, suggests the US misunderstanding of postwar governance costs was important. Existing studies struggle to capture this source of uncertainty.

Informational accounts of war remain an exciting vein of conflict scholarship. Theories are consistently refined, clarifying the disparate effects of various sources of uncertainty. Validating theoretical contentions necessitates continued empirical efforts. While recognizing the difficulty of discerning what was once private information or actors’ beliefs, such efforts warrant cautious optimism. The promise of this strand of research depends on a close dialogue between theory and data. Further refinement and confirmation of uncertainty’s effects is necessary from a policy perspective as well. A simple survey of the literature might suggest that informational interventions

foster peace. It is worth continued study to determine whether and when this prescription has the intended effect.

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