

DEPARTMENT OF  
**International Affairs**

---

**OCCASIONAL PAPERS**

---



**Cheating Honestly: Exit Versus Predation in the  
Nonproliferation Regime**

Jeffrey Berejikian\*  
Department of International Affairs,  
University of Georgia

Matthew Fuhrmann  
Belfer Center for Science and International Affairs,  
Harvard University

*\*The order of authorship represents the results of a random coin toss. A version of this paper was presented at the Annual Meeting of the International Studies Association, Chicago, IL, February 28-March 3, 2007. We thank Johannes Karreth and Cale Horne for excellent research assistance.*

## **Abstract**

The principal objective of this paper is to lay a theoretical foundation for examining an important distinction between non-compliant strategies. As institutions comprise codified expressions of appropriate behavior, state participation in such agreements is often voluntary. Governments wishing to engage in rogue behavior may participate in cooperative agreements and cheat, or they may decline participation altogether. We argue that the first behavior constitutes *predation* and the second an act of *exit*. We demonstrate these are distinct strategies motivated by different goals, and then argue that a state's regime type sheds light on the strategy it will adopt. To explore this distinction, we investigate the behavior of states pursuing nuclear weapons. Specifically, we deploy a Heckman specification with probit estimators to model state choices after the decision to pursue nuclear weapons is made. The results lend robust empirical support to our argument, which has important implications for international law, regime effectiveness, and nuclear non-proliferation.

# Cheating Honestly: Exit Versus Predation in the Nonproliferation Regime

Jeffrey Berejikian  
and Matthew Fuhrmann

Jeffrey Berejikian\*  
Department of  
International Affairs,  
University of Georgia  
jberejik@uga.edu

Matthew Fuhrmann  
Belfer Center for Science and  
International Affairs,  
Harvard University  
matthew\_fuhrmann@ksg.  
harvard.edu

## Introduction

Political scientists have devoted considerable attention to understanding why governments comply with international legal commitments (Young 1979; Chayes and Chayes 1992; Downs, Rocke, and Barsoom, 1996; Simmons 2000; von Stein 2005). Less studied are the factors that lead states to select non-cooperative strategies *outside* of institutions.<sup>1</sup> Indeed, Simmons (2000) has challenged scholars to explore whether non-compliance within the context of a formal commitment holds the potential for greater damage than the same behavior in the absence of such commitments. Implicit in this challenge is the recognition that states may choose between non-compliant strategies based upon an assessment of relative costs and, further, that *how* states engage in rogue behavior has important consequences for international law.

Our principal objective here is to lay a theoretical foundation for the empirical study of the distinction between non-cooperative strategies. As institutions comprise codified expressions of appropriate behavior, state participation in such agreements is often voluntary. However, much of the research on cooperative behavior tends to collapse two forms of non-cooperation into a single category. Governments wishing to engage in bad behavior may participate in cooperative agreements and cheat, or they may decline participation altogether. We label the first behavior *predation* and the second *exit*, and demonstrate that these represent distinct strategies and that they are motivated by different goals. In this paper, we argue that: (1) there are clear incentives underpinning the two types of non-cooperative behavior; (2) this distinction is under-appreciated in the literature on cooperation; and (3) a state's regime type sheds light on whether it will engage in predation or exit.

Our research question is this: among states that engage in rogue behavior, why do some choose a strategy of predation while others choose a strategy of exit? To shed light on the issue, we explore why some states intent on pursuing nuclear weapons do so within the framework of the nuclear nonproliferation regime and its anchor, the nuclear Nonproliferation Treaty (NPT), while others choose to do so outside of this regime. We chose this domain for a number of reasons. First, thanks to recent research (Singh and Way 2004; Jo and Gartzke 2007) we have data that make it possible to identify the spatial and temporal domains of nuclear proliferation and so we can now clearly differentiate between the strategy states chose (e.g. predation or exit). Second, there is significant variation in the strategies states adopt. Of the 17 states that have pursued nuclear weapons since 1968, the year the NPT was opened for signature, seven have chosen a strategy of predation at some point.<sup>2</sup> Third, nuclear proliferation falls under the broad rubric of "high politics." What this means is that the stakes are significant (Jervis 1982); nuclear proliferation has important implications on regional and global security. Finally, there is currently a debate about whether the NPT should be scrapped due to its seeming inability to effectively stem proliferation (Wesley 2005; Hanson 2005). Indeed, recent challenges to the regime from Iran, North Korea, and others would seem to threaten the viability of the NPT. Recognizing the distinction between exit and predation in the context of nuclear proliferation could offer prescriptions on how to bolster the NPT.

Drawing from the relevant literature, we construct a theory of non-cooperation based on a comparison of the costs and benefits of the two strategies. Our principle argument is that democracies are more likely to choose exit. Because predation carries comparatively greater costs for democracies and supplies greater benefits to non-democracies. These arguments offer a number of contributions. In a general sense, we demonstrate that exit and predation *are* distinct forms of non-cooperative behavior motivated by different incentives. This study also contributes to the growing body of empirical research on nuclear proliferation (Quester 1973; Solingen 1994; Sagan 1996; Paul 2000; Singh and Way 2004; Jo and Gartzke 2007). Recently, much of this literature has turned from asking why states pursue nuclear weapons to understanding how states do so (Braun and Chyba 2004; Montgomery 2005; Kroenig 2008; Fuhrmann 2008). We argue below that predation is a higher risk, higher reward strategy that might allow a state to obtain nuclear weapons more quickly – particularly if they lack sufficient indigenous resources. The selection of a strategy therefore affects the likelihood a state will eventually obtain nuclear weapons and the speed with which it will do so.

By distinguishing between non-cooperative strategies, we also shed new light on the issue of regime effectiveness. Both forms of noncompliant behavior are potentially damaging to regimes, but for different reasons. Persistent and wide-spread predation can undermine the legitimacy of an institution, and places significant demands upon member states to coordinate the policing of rogues. The mechanisms here are well understood. However, the strategy we define here as exit has also recently come to be understood as a serious a threat to effective international cooperation. Asculai (2004) notes, for example, that the “most serious issue” threatening the viability of the NPT is that a handful of non-compliant states remain outside the regime. Pakistan has assisted Iran, Libya, and North Korea in developing nuclear weapons (Albright and Hinderstein 2005) and pursued (and ultimately acquired) nuclear weapons itself. That is, persistent exit can facilitate predation making the exploitation of cooperative states easier and more efficient. In addition, among the principal benefits of regimes are that they can promote transparency and identify and punish those in noncompliance (Axelrod and Keohane 1985). For example, in the case of the NPT, exit prevents inspectors from the International Atomic Energy Agency (IAEA) and other verification measures from properly functioning. IAEA inspections detected irregularities in North Korea in 1992 (Albright and O’Neill 2000) and Iran in 2002. Exit mitigates this benefit, making detection more difficult and rendering inert the institutional mechanisms to promote transparency, identify non-compliant behavior, and punish violators.

We proceed by describing the distinction between exit and predation and then explain why it is important. Next, we construct a theory of non-cooperative behavior anchored to the relative costs and benefits of each strategy. Then we describe why democracies are less likely than non-democracies to exit and examine this argument within the context of the NPT. After describing our methodology, we examine the results and comment on the implications of our findings and offer directions for future research.

## Definitions: Exit Versus Predation

To develop the distinction between exit and defection we return to a classic metaphor for interstate cooperation, the prisoner’s dilemma (PD). A long tradition of research in political science uses the logic of the prisoner’s dilemma to describe the incentives governments confront when contemplating cooperation (Krasner 1982; Oye 1982; Keohane 1984). In a typical PD actors have two choices. Each can cooperate with its partner(s) or defect. This produces four possible outcomes and an incentive structure in which defection is a dominating strategy.

By contrast, the key assertion behind our argument is that there are in fact more than two choices available to actors, even in PD games. While this idea is well developed in other disciplines, the realization has come somewhat more slowly to the study of international relations. The result is that terms like defection, cheating, non-compliance, etc., do not adequately differentiate between the two distinct strategies of exit and predation. Indeed, the two are often conflated. Take for example the following classic description of an arms race.

The most obvious example [of a prisoner’s dilemma] in international politics is that of arms competition and its obverse, disarmament. Let us assume that in the long run all states would be best off if none arms at all. However, if one state thinks another will not arm, it is tempted to arm itself in order to make gains by coercion or war against the disarmed state. Or, one state, fearing another will reason this way, is motivated to arm to protect itself against the other’s possible armament. When both states act on either of these incentives, the result is mutual armament with no greater security than before but with the economic burden of the arms. Conversely, if both start in a condition of mutual armament and seek to negotiate disarmament or arms reduction, they find it impossible to do so because each fears that, if it disarms, the other may cheat on the agreement. The states are trapped in the double-defection box of a prisoner’s dilemma (Snyder 1971).

Notice that there are actually two ‘defect’ strategies described here. The first involves the decision to eschew cooperation and arm unilaterally, the second implies a decision to enter into an agreement and then cheat. Both strategies are treated as defection. The depiction is typical, and until now has not been widely disputed. However, the motivation underpinning the two strategies is clearly different. Declining to participate in a cooperative endeavor represents an attempt to exit. One possible motivation might be to shield oneself from some of the externalities inherent to cooperation. Entering into an agreement places an actor at risk by creating opportunities for rivals to capture increased gains that would be otherwise impossible without an agreement. In the context of an arms race, a state must consider the possibility that while it disarms as part of an agreement, rivals may retain their weapons. This worst outcome is made possible because of the arms treaty, and exit can represent a strategy aimed at preventing it.

By contrast, defection can also represent an attempt to secure that larger payoff, otherwise impossible to collect unilaterally, by cheating within the context of a cooperative agreement. The gains available through cheating are only possible if both (or all) parties are participating. Here, defection seems to imply a deliberate act of deception intended to exploit the cooperation of others for profit. This new, narrower, definition requires that instances of defection are always at least partially rule-governed. Any cooperative endeavor involves agreement – formal or informal – to the game’s rules. Minimally, this requires shared expectations defining cooperative and uncooperative behavior. This form of “defection” is, then, best applied within the context of an explicit agreement that defines appropriate behavior.

Take a second example. In a classic essay on alliances, Olson and Zeckhauser (1966) note that states in a military alliance will have a strong incentive to free-ride – to defect – on the contributions of other members. But here again cooperation and defection are not the only available options. States can also decline participation and provide unilaterally for their defense, or move to a different set of alliance partners. In such cases, states have exited rather than defected. An exit strategy is thus quite different from formally agreeing to alliance and then shirking one’s responsible level of contribution. The incentives to exit include avoiding the costs of new alliance entanglements and the concomitant increased probability of conflict. By contrast, the incentive to cheat lies in the temptation to stand aside in the face of aggression and let others pay the cost of an appropriate response.

Essentially, the difference between the motivation for cheating and exit lies respectively in the distinction between predation and autonomy. To avoid confusion with traditional definitions, we use

the terms *exit* and *predation* to identify the two non-cooperative behaviors described here. Unlike the standard metaphor of two criminals locked into a structure imposed by the state, this distinction acknowledges that real-world actors can walk away from such interactions, or can initially decline to play. That is, actors confront “field of prisoner’s dilemma games that leaves them free to decide which games they will play and with whom,” and they have the option to enter and exit collective endeavors that, once entered into, take on the incentive structure defined by the prisoner’s dilemma (Orbell and Dawes, 1993). It would be obviously incorrect to assert that exit is always a viable strategy. Still, it is also unreasonable to begin with the (often only implicit) assumption that states are compelled to participate in all conceivable collective endeavors, or that once participating there are no options beyond cooperation or deception.

There has been considerable empirical research on exit games conducted outside political science. Research exploring the implications of exit has appeared for journals in fields as diverse as evolutionary biology, computer science, economics, mathematics, sociology, psychology and moral philosophy.<sup>3</sup> There has also been some increasing attention within political science.<sup>4</sup> Nonetheless, while the importance of studying the distinction between exit and predation is well established elsewhere, it remains an open question as to whether it is an appropriate and useful metaphor for the study of international politics.

For example, the distinction appears to be important in the debate surrounding the effectiveness of the NPT regime. In policy circles, the regime is often criticized as ineffective in halting the drive to develop nuclear weapons by determined governments (Braun and Chyba 2004). In the academic literature, recent research efforts have successfully identified a set of factors that can be associated with the decision to develop a nuclear program (Singh and Way 2004; Jo and Gartzke 2007). In both cases governments engaged in predation and exit are treated uniformly as ‘proliferators.’ While this is technically correct, we believe that distinguishing between exit and predation permits examination of the factors that lead governments to choose one path to proliferation over the other. As noted above, such an approach holds the potential to improve our understanding both of non-cooperative behavior and the impact it has on institutions.

## Theoretical Expectations

In our framework, once a government has decided to pursue nuclear weapons, it must then choose between the strategies of predation and exit. In making this choice, we assume that governments consider the relative benefits and costs attached to each strategy. Specifically, taking advantage of another's cooperation is the principle benefit of predation. By choosing predation, leaders seek to extract these benefits while skirting the costs of compliance. Alternatively, a principal cost of predation is the potential for damage to a state's credibility and reputation, and an increased chance of coordinated international pressure. In this section we argue that these costs and benefits also vary by regime type, and that this predicts state choice.

Sasikumar and Way (2007) argue that participation in the NPT provides important security, economic, and political benefits. The principal benefit of membership is increased access to nuclear technology for "peaceful purposes" that might ultimately support a nuclear weapons. Article IV of the NPT states that: "all the Parties to the Treaty undertake to facilitate...the fullest possible exchange of equipment, materials and scientific and technological information for the peaceful uses of nuclear energy." Once nuclear technology for peaceful purposes is acquired, it is easy to redeploy it for military purposes. Further, NPT members are more likely to receive technical assistance from the International Atomic Energy Agency's (IAEA) (Baretto and Cetto 2004).<sup>5</sup> As Andrew Semmel (2003), the U.S. representative to the 1995 NPT review conference, points out, Iraq, North Korea, and Iran each used:

"[a]pparent compliance with the Treaty to present a peaceful public image. That image and the claimed 'right' to a peaceful nuclear program were used to mask access to foreign help in building fissile material production facilities that could support a nuclear weapons capability... for many years, each of these countries was able to use its status as an NPT member 'in good standing' to divert attention from its real motivations and to facilitate foreign nuclear assistance."

A strategy of predation, which allows for easier access to nuclear technology under the guise of the NPT, enables states to acquire nuclear weapons more quickly than they could through exit. In addition, signing the NPT signals an intention to forgo nuclear weapons, yielding additional benefits. This (sometimes deliberately false) perception decreases the likelihood that rivals will feel compelled to pursue such weapons, generating coveted relative gains over rivals (Waltz 1979).

There are, of course, significant costs associated with predation. If discovered, predation damages a state's reputation and credibility. Reputations are important in international politics (Axelrod 1984; Simmons 2000; McGillivray and Smith 2006),<sup>6</sup> particularly in

bargaining situations (Schelling 1960). Damage to reputation can discourage future partners from entering into profitable cooperation, inhibit foreign investment, and hinder economic integration generally (Simmons 2000). Verified predation – and its associated reputational costs – can also lead to political and diplomatic isolation (Lipson 1991). While states may impose such costs unilaterally, an agreement increases the probability of a more punishing collective effort as verified NPT predation can trigger a set of legally permissible and coordinated punishments intended to bring rogue governments back into compliance. Such mechanisms usually do not apply to states that exit. Additionally, participation in a regime makes the pursuit of nuclear weapons more costly as governments must subject their nuclear facilities to safeguards and inspections by the IAEA, making it more difficult for leaders to conceal their nuclear ambitions.

By contrast, the strategy of exit presents a distinct set of incentives. Relative to predation, exit risks less damage to states' reputations. While openly pursuing nuclear weapons may lead to a certain amount of political damage (Jo and Gartzke, 2007), exit is the more honest path. In addition, leaders who choose exit over predation suffer less political and economic isolation. This is in part because the international community has less leverage against those that are not technically bound by formal international commitments. However, exit also weakens the argument that a government is entitled to nuclear technology for "peaceful purposes." Because leaders who choose exit cannot collect on the benefits of cooperation, this strategy offers less of an opportunity to take advantage of others and pursue relative gains over adversaries.

Thus, the strategy of predation carries both greater risks and rewards than does exit. So when will leaders choose predation over exit? The argument we advance in this paper is that non-democratic states are more likely to engage in predation because they are comparatively insulated from the costs of this strategy. The logic driving this expectation is three-fold. First, legal commitments are more likely to be viewed as binding in democracies. Second, the transparency associated with institutions and the free-flow of information in democracies makes it more difficult for democratic states to conceal their pursuit of nuclear weapons. Third, the domestic audience costs for violating legal commitments are greater for democratic than non-democratic leaders. We develop this argument next.

## Binding Commitments

Alexis de Tocqueville (1835/1969) observed that respect for law is a key component of democratic societies, and scholars have since argued that the “internal practice” of democracy necessitates a basic value for legal commitments that carries over to international politics (Doyle, 1983; Maoz and Russett, 1993; Slaughter, 1995; Gaubatz 1996; Simmons, 2000). Gaubatz (1996: 119) argues that “international law has long been expressly incorporated into the domestic legal order” in most of the major liberal democracies because “democratic peoples hold legal norms to be of some overarching legitimacy.” Since international law becomes a part of the domestic legal order in democracies, these states are more likely than non-democracies to enforce their commitments through domestic institutions thereby creating real constraints for democracies that they may wish to avoid. For example, it is this logic that leads Hathaway (2007) to conclude that states with strong domestic enforcement (i.e. democracies) and poor human rights practices are unlikely to commit to treaties in this vein because they would bear substantial compliance costs. Similarly, we expect that democratic proliferators are less likely than non-democratic proliferators to choose predation because they expect that their legal commitments are legitimate and will be enforced domestically.

Differences in the way that democratic and non-democratic proliferators view the NPT lend support to this logic. For example, North Korea never viewed its NPT commitment as a real constraint. It ratified the treaty in 1985 in response to the Soviet Union’s proclamation that assistance in building a nuclear power plant would be withheld until Pyongyang entered the nonproliferation regime (United States, 1987). But North Korea was pursuing nuclear weapons well before it ratified the treaty (e.g. Singh and Way, 2004).<sup>7</sup> Indeed, Pyongyang threatened to withdraw from the treaty in March 1993 and officially did so in January 2003—after it had made sufficient progress towards assembling a nuclear bomb. On the other hand, India chose exit over predation as its path to producing nuclear weapons as New Delhi perceived the treaty to be a real constraint on its security interests. As one member of parliament put it, India must not sign the NPT because it needs to “remain free to develop its own nuclear capabilities and nuclear weapons” to counter China (Perkovich, 1999: 135).

## Transparency of Domestic Institutions

Democracies are transparent in the sense that their institutions and political processes are open and there is thus a good deal of economic, legal, and social information publicly available (e.g.

Starr, 1997). This decreases the likelihood that a covert nuclear weapons program can be effectively concealed. Further, democratic leaders have incentives to provide accurate information to the public because this increases the likelihood that they will remain in power (Buono de Mesquita, Smith, Siverson, and Morrow, 2003; Rosendorff and Vreeland, 2006). Non-democratic leaders do not have this same incentive to act transparently.<sup>8</sup> Therefore, while predation risks the costs associated with being identified as a cheater, the relative lack of transparency in non-democratic states decreases the perceived likelihood that this will happen making predation more likely among non-democratic states.

## Audience Costs

Previous research finds that democratic governments are more inclined to make promises they know they can keep (von Stein, 2004) because there are domestic audience costs associated with reneging (Fearon 1994; Morrow 2001). Since democratic leaders are primarily motivated by a desire to stay in power (Buono de Mesquita, Smith, Siverson, and Morrow, 2003) and must satisfy comparatively large constituencies to do so, they are more likely than autocratic leaders to avoid behavior that is unpopular domestically.<sup>9</sup> Like escalating a crisis and then backing down (Fearon 1994), reneging on a legal commitment is likely to damage a state’s credibility and be unpopular domestically. Indeed, previous work concludes that flaunting international commitments increases governments’ susceptibility before domestic audiences and that this susceptibility is particularly true of governments with strong commitments to the rule of law (Dixon 1993; Slaughter 1995; Simmons, 2000; McGillivray and Smith 2006). Consequently, as a state’s level of democracy increases it will be more inclined to exit in an attempt to avoid the domestic costs associated with predation.

## Methodology

We assume that choosing between the strategies of predation or exit follows the decision to pursue nuclear weapons. To model this sequence, we deploy a two-stage Heckman selection model (Heckman, 1979).<sup>10</sup> Here, two probit models are estimated. The predicted probabilities from the first model—the proliferation decision model—are saved and transformed into Mill’s inverse ratio. These ratios are then included as an independent variable in the second model—the strategy selection model. This approach allows us to account for the probability of any state being selected into the analysis of proliferation strategy (e.g. predation or exit) (Reed, 2000).

We adopt a time-series, cross-section data structure with the country year as the unit of analysis. The statistical analysis of nuclear weapons exploration includes all states in the international system from 1968 to 2000.<sup>11</sup> In the second model, we exclude states that did not explore nuclear weapons, which leaves 17 countries in the sample,<sup>12</sup> producing 4,251 observations in the first analysis and 281 observations in the second analysis. Since we estimate both models model using time-series, cross-sectional data and binary dependant variables (BTSCS), there is a strong likelihood of temporal dependence among observations. To address this problem we include duration variables in each model that measure the number of years since the last “1” occurred and three cubic splines, as suggested by Beck, Katz, and Tucker (1998). We also estimate Huber’s robust standard errors for spatial dependence and clustering over states to reduce the effects of heteroskedasticity. Finally, we lag all independent variables one year to control for potential endogeneity.

#### First Stage Variables

We rely upon established findings to model the proliferation decision. Specifically, all variables for this model are taken from Singh and Way’s (2004) study on the correlates of nuclear proliferation. The dependent variable *Explore* is a dichotomous and is coded as 1 if a state is at least exploring nuclear weapons in year  $t$  and 0 otherwise.<sup>13</sup> We include all of the independent variables used by Singh and Way (2004) to model the probability that a country will explore nuclear weapons development. These variables are described briefly below.

According to Singh and Way (2004) variables related to technological development can affect a state’s opportunity to develop nuclear weapons. *Gross Domestic Product Per Capita* is a variable measuring a country’s gross domestic product (GDP) per capita in year  $t-1$ . We also include the squared value of a state’s GDP per capita to account for the potential curvilinear relationship between development and nuclear weapons exploration. *Industrial Capacity* is a dummy variable that is coded 1 if a country produces steel domestically and has an electricity generating capacity greater than 5,000 MW in year  $t-1$  and 0 otherwise.

States in threatening security environments are more likely to pursue nuclear weapons. *Enduring Rivalry* is a dichotomous variable that is coded 1 if a country is involved in an enduring rivalry in year  $t-1$  and 0 otherwise. This variable is coded by Singh and Way (2004) using Bennett’s (1998) coding for enduring rivalries. *Dispute Involvement* is a variable measuring a five-year moving average of the number of militarized interstate disputes (MIDs) (Ghosn and Palmer, 2003) that a state is involved in. States that have protection from a nuclear power may be less

likely to desire nuclear weapons, even if they are in a threatening security environment. *Security Guarantee* is a dichotomous variable coded 1 if a state has a military alliance with a great power in year  $t-1$  and 0 otherwise.<sup>14</sup>

A number of factors related to regime type also could influence a state’s willingness to pursue nuclear weapons. *Democracy* and *Democratization* are variables measuring the state’s overall level of democracy based on the 21-point scale developed by the Polity IV project (Jagers and Gurr, 1995) and the change in this variable over a five year period, respectively. *Democracies* is a variable measuring the percentage of states in the international system that are democracies in year  $t-1$ .<sup>15</sup> States that are highly integrated in the global economy might be less likely to proliferate because they have more to lose from being ostracized by the international community (e.g. Solingen, 1994). *Openness* and *Liberalization* are variables that measure the ratio of a state’s imports and exports as a share of its GDP and the change in this variable over five year periods, respectively.

#### Second Stage Variables

We construct a dichotomous dependent variable, which is coded annually, to identify whether a state is engaging in predation or exit in a given year. To operationalize proliferation strategy, we need two pieces of information: the years in which it is pursuing nuclear weapons, and when it acceded to or ratified the NPT. States that are pursuing nuclear weapons while a part of the NPT are considered to be engaging in predation; those that do so while outside of the treaty are engaging in exit. Data on nuclear weapons exploration come from Singh and Way (2004).<sup>16</sup> Data on NPT membership are taken from the Center for Nonproliferation Studies (2005). We create a dummy variable *Predation* and code it 1 if a country is engaging in predation in year  $t$  and 0 otherwise.<sup>17</sup> Of the 17 states included in our analysis, seven engaged in predation at some point in time. Table 1 summarizes these data.

Our argument is that democracy affects the likelihood a state will engage in predation because less democratic states are more insulated from the costs of this strategy. Democracy data were obtained from the Polity IV dataset (Beardsley and Gleditsch, 2003). The variable *Democracy* ranges from -10 to 10 and is calculated by subtracting the score for the general closedness of political institutions from the score for the general openness of political institutions. For the sake of robustness, we employ a dichotomous independent variable that equals 1 if a state has a score of less than 1 on the Polity scale and 0 otherwise.<sup>18</sup> We also operationalize *Democracy* using Vanhanen’s (2000) Index of Democratization, which is based on the degree of competition and participation in a particular country.<sup>19</sup>

**Table 1: Strategies of Nuclear Weapons Pursuit, 1968-2000**

Country	Years	NPT Ratification	Strategy
Algeria	1983 - 2000	12 Jan 1995	Exit (1983-1994); Predation (1995-2000)
Argentina	1968 - 1990	10 Feb 1995	Exit
Australia	1968 - 1973	23 Jan 1973	Exit
Brazil	1968 - 1990	13 July 1998	Exit
India	1968 - 2000	Non-Member	Exit
Iran	1984 - 2000	2 Feb 1970	Predation
Iraq	1976 - 2003	29 Oct 1969	Predation
Israel	1968 - 2000	Non-Member	Exit
North Korea	1968 - 2000	12 Dec 85 (withdrew 10 Jan 2003)	Exit (1968-1984); Predation (1985-2000)
South Korea	1968 - 1978	23 April 1975	Exit (1968-1974); Predation (1975-1978)
Libya	1970 - 2003	26 May 1975	Exit (1970-1974); Predation (1975-2000)
Pakistan	1972 - 2000	Non-Member	Exit
Romania	1985 - 1990	4 Feb 1970	Predation
South Africa	1969 - 1991	10 July 1991	Exit
Sweden	1968 - 1969	9 Jan 1970	Exit
Switzerland	1968 - 1970	9 March 1977	Exit
Yugoslavia	1974 - 1988	12 April 1995	Exit

Source: Data on the pursuit of nuclear weapons are from Singh and Way (2004). Data on NPT ratification are from the Center for Nonproliferation Studies (2005).

We control for a number of other factors that could affect whether a state chooses predation or exit. A state's existing resources might influence its proliferation strategy. Governments with sufficient indigenous resources to sustain a nuclear program will be less enticed by the benefits of nuclear technology transfer than governments that do not. To control for the resources a state has at its disposal, we include a variable measuring a country's *Gross Domestic Product Per Capita* in year  $t-1$ .<sup>20</sup> The nuclear-specific resources a country possesses could also affect the relative attractiveness of predation. We include Jo and Gartzke's (2007) measure of latent nuclear production capability: an index generated by adding the components a state has for nuclear weapons production.<sup>21</sup> We also include the variable *Nuclear Resources* that ranges from zero to seven (seven being the highest).

Militarized conflict could influence states' willingness to engage in predation because conflict could destroy or damage nuclear infrastructure<sup>22</sup> and necessitate the diversion of resources away from nuclear programs towards more immediate security concerns (e.g. Iqbal 2006). Under these circumstances, leaders would be more dependent on nuclear assistance from other countries. Additionally, conflict may increase states' sensitivity to relative gains (Paul 2000), making them more likely to take

advantage of others and select a strategy of predation. We generate a dichotomous variable *Fatal MID* and code it 1 if the state was involved in a dispute that produced at least one fatality in year  $t-1$  and 0 otherwise. These data come from version 3.0 of the COW Militarized Interstate Dispute (MID) dataset (Ghosn, Palmer, and Bremer 2004).

We control for the normative strength of the NPT since we expect that it will be more difficult for states to remain outside the treaty as its strength increases. Thus, states may be more likely to enter the regime over time—even if they do not intend to comply. We include a variable *NPT Strength* to control for the strength of the nonproliferation norm by including a variable that measures the proportion of NPT joiners relative to the number of states in the international system.<sup>23</sup>

While pursuing nuclear weapons by any strategy may lead to economic or political isolation (Caprioli and Trumbore 2005; Jo and Gartzke 2007), states that are already highly integrated into the international system will be less likely to accept the risks inherent to predation. For example, the political fate of leaders pursuing liberal trade policies is closely tied to their economic performance (Solingen 1994) and so a state's existing level of international integration could have an effect on its tolerance for

the costs of reputational damage (i.e. potential economic/political isolation) that may stem from predation. To control for this, we include variables measuring states' political and economic integration. We include a variable *Openness* that mirrors the measure included in the first-stage equation. Following Jo and Gartzke (2007), we code *Diplomatic Isolation* between a state and other politically relevant states (e.g. states within 150 miles and major powers).<sup>24</sup> We use the 2006 version of the correlates of war (COW) diplomatic data set (Bayer 2006) for data on exchanges at the level of chargé d'affaires, minister, and ambassador between countries.<sup>25</sup>

Finally, we add a dummy variable to control for the effect of the *Cold War*, which is coded 1 if the state's choice occurred after 1991 and 0 otherwise. The shift from bipolarity to unipolarity after the cold war may have an impact on states' willingness to engage in predation.

## Results

We argue above that non-compliant behaviors—which are typically lumped together—can be disaggregated. States wishing to engage in non-compliant actions can join institutions and cheat (predation) or decline participation altogether (exit). Our argument is that regime type helps us understand which path a country will take. Democracies are less likely to choose predation because it is a more costly strategy for them vis-à-vis non-democracies. Relative to non-democracies, democratic states are more likely to view their commitments as binding, perceive that their weapons program will be exposed, and suffer domestic audience costs as a result of engaging in predation.

Table 2 displays the results of the empirical analysis. Model 1 is estimated using standard probit regression analysis. Models 2-6 are estimated using a two-staged Heckman selection model. In the first stage, we estimate the effect that a number of independent variables have on the probability that a state will explore nuclear weapons. We then use the probability of nuclear weapons exploration as a regressor in the second stage analyzing the likelihood that a state chooses a strategy of predation over a strategy of exit. Model 2 includes only the *Democracy* variable and controls for temporal dependence while Model 3 includes only Vanhanen's (2000) *Index of Democratization* and the temporal controls. Models 4 and 5 are full models that use the *Democracy* and *Index of Democratization* variables, respectively. Model 6 substitutes a dummy variable measuring whether a state is an autocracy or a non-autocracy.

Before describing the results in detail, it is appropriate to consider the advantages of estimating a Heckman probit selection

model rather than simply using a probit analysis to uncover the determinants of predation. It is necessary to use the Heckman model if the estimation errors in our two models are correlated. We conducted a Wald likelihood ratio test to determine whether the two equations are independent and it was easily rejected for Models 2-6. This means that using a single probit analysis would have produced inconsistent coefficients. It is noteworthy, however, that the probit estimates (Model 1) are virtually identical to those produced by the selection models (Models 2-6).

As Table 2 reveals, the results of the first stage are largely consistent with the results produced by Singh and Way (2004). The key differences are with the variables related to regime type. *Democracy*, *Democratization*, and *Percent Democracies* all have statistically significant effects on the probability that a state will pursue nuclear weapons and these results are robust across model specifications. Consistent with expectations, *Democracy* and *Percent Democracies* reduce the likelihood of proliferation. We find that *Democratization* increases the probability that a state will explore nuclear weapons, which is an unexpected result. Collectively, these results suggest that regime type is salient in explaining states' pursuit of nuclear weapons, which is a point of departure from other recent studies (Singh and Way, 2004; Jo and Gartzke, 2007).<sup>26</sup> Since we are most interested in the results of the second stage, we turn our attention there.

The results presented in Table 2 reveal robust empirical support for our argument. *Democracy* has a negative and statistically significant effect on the likelihood that a proliferating state will choose predation. This result holds regardless of whether we operationalize democracy based on the Polity index (Models 2 and 4), Vanhanen's (2000) Index of Democratization (Models 3 and 5), or a dummy variable based on the Polity measure (Models 6). *Democracy* also has a large substantive effect on the likelihood of predation, as Figure 1 illustrates. The conditional probability that a state will predate drops by .77, from .78 to .01, when the *Democracy* variable moves from its minimum to its maximum and all other factors are held at their mean. Increasing the value of the *Democracy* variable from ½ standard deviation below its mean to ½ standard deviation above its mean increases the conditional probability of predation by .34, from .44 to .10.<sup>27</sup> This effect is even more pronounced when we include a variable that distinguishes states as autocracies and non-autocracies (Model 6). The conditional probability that an autocracy will choose predation is .78 while the conditional probability that a similar non-autocracy will do so is only .0001. This indicates that democracies that are pursuing nuclear weapons will almost certainly exit and autocratic states that are doing so are very likely to predate, which supports our argument that costs of predation for democratic regimes are comparatively large. We revisit the theoretical and practical implications of this finding below.

**Table 2: Heckman Probit Selection Model for the Probability of Predation**

	(1) One-Stage Probit	(2) Polity Only	(3) Vanhnen Democracy Only	(4) Full Model- Polity	(5) Full Model- Vanhnen Democracy	(6) Autocracy (Polity score <1)
<i>Second Stage: Predation or Exit?</i>						
Democracy	-0.146** (0.068)	-0.127*** (0.034)	-0.069*** (0.026)	-0.152** (0.064)	-0.266*** (0.066)	4.484*** (0.856)
GDP Per Capita	0.000 (0.000)	- -	- -	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Nuclear Resources	0.289 (0.369)	- -	- -	0.461 (0.373)	0.702 (0.562)	0.560 (0.472)
NPT Strength	0.074*** (0.018)	- -	- -	0.061*** (0.015)	0.085*** (0.018)	0.076*** (0.014)
Fatal MID	2.021*** (0.409)	- -	- -	1.873*** (0.437)	2.331*** (0.536)	2.575*** (0.675)
Diplomatic Isolation	3.293*** (0.838)	- -	- -	2.842*** (1.097)	4.605*** (1.683)	3.657** (1.631)
Openness	0.539*** (0.169)	- -	- -	0.620*** (0.165)	0.767*** (0.216)	0.702*** (0.195)
Cold War	3.172*** (1.094)	- -	- -	2.650** (1.221)	3.035** (1.282)	3.234*** 4.484***
Constant	-9.264*** (2.557)	0.679** (0.346)	1.985*** (0.204)	-8.241** (3.273)	-10.249** (3.998)	- 13.282*** (4.372)
<i>First Stage: Nuclear Proliferation</i>						
GDP Per Capita	- -	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)	0.001*** (0.000)
GDP Per Capita Squared	- -	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)	-0.000*** (0.000)
Industrial Development	- -	1.076*** (0.287)	1.056*** (0.286)	1.066*** (0.288)	1.065*** (0.288)	0.914*** (0.308)
Rivalry	- -	0.937*** (0.341)	0.957*** (0.340)	0.957*** (0.337)	0.958*** (0.338)	0.227*** (0.076)
MIDs	- -	0.247*** (0.064)	0.244*** (0.064)	0.241*** (0.062)	0.241*** (0.062)	1.065*** (0.360)
Allies	- -	-0.198 (0.299)	-0.184 (0.298)	-0.183 (0.299)	-0.184 (0.299)	-0.150 (0.273)
Polity	- -	-	-0.069*** (0.017)	-0.067*** (0.017)	-0.067*** (0.017)	-0.003 (0.013)
Democratization	- -	0.029* (0.016)	0.029* (0.017)	0.030* (0.016)	0.029* (0.016)	-0.080** (0.033)
Percent Democracies	-	-0.088***	-0.083***	-0.088***	-0.088***	-0.004

**Table 2: cont.**

	-	(0.032)	(0.032)	(0.032)	(0.032)	(0.003)
Openness	-	-0.004	-0.004	-0.005	-0.005	-0.005
	-	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)
Liberalization	-	-0.001	-0.001	-0.002	-0.002	-0.002
	-	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
N (Uncensored N)	264	5364 (238)	5364 (232)	5364 (232)	5364 (232)	5634 (232)
LR Test of Independence [p>chi-sq]	-	4.98 [.0256]	16.4 [.0001]	5.22 [.0223]	4.74 [.0296]	8.02 [.0046]

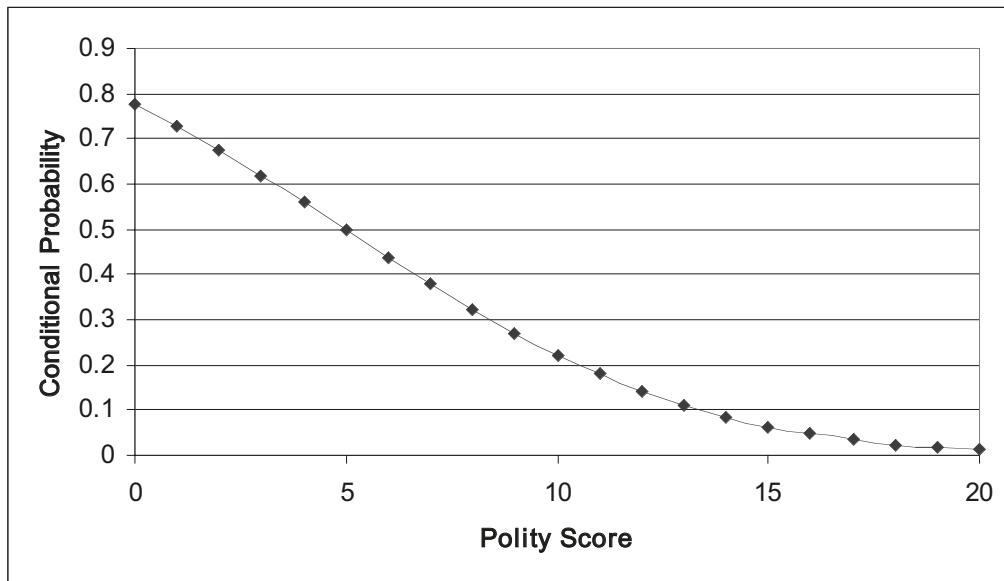
Notes: Controls for temporal dependence (3 cubic splines and a variable counting the number of years that pass without “1s”) are not displayed. Robust standard errors in parentheses; \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%.

Turning to the control variables in our second stage equation, *GDP Per Capita* and *Nuclear Resources* do not have statistically significant effects on the likelihood of predation. These results fail to offer support to the argument that states with limited resources have more to gain from entering the NPT than states that can develop the relevant nuclear technology indigenously. The controls unrelated to resources all have significant effects on predation. *NPT Strength* has a positive effect on the likelihood of a state choosing predation, suggesting that states find it hard to remain outside of the regime as more states enter the treaty—regardless of whether they plan on complying or not. Table 3 displays the conditional probabilities of predation when the statistically significant variables are shifted from low to high values and all other factors are held at their mean. We see from

this table that *NPT Strength* also has a substantively significant effect on predation. Increasing the value of this variable from ½ standard deviation below its mean to ½ standard deviation above its mean increases the probability of predation by .38, from .09 to .47. *Fatal MID* increases the likelihood of predation, which suggests that states turn to this strategy when they may be especially sensitive to relative gains considerations (e.g. Waltz, 1979) or when infrastructure may be in need of repair (e.g. Iqbal, 2006). From a substantive standpoint, experiencing a MID that results in at least one fatality increases the probability of predation by .626, from .103 to .729.

*Diplomatic Isolation* has a negative effect on the likelihood of predation, contrary to expectations. Increasing the value of *Diplomatic Isolation* from ½ standard deviation below the mean to ½ standard deviation above the mean increases the conditional likelihood of predation by .209, from .143 to .352. This is the most modest substantive effect produced by any of the statistically significant variables. *Openness* has a positive effect of predation, suggesting that states are more likely to predate as their exposure to the global economy increases. Substantively, increasing the value of *Openness* from ½ standard deviation below its mean to ½ standard deviation above its mean increases the probability of predation by .587, from .038

**Figure 1: Conditional Probabilities of Predation**



Note: Conditional probabilities are calculated based on Model 4 in Table 2.

**Table 3: Effect of Changes in Control Variables on the Conditional Probability of Predation**

<u>Independent Variable</u>	<u>Low Value</u>	<u>High Value</u>	<u>Pr Change</u>
NPT Strength	.085	.469	.384
Fatal MID	.103	.729	.626
Diplomatic Isolation	.143	.352	.209
Openness	.038	.625	.587
Cold War	.130	.936	.836

Notes: Calculations are based on Model 4 in Table 2. The “low” and “high” values for the continuous variables are one-half standard deviation below the mean and one-half standard deviation above the mean, respectively. The “low” and “high” value for the dummy variable is 0 and 1, respectively.

to .625. The results of these two variables suggest that political and economic isolation increases the likelihood of exit, which is contrary to our expectations. Insights from comparative politics reveal that actors who are isolated often lack trust (e.g. Putnam 1993). By this logic, it is possible that isolated states do not have sufficient trust to believe that others will fulfill their Article IV commitment to provide nuclear technology for peaceful purposes to members of the NPT. It is also possible that economically and diplomatically isolated governments prefer to avoid multilateral forums. Isolation—whether as a means to defy the international community (e.g. China in the 1930s) or simply a reflection of a state’s preferences (e.g. the United States after World War I)—may reflect states’ willingness to remain outside international forums. Since predation requires entering an institution (e.g. the NPT), it is possible that it is simply not considered by isolated states.

Finally, *Cold War* has a positive and statistically significant effect on predation and it is the only variable in the model that has a larger substantive effect than *Democracy*. This suggests that the polarity of the system influences states’ affinity for predation. It also indicates that states find it hard to remain outside of the NPT in the current era—even if their intention is to cheat.<sup>28</sup>

## CONCLUSION

Several implications stem from this study. Although the extant literature fails to fully appreciate the distinction between exit and defection, the results discussed above establish that exit and predation are separate forms of non-cooperative behavior motivated by distinct incentives. Our analysis does not challenge the existing literature that identifies the determinants of

proliferation per se (Singh and Way 2004; Jo and Gartzke 2007). Rather, we build on this literature by focusing on which non-cooperative strategy states select when proliferating. Laboratory experiments have long-established that individuals treat exit and (what we call) predation as distinct strategies.<sup>29</sup> Our research lends support for these findings in the real world by demonstrating that the motivations underpinning these two strategies are quite different.<sup>30</sup> We argue in this paper that a state’s regime type sheds light on whether they will choose exit or predation. Democracies are less likely to engage in predation because the perceived costs of this strategy are greater relative to non-democracies. Specifically, democratic states expect that their commitments will be enforced, that their nuclear programs are more likely to be exposed, and that domestic audience costs are more likely to result from predation than exit. The empirical results lend robust support to this argument and contribute to a growing body of literature addressing the relationship between regime type and legalization (e.g. Gaubatz 1996; Simmons 2000; Landman 2005; Hathaway 2007; Vreeland 2008).

The strategy a state selects has important consequences. Understanding when states choose exit and when they choose predation could be useful in identifying the outcomes of non-compliant behavior—in this case, whether states will acquire nuclear weapons. Predation may allow states to acquire nuclear weapons more quickly because it makes it easier to acquire relevant technology for “peaceful purposes” and divert this technology to a weapons program. In recognizing this distinction, we build on existing studies that have attempted to gain a better understanding of *how* states proliferate (Braun and Chyba 2004; Montgomery 2005; Kroenig 2008; Fuhrmann 2008).

There is a large and important literature on regime effectiveness (e.g. Mitchell 1994; Hasenclever, Mayer and Rittberger 1997;

Young 2003). While different incentives lead to exit or predation, both forms of non-compliant behavior may hurt the regime. Exit is particularly costly because it mitigates many of the potential benefits of regimes. Understanding these differences, and working to design institutions that address the unique problems these behaviors pose, has both theoretical and substantive importance. Some of the variables in our study that are statistically significant (e.g. democracy and conflict) represent state characteristics that do not easily lend themselves to manipulation. This represents a cautionary tail concerning the capacity of institutions to impact exit. By contrast, diplomatic and economic isolation are variables that external players can alter to some extent. Based on our findings, governments and institutions interested in reducing the likelihood of exit might consider working to diplomatically and economically integrate states into the international system. This may increase states' willingness to enter the institution—then it is up to the regime to alter the state's behavior.

Our study suggests a compelling dilemma that extends beyond the NPT, and that afflicts international institutions generally. The question is whether or not to permit demonstrated non-compliant

states entrance to institutions. On one hand is a “rein them in” argument which holds that admitting rogue governments offers the international community the possibility of modifying their behavior. On the other hand, admitting a rogue state also offers the potential to undermine the institution if governments continue their non-cooperative behavior.<sup>31</sup> Indeed, this is precisely the issue currently being debated with several nonproliferation arrangements (Zaborsky 2004). While our results can not resolve this debate, we have identified a set of characteristics that are associated with predation. In doing so, we have opened avenues for further research.

In a general sense, our findings encourage further work on the various types of non-compliant behavior states can engage in and the implications of such actions. In particular, future research should explore whether a similar distinction between exit and predation can be made in other issue areas. Evidence of such a distinction would lend further credibility to our argument. It would also be interesting to conduct comparative analysis of regimes to systematically determine the implications of predation and exit in international politics.

## References

- Albright, David, and Corey Hinderstein. 2005. "Unraveling the AQ Khan and Future Proliferation Networks." *The Washington Quarterly* 28 (2):111-28.
- Albright, David, and Kevin O'Neill, eds. 2000. *Solving the North Korean Nuclear Puzzle*. Washington, D.C.: Institute for Science and International Security.
- Asculai, Ephraim. 2004. "Rethinking the Nuclear Non-Proliferation Regime." *Memorandum No. 70*. Tel Aviv: Jaffee Center for Strategic Studies.
- Ashlock, D., M. Smucker, E. Ann Stanley, and Leigh Tesfatsion. 1996. "Preferential Partner Selection in an Evolutionary Study of Prisoner's Dilemma." *BioSystems* 37 (1-2):99-125.
- Axelrod, Robert, and Robert O. Keohane. 1985. "Achieving Cooperation Under Anarchy: Strategies and Institutions." *World Politics* 38 (1):226-54.
- Barbieri, Katherine. 1996. "Economic Interdependence: A Path to Peace or a Source of Interstate Conflict," *Journal of Peace Research*, 33(1): 29-49
- Barretto, Paulo, and Ana Maria Cetto. 2004. "IAEA Technical Cooperation and the NPT?" *IAEA Bulletin* 46 (2):28-30. [http://www.iaea.org/Publications/Magazines/Bulletin/Bull462/technical\\_cooperation.html](http://www.iaea.org/Publications/Magazines/Bulletin/Bull462/technical_cooperation.html) (02/27/2007)
- Bayer, Re\_at. 2006. "Diplomatic Exchange Data Set, v2006.1." <http://www.correlatesofwar.org>.
- Bennett, D. Scott, and Allan Stam. 2000. "EUGene: A Conceptual Manual." *International Interactions* 26 (2):179-204.
- Boehmer, Charles, Erik Gartzke and Timothy Nortstrom. 2004. "Do Intergovernmental Organizations Promote Peace?" *World Politics* 57(1): 1-38.
- Bueno de Mesquita, Bruce and Randolph Siverson. 1995. "War and the Survival of Political Leaders: A Comparative Study of Regime Types and Political Accountability." *American Political Science Review* 89(4): 841-55.
- Caprioli, Mary and Peter Trumbore. 2005. "Rhetoric versus Reality: Rogue States in Interstate Conflict," *Journal of Conflict Resolution* 49(5): 770-791.
- Center for Nonproliferation Studies. 2005. "NPT Membership." <http://www.cns.miis.edu/pubs/inven/pdfs/apmnpt.pdf> (02/27/2007)
- Chan, Steve. 2004. "Influence of International Organizations on Great-Power War Involvement: A Preliminary Analysis," *International Politics* 41: 127-143.
- Deutsch, Karl W., Sidney Burrell, Robert Kann, Maurice Lee, Martin Lichterman, Raymond Lindgren, Francis Loewenheim, and Richard van Wagenen. 1957. *Political Community and the North Atlantic Area*. Princeton, N.J.: Princeton University Press.
- Downs, George and David Rocke. 1995. *Optimal Imperfection? Domestic Uncertainty and Institutions in International Relations*. Princeton, NJ: Princeton University Press.
- Downs, George, David Rocke, and Peter Barsoom. 1996. "Is the Good News about Compliance Good News about Cooperation?" *International Organization* 50 (3):379-406.
- Doyle, Michael. 1983. "Kant, Liberal Legacies, and Foreign Affairs." *Philosophy and Public Affairs* 12 (3):205-35.
- Fearon, James D. 1994. "Domestic Political Audiences and the Escalation of International Disputes." *American Political Science Review* 88 (3):597-616.
- Fuhrmann, Matthew. 2008. "Taking a Walk on the Supply Side: The Determinants of Civilian Nuclear Cooperation." Cambridge, MA: Harvard University. [http://belfercenter.ksg.harvard.edu/files/uploads/Fuhrmann\\_Taking\\_A\\_Walk\\_on\\_the\\_Supply\\_Side.pdf](http://belfercenter.ksg.harvard.edu/files/uploads/Fuhrmann_Taking_A_Walk_on_the_Supply_Side.pdf).
- Gartzke, Erik, Quan Li and Charles Boehmer. 2001. "Investing in the Peace: Economic Interdependence and International Conflict," 55: 391-438.
- Gaubatz, Kurt Taylor. 1996. "Democratic States and Commitment in International Relations." *International Organization* 50 (1):109-39.
- Geldenhuis, Deon. 1991. *Isolated States: A Comparative Analysis*. London: Cambridge University Press.
- Ghosn, Faten, Glenn Palmer, and Stuart Bremer. 2004. "The MID3 Data Set, 1993-2001: Procedures, Coding Rules, and Description." *Conflict Management and Peace Science* 21 (2):133-54.
- Gibler, Douglas M., and Meredith Sarkees. Forthcoming. "Measuring Alliances: the Correlates of War Formal Interstate Alliance Data set, 1816-2000." *Journal of Peace Research*.
- Hafner-Burton, Emilie and Alexander Montgomery. 2006. "Power Positions: International Organizations, Social Networks, and Conflict," *Journal of Conflict Resolution* 50(1): 3-27.
- Hanson, Marianne. 2005. "The Future of the NPT." *Australian Journal of International Affairs* 59 (3):301-16.
- Hasenclever, Andreas, Peter Mayer, and Volker Rittberger. 1997. *Theories of International Regimes*. Cambridge: Cambridge University Press.
- Hathaway, Oona. 2007. "Why Do Countries Commit to Human Rights Treaties?" *Journal of Conflict Resolution* 51: 588-621.
- Heckman, James J. (1979). "Sample Selection Bias as a Specification Error." *Econometrica* 47(1): 153-162.
- Hirshleiver, David, and Eric Rasmusen. 1989. "Cooperation in a Repeated Prisoner's Dilemma with Ostracism." *Journal of Economic Behavior and Organization* 12 (1):87-106.
- Iqbal, Zaryab. 2006. "Health and Human Security: The Public Health Impact of Violent Conflict." *International Studies Quarterly* 50 (3):631-49.
- Jervis, Robert. 1982. "Security Regimes," *International Organization* 36(2): 357-378.
- Jo, Dong-Joon, and Erik Gartzke. 2007. "Determinants of Nuclear Weapons Proliferation." *Journal of Conflict Resolution* 51 (1):1-28.
- Kapur, A. 2001. *Pokhran and beyond: India's nuclear behavior*. New Delhi: Oxford University Press.
- Keohane, Robert O. 1984. *After Hegemony: Cooperation and Discord in the World Political Economy*. Princeton, NJ: Princeton University Press.
- Kimball, Daryl. 2003. "Turning Iran Away from Nuclear Weapons." *Arms Control Today*.
- Krasner, Stephen, ed. 1982. *International Regimes*. Ithaca, NY: Cornell University Press.
- Kroenig, Matthew. 2008. "Importing the Bomb: Sensitive Nuclear Assistance and Nuclear Proliferation." Cambridge, MA: Harvard University. [http://belfercenter.ksg.harvard.edu/files/uploads/Kroenig\\_Importing\\_the\\_Bomb.pdf](http://belfercenter.ksg.harvard.edu/files/uploads/Kroenig_Importing_the_Bomb.pdf).
- Landman, Todd. 2005. *Protecting Human Rights: A Comparative Study*. Washington, D.C.: Georgetown University Press.
- Marshall, Monty, Ted Gurr and Barbara Harff. 2001. "PITF Problem Set Codebook," *Political Instability Task Force*. <http://globalpolicy.gmu.edu/pitf/pitfcode.htm>.
- Mercer, Jonathan. 1996. *Reputation and International Politics*. Ithaca, NY: Cornell University Press.
- McGillivray, Fiona and Alastair Smith. 2006. "Credibility in Compliance and Punishment: Leader Specific Punishments and Credibility." *The Journal of Politics* 68 (2): 248-258.

- Mitchell, Ronald B. 1994. "Regime Design Matters: Intentional Oil Pollution and Treaty Compliance." *International Organization* 48 (3):425-58.
- Morikawa, Tomonori, John M. Orbell, and Audun S. Runde. 1995. "The Advantage of Being Moderately Cooperative." *American Political Science Review* 89 (3):601-11.
- Morrow, James. 2001. "The Institutional Features of the Prisoner of War Treaties." *International Organization* 55(3): 971-991
- Olson, Mancur, and Richard Zekhauser. 1966. "An Economic Theory of Alliances." *Review of Economics and Statistics* 48 (3):266-79.
- Orbell, John, and Robyn M. Dawes. 1991. "A Cognitive Miser's Theory of Cooperators Advantage." *American Political Science Review* 85 (2):515-28.
- . 1993. "Social Welfare, Cooperators' Advantage, and the Option of Not Playing The Game." *American Sociological Review* 58 (6):787-800.
- Orbell, John, Peregrine Schwartz-Shea, and Randy T. Simmons. 1984. "Do Cooperators Exit More Readily than Defectors." *American Political Science Review* 78 (1):147-262.
- Paul, Thazha Varkey. 2000. *Power versus Prudence: Why Nations Forgo Nuclear Weapons*. Montreal: McGill-Queen's University Press.
- Peck, JR. 1993. "Friendship and the Evolution of Cooperation." *Journal of Theoretical Biology* 162 (2):195-228.
- Pevehouse, Jon, Timothy Nordstrom, and Kevin Warnke. 2003. "Intergovernmental Organizations, 1815-2000: A New Correlates of War Data Set."
- Putnam, Robert. 1993. *Making Democracy Work: Civic Traditions in Modern Italy*. Princeton, NJ: Princeton University Press.
- Qeester, G. H. 1973. *The Politics of Nuclear Proliferation*. Baltimore: Johns Hopkins University Press.
- Russett, Bruce, John Oneal, and David Davis. 1998. "The Third Leg of the Kantian Tripod for Peace: International Organizations and Militarized Disputes, 1950-1985." *International Organization* 52 (3):441-67.
- Russett, Bruce and John Oneal. 2001. *Triangulating Peace: Democracy, Inteterdependence, and International Organizations*. New York: W.W. Norton.
- Sagan, Scott. 1996-97. "Why Do States Build Nuclear Weapons? Three Models in Search of a Bomb." *International Security* 21 (3):54-86.
- Sasikumar, Karthika. and Christopher Way. 2007. "Leaders and Laggards: When and Why Do Countries Sign the NPT?" Paper presented at the annual meeting of the International Studies Association 48th Annual Convention, February 28, 2007.
- Schelling, Thomas. 1960. *The Strategy of Conflict*. Cambridge, UK: Cambridge University Press.
- Semmel, Andrew K. 2003. "Statement to the Second Session of the Preparatory Committee for the 2005 NPT Review Conference." Geneva, Switzerland. <http://usmission.ch/press2003/0507semmel.htm> (02/27/2007)
- Simmons, Beth A. 2000. "International Law and State Behavior: Commitment and Compliance in International Monetary Affairs." *American Political Science Review* 94 (4):819-35.
- Singer, J. David, Stuart Bremer, and John Stuckey. 1972. "Capability Distribution, Uncertainty, and Major Power War, 1820-1965." in Bruce Russett (ed) *Peace, War, and Numbers*, Beverly Hills: Sage, 19-48.
- Singh, Sonali, and Christopher R. Way. 2004. "The Correlates of Nuclear Proliferation: A Quantitative Test." *Journal of Conflict Resolution* 48 (6):859-85.
- Slaughter, Anne Marie. 1995. "International Law In a World of Liberal State," *European Journal of International Law* 6: 503-538.
- Snyder, Glen. 1971. "'Prisoner's Dilemma' and 'Chicken' Models in International Politics." *International Studies Quarterly* 15 (1):66-103.
- Solingen, Eitel. 1994. "The Political Economy of Nuclear Restraint," *International Security* 19(2): 126-169.
- Starr, Harvey. 1997. "Democracy and Integration: Why Democracies Don't Fight Each Other," *Journal of Peace Research* 34(2): 153-162.
- Vanberg, Viktor J., and Roger D. Congleton. 1992. "Rationality, Morality, and Exit." *American Political Science Review* 86 (2):418-31.
- von Stein, Jana. 2004. "Making Promises, Keeping Promises: Democracy, Ratification, and Compliance in International Human Rights Law." *Working manuscript*. Ann Arbor, MI: University of Michigan.
- . 2005. "Selection Bias and Treaty Compliance." *American Political Science Review* 99 (4):611-22.
- Vreeland, James. 2008. "Political Institutions and Human Rights: Why Dictatorships Enter into the United Nations Convention Against Torture." *International Organization* 62(1): 65-101.
- Waltz, Kenneth. 1979. *Theory of International Politics*. New York: McGraw-Hill.
- Weeks, Jessica. 2008. "Autocratic Audience Costs: Regime Type and Signaling Resolve," *International Organization* 62(1): 35-64.
- Wesley, Michael. 2005. "It's Time to Scrap the NPT." *Australian Journal of International Affairs* 59 (3):283-99.
- Yamagishi, T. 1988. "Exit from the Group as an Individualistic Solution to the Free-Rider Problem in the United States and Japan." *Journal of Experimental Psychology* 24.
- Young, Oran. 1979. *Compliance with Public Authority*. Baltimore, MD: Johns Hopkins University Press.
- Young, Oran. 2003. "Determining Regime Effectiveness: A Commentary on the Oslo-Potsdam Solution." *Global Environment Politics* 3 (3):97-104.
- Zaborsky, Victor. 2004. "Does China Belong in the Missile Technology Control Regime." *Arms Control Today* 34 (8). [http://www.armscontrol.org/ACT/2004\\_10/Zaborsky.asp](http://www.armscontrol.org/ACT/2004_10/Zaborsky.asp) (02/27/2007)

## Endnotes

- 1 We use the terms institution and regime interchangeably.
- 2 This excludes the 5 states classified as “nuclear weapons states” according to the NPT, which are entitled to have nuclear weapons under the treaty.
- 3 See for example; Hirschleifer, D. and E. Rasmusen (1989).. Peck, J. (1993). Ashlock, D., M. Smucker, et al. (1996).
- 4 Studies that are couched in terms familiar to political science include: Vanberg, V. and R. Congleton (1992), Morikawa, T. (1995). Orbell, J., P. Schwartz-Shea, et al. (1984). Orbell, J. and R. Dawes (1991). Orbell, J. and R. Dawes (1993). Yamagishi, T. (1988).
- 5 Since the IAEA’s inception in 1957, the organization has provided direct technical assistance to member states valued at \$1.3 billion. Prior to the 1990s, NPT members were especially more likely to receive such technical assistance (Baretto and Cetto 2004).
- 6 For a competing perspective see Mercer (1996).
- 7 North Korea was very reluctant to publicly acknowledge the presence of its civilian nuclear infrastructure and subject its reactors to International Atomic Energy Agency (IAEA) safeguards, as mandated by the NPT (United States, 1987).
- 8 South Africa’s experience illustrates this well. Throughout the 1970s, when South Africa was pursuing nuclear weapons, it conducted weapon-related activities under a cloak of secrecy. However, in March 1993—after South Africa had become a democracy—President F.W. de Klerk announced that the country had secretly developed and subsequently dismantled seven nuclear weapons. This unprecedented announcement was “startling in its candor,” as were subsequent revelations of past bomb-related activities (Albright, 1994: 37).
- 9 This is not to suggest that autocratic leaders do not face audience costs, just that they are less concerned with these costs than democratic leaders. For more on autocratic audience costs see Weeks (2008).
- 10 These models have been used widely in international relations. See Reed (2000).
- 11 We begin our investigation in 1968 because this was the year that the NPT was opened for signatures. Consequently, it was the first year that states had the opportunity to engage in predation. We end our investigation in 2000 because this is the final year that much of our data are available.
- 12 This does not include the five states that signed the NPT as nuclear weapons states (China, UK, USA, France, and Russia). States are not included in our second stage analysis once they acquire nuclear weapons. Leaving these countries in our analysis does not change the results.
- 13 We also coded the DV as 1 for only years when a state was exploring but had not yet acquired nuclear weapons. This alternate coding produces estimates that are virtually identical.
- 14 Singh and Way (2004) base their coding of this variable on version 3.0 of the Correlates of War alliance data (Gibler and Sarkees, 2002).
- 15 Singh and Way (2004) code states as democracies if they have a score of at least 7 on the Polity IV scale.
- 16 Singh and Way (2004) collect data on states’ exploration, pursuit, and acquisition of nuclear weapons. We rely on their data on exploration because this minimum threshold indicates that a state is violating its commitment (e.g. engaging in predation).
- 17 Of the 269 country years in our analysis of predation, 169 are coded 0 and 100 are coded 1.
- 18 States with Polity scores of less than 1 are generally considered to be autocracies (Marshall, Gurr and Harff, 2001). This is an appropriate cutoff point because it allows us to distinguish among autocracies and non-autocracies.
- 19 Vanhanen (2000) calculates measures for competition and participation, multiplies them together, and divides this product by 100 to obtain an index of democracy. Competition is calculated by subtracting the percentage of votes won by the largest party by 100 and participation is the percentage of a country’s total population that voted in an election. This variable ranges from 0 to 47.
- 20 These data are taken from Singh and Way (2004).
- 21 These components include uranium deposits, metallurgists, chemical engineers, nuclear engineers, electronic/explosive specialists, nitric acid production capacity, and electricity production capacity (Jo and Gartzke 2007).
- 22 For example, in 1981 Israeli air strikes destroyed Iraqi nuclear facilities at Osiraq.
- 23 This is similar to a measure that Jo and Gartzke (2007) included in the model of nuclear proliferation.
- 24 Distance data are collecting using EUGene (Bennett and Stam 2000).
- 25 We rescale this variable between 0 and 100. The COW diplomatic exchange data are available in five-year intervals. We replace the missing data with lags.
- 26 These studies find support for democracy-related hypotheses in some models, but the finding is sensitive to model specifications.
- 27 These values correspond to -4.1 and 3.5 on the Polity scale, respectively.
- 28 Only four states remain outside of the NPT today: Israel, Pakistan, India, and North Korea. Pyongyang ratified the treaty in 1985 but subsequently withdrew from it in 2003.
- 29 Note however, that our definition of exit is more restrictive, in that it includes only non-cooperative exit.
- 30 See for example Orbell and Daws (1993). Of course the substantive domain for our study is very different than that constructed in a laboratory setting.
- 31 The current conflict over Iran’s nuclear program is a case in point.

## Department of International Affairs Faculty

**Christopher Allen, Ph.D.**, Brandeis, specializes in Comparative Politics, European Politics, Germany, labor relations, welfare states.

**Jeffrey Berejikian, Ph.D.**, Oregon, specializes in International Relations, decision-making, political economy, environmental politics, political psychology, methodology.

**Gary Bertsch, Director, CITS, Ph.D.**, Oregon, Emeritus Professor, specializes in Comparative Politics and IR, Russia, Eastern Europe, arms control, security issues, trade policy.

**Mia Bloom, Ph.D.**, Columbia, specializes in international terrorism, comparative politics, gender and conflict.

**Ann Herbert Bodansky, J.D., Virginia, Ph.D.**, University of California-Berkeley, specializes in international law, international organizations, human rights, international ethics.

**William Chittick, Ph.D.**, Johns Hopkins, Emeritus Associate Professor, specializes in American foreign policy.

**Markus Crepaz, Ph.D.**, University of California, San Diego, specializes in Comparative Politics, Austria and Central Europe, corporatism, methodologies, political institutions, democracy.

**Loch Johnson, Ph.D.**, University of California, Riverside, Regents Professor, specializes in International Relations, American foreign policy, congressional-executive relations, intelligence and national security.

**Sherry Lowrance, Ph.D.**, Texas, specializes in Middle Eastern politics, U.S. foreign policy, and the Israel-Palestinian Conflict.

**Abdulahi Osman, Ph.D.**, Wayne State, specializes in African politics, the Third World, conflict and conflict resolution.

**Han Park, Director, GLOBIS, Ph.D.**, Minnesota, University Professor, specializes in Comparative Politics, developing areas, Asia, Korea.

**Douglas Stinnett, Ph.D.**, Illinois, specializes in international institutions, international trade agreements, international organizations.

**Patricia Sullivan, Ph.D.**, University of California-Davis, specializes in international relations, foreign and security policy, global issues, strategic policy.

**Brock Tessman, Ph.D.**, Colorado, specializes in foreign policy, international security, conflict processes.

**Jaroslav Tir, Ph.D.**, Illinois, specializes in International Relations, IR theory, ethnic conflict, conflict management, territorial disputes, environmental issues.

**Maurits van der Veen, Ph.D.**, Harvard, specializes in International Relations, comparative political economy, methodology, foreign aid, European politics, international institutions.

**Howard J. Wiarda, Dean Rusk Chair and Head of Department, Ph.D.**, Florida, specializes in comparative politics, Latin America, Southern & Eastern Europe, Russia, Asia, South Africa, developing areas, democratization, foreign policy, civil society.

**Ieda Siqueria Wiarda, Ph.D.**, Florida, specializes in Latin American politics, Inter-American relations, Brazil and the Portuguese world, appointment in Political Science.