Greasing the Wheels of the Nuclear Nonproliferation Regime: The Political Economy of Nuclear Suppliers Group Rules

Jason Enia

Department of Political Science, Sam Houston State University, Huntsville, TX, USA

ABSTRACT
Within the nuclear nonproliferation regime, the Nuclear Suppliers Group (NSG) is an important, but relatively underexplored, topic. Given the voluntary limitations member states have agreed to accept since 1974, the rules of the NSG must provide some benefit to the parties involved. This paper employs a political economy lens and explores these benefits through the language of transaction costs. What are the ways in which the rules of the NSG mitigate the transaction cost problems associated with cooperation and coordination in the international system? How have these rules evolved over time to keep pace with changes in transaction costs? In wrestling with these questions, this paper explores one of the major institutions of the nonproliferation regime and lends further credence to the argument that the efficacy of the regime cannot be measured by looking solely at the Nuclear Nonproliferation Treaty (NPT).

Introduction
In a particular light, the Nuclear Suppliers Group (NSG) is a remarkable institution. Since 1974, member countries have voluntarily agreed to change their domestic laws, regulations, and procedures for exporting and/or importing nuclear materials and related dual-use technologies. These changes are not based on a specific NSG treaty nor on a single set of procedures but instead on agreed-upon sets of guidelines and product lists. Countries change their own domestic institutions in order to meet the guidelines. The NSG has no enforcement mechanism. It has no specific dispute resolution mechanism. And yet, while the NSG has not been tension free, the level of cooperation on a thorny issue at the intersection of security and economic development has been impressive (Gheorghe 2019). Even countries on the outside of the Treaty on the Non-Proliferation of Nuclear Weapons (NPT) are interested in joining (e.g. India, Pakistan, possibly Israel).

Why has this worked? In the trade of nuclear and dual-use technologies, countries have powerful economic incentives that would seem to push against voluntarily changing domestic regulations based on a relatively informal set of guidelines. The most obvious is the incentive to “undercut” those abiding by the NSG guidelines and capture the market by selling and/or buying without concern for proliferation. For countries to forgo these
benefits, there must be some larger benefits provided by abiding by the institutions of the NSG. From a political economy perspective, the NSG must be reducing transaction costs in ways that are beneficial for its members and non-member adherents.

In this light, analysis of the institutional features of the NSG becomes critical for thinking about the nuclear nonproliferation regime more broadly. Scholars of international regimes have long held that regime analysis must be multidimensional, exploring the relationships between convergence of expectations (Krasner 1983; Smith 1987; Müller 1993), norms (Hasenclever, Mayer, and Rittberger 1997; Rublee 2008, 2009), and behaviors as a whole (Tate 1990; Müller 1995). In recent years, nonproliferation scholars have moved much of the analysis away from the NPT, the regime’s cornerstone treaty, and focused on its other institutions: the International Atomic Energy Agency (IAEA), nuclear weapon free zones (NWFZs) (e.g. Kutchesfahani 2019), United Nations Security Council Resolution 1540 (UNSCR 1540) (e.g. Shirazyan 2019), 123 agreements (e.g. Kerr and Nikitin 2011), the Proliferation Security Initiative (PSI) (e.g. Nguyen and Yim 2019), and the Non-Proliferation and Disarmament Initiative (e.g. Kurosawa 2020), among others. This research has provided a stronger basis for assessing the health and robustness of the regime (Fields and Enia 2009; Knopf 2016; Enia and Fields 2018).

This paper builds on this trend and contributes to the nuclear nonproliferation regime research in two novel ways. First, it utilizes a political economy framework focused on transaction costs and institutions as the basis for analysis. Many of the propositions associated with this framework have not been explored in a security setting. This paper offers a single-case test of these propositions. Second, the paper focuses on the NSG, a relatively underexplored institution in the context of its relationship to the broader regime. The paper explores three related questions: (1) What are the specific obstacles to effective and efficient cooperation within the nonproliferation regime? (2) How are these transaction-cost obstacles mitigated through the specific institutional design of the NSG? (3) How the answers to the first two questions aid our understanding of the health and effectiveness of the broader nuclear nonproliferation regime?

Obstacles to Cooperation and the Demand for Governance

Since the early 1980s, several strands of research in international institutions and international political economy more broadly have pulled the language and framework of microeconomics into the study of international regimes and institutions. This approach places analytical focus on the ways in which different types of institutions mitigate the challenges of an anarchic international system (Keohane 1982, 1984; Oye 1985; Martin 1992; Koremenos, Lipson, and Snidal 2001). In the context of an international system lacking “authoritative governmental institutions” and “characterized by pervasive uncertainty” (Keohane 1982, 332), states choose different features of international institutions as a means of mitigating specific cooperation challenges. These include challenges associated with information and uncertainty, time-inconsistency and commitment, the distribution of costs and benefits, and free riding and enforcement.

In any cooperative exchange information is critical. In an anarchic international system in which states have incentives to misinform, information-related challenges are even more acute and uncertainty abounds. These obstacles cover three areas: information about others’ preferences, information about the present and future states of the
world, and information about whether states are cooperating or defecting. As states attempt to solve problems cooperatively, the first information challenge they face is uncertainty about the other’s preferences (Koremenos 2016, 38–39). To the extent that each is stating its preferences, is it stating them accurately or obfuscating? Is there signaling going on that reinforces or contradicts the stated preferences? Do the preferences seem consistent with domestic political incentives? Second, states encounter significant uncertainty in thinking about how decisions made in the present might influence the future (Downs and Rocke 1995; Koremenos, Lipson, and Snidal 2001, 773; Koremenos 2005; Marcoux 2009). It can be difficult for states to comprehend the distributional implications of a new agreement (Koremenos 2001, 292, 2016, 39). In addition, it is often difficult for parties to “be able to make confident predictions at the outset regarding the benefits likely to flow from alternative institutional arrangements” (Young 1991, 288–89). Finally, once cooperative arrangements are made, information challenges often make it difficult to discern and decide whether a state is cooperating or reneging (Keohane 1984; Chayes and Chayes 1993; Fearon 1998). Although on its face this appears to be a problem for institutions ex post, it also makes for a significant problem ex ante as it can make it difficult for states to come to an agreement in the first place.

In any cooperative agreement there may be one or more types of commitment challenges present. In these cases, it is difficult for one or more parties to credibly commit to upholding its end of the cooperation even if that party is verbally willing to commit to cooperating at the time of the agreement. These can be time-inconsistency problems where one or more of the parties has incentives to cooperate in the present that are likely to change in the future (Kydland and Prescott 1977). They can also arise in the face of domestic incentives that will make it hard to uphold any deal. Commitment challenges are more pressing in the face of information challenges, and as such signaling becomes a priority (Fearon 1995; Powell 2006).

Similar to any bargaining environment, the parties may have different preferences with respect to the distribution of costs and benefits within any potential cooperative arrangement (Keohane 1982; Haas 1990; Martin 1992, 779; Koremenos, Lipson, and Snidal 2001). If either the underlying issue or one of the sub-issues being negotiated has a zero-sum quality, then the distribution issues can make cooperation even more challenging (Koremenos 2016, 33).

Finally, free riding and enforcement challenges vary based on the specific types of public good being produced (e.g. Martin 1992; Sandler 2004 among many others). Collaboration challenges (e.g. prisoners’ dilemma games) are rooted in incentives to defect. While cooperation may make all parties better off, individual states may be better off if they free-ride while the others cooperate. For coordination challenges (e.g. battle of the sexes games), states need to identify the focal point that contributes to a cooperative outcome (Schelling, Thomas C 1980). For “suasion games” states that are the largest contributors to public goods need to persuade or coerce other states in an attempt to get around those other states’ incentives to free ride (Martin 1992, 778). Given that the international system has no third-party enforcement mechanism outside of other state-actors, it is relatively more difficult to punish free riders than it is in other contexts.

Analytically, it is useful to think about each of these concerns as a cost of transacting (North 1990, 27) as it simplifies the theoretical expectations. As the costs of transacting
increase, the likelihood of completing the transaction decreases. This expectation holds for transactions involving exchanges of goods, but it also applies to transactions aimed at cooperation and coordination. This is certainly true in international cooperation (Keohane 1984). Institutions are the formal and informal rules of the game designed to reduce transaction costs in a way that allows for political and economic exchange (North 1990). In order to understand the institutions (rules) associated with the NSG and their relationship to the larger nonproliferation regime, it is necessary to think about why it is costly to transact in the regime (North 1990, 28) and the ways that the NSG’s rules have been designed and have evolved to mitigate these challenges.

Despite three decades of scholarship on the political economy of regimes and their institutions, very little of it has focused on security regimes. In some early and still influential thinking on the issue, Jervis (1982) put forth a series of ideas about why the security realm is different: greater competitiveness, offensive and defensive behavior leading to similar outcomes, higher stakes, and the difficulty of measuring one’s own security. Indeed, with few exceptions, the rational choice literature on regimes (i.e. the neoliberal institutionalist “demand for regimes” literature and the “rational design of international institutions” literature) has largely ignored security regimes.

But are security regimes really that different? Surely, even after granting Jervis’ arguments, security regimes face similar, fundamental challenges. Even amongst states that join security regimes voluntarily, competitiveness and the difficulties in distinguishing between the effects of offensive and defensive behavior make the information-related challenges of property rights enforcement seem particularly acute. Transaction cost considerations would seem to inhibit exchange in a security context as much as they would in any other (Verdier 2008). Finally, similar to other types of regimes, security regimes often involve the provision of a variety of different types of public goods each with unique collective action challenges (Enia 2014).

**Governance in the NSG**

The NSG emerged in 1974 as a series of rules – institutions – creating the first global, multilateral export control system designed to prevent the spread of nuclear weapons (Koch 2019). India’s so-called “peaceful nuclear explosion” (PNE) in 1974 was a primary motivator for the initial meeting of the “London Club” of seven suppliers. A Canadian-supplied reactor and US-supplied heavy water helped to generate the plutonium for the Indian device, and this presented an early “period of crisis” for the nonproliferation regime based on that the “threats to regime stability originating from the ambiguities of ‘peaceful’ uses,” (Nye 1981, 18–19) especially those referenced in NPT Article III sections 2 and 3 and Article IV.

Before moving through several of the key institutional features of the NSG, it is important to set out expectations based on the conversation in the preceding section. To the extent that the NSG is meeting the specific demands predicted by the literature

---

1Koremenos (2001) applies her theory of regime uncertainty to the NPT. Her later work is noteworthy for its random selection of cases, some of which are security regimes (Koremenos 2005, 2016). Verdier (2008) is also noteworthy for its exploration of the optimal use of bilateral and multilateral instruments in the nuclear nonproliferation regime.
discussed above, I would expect to see evidence that it is mitigating/solving the challenges set out in Table 1.

Since the inception of the NSG, its organization, rules, and procedures have been designed to address these issues. In fact, some of the ways in which the specific challenges play out in the context of nuclear nonproliferation are the direct result of the vagueness in the NPT. Exploring the ways in which the NSG solves some of these issues is not only valuable for understanding the institution; it provides insight into the ways the NSG intersects with the larger nonproliferation regime. These are summarized in Table 2.

Arguably, the NSG’s most important transaction-cost-related function is helping states overcome information challenges. It is useful to view the circumstances around the 1974 Indian PNE through this lens. The roles of the Canadian-supplied reactor and US-supplied heavy water highlighted the critical information challenge at the core of the peaceful exchange of nuclear materials: it is very difficult to discern recipient preferences about the use of nuclear and dual-use materials. The NSG has established two sets of guidelines that help combat these ambiguities. In 1978, NSG published INFCIRC/254 which established specific guidelines for the transfer of nuclear-related materials as well as a trigger list of items for which the guidelines would apply. Following revelations about the Iraqi nuclear program, the NSG amended INFCIRC/254 in 1992 revising the guidelines concerning the transfer of dual-use equipment, materials, and technology. In the context of my analytical framework, the guidelines and trigger list perform four inter-related functions. First, they require recipient states to give formal assurances regarding their peaceful use of the materials. On the surface, this may seem trivial, as the recipient state could of course go back on its assurances once the material is in hand. However, the

| Table 1. Transaction costs facing cooperation on nuclear nonproliferation. |
|---------------------------------------------------------------|
| Information Challenges | Regarding exchange of nuclear materials                  |
| General               |                                                              |
| Information about others’ preferences | Other state’s perceptions about their security environments, their energy/economic development needs, and the relationship between the two |
| Information about the present and future | Information about other state’s preferences, commitments to nonproliferation; |
| Information about compliance | Arriving at mutually-agreed definitions of compliance and cheating; information about when state is cheating or in compliance |
| Commitment Challenges | Regarding exchange of nuclear materials                   |
| General               |                                                              |
| Credible commitment issues due to time-inconsistency | Upholding commitments challenging if future offers clear opportunity to capture market by undercutting |
| Credible commitment issues associated with domestic political incentives | Issues closely linked to energy politics; concentrated interests in supplier and recipient countries; links to economic development |
| Tensions over Distribution of Costs & Benefits | Regarding exchange of nuclear materials                   |
| General               |                                                              |
| Distributional issues | Tension between NWS and NNWS; tension between responsibilities of NWS in NPT Article IV and dual-use technologies |
| Free-Riding and Improving Enforcement | Regarding exchange of nuclear materials                   |
| General               |                                                              |
| Free-riding challenges | Incentives for states to capitalize on supply restrictions by “undercutting” |
| Focal points in coordination games | Coordinating lists of dual-use technologies |
Table 2. Mitigating transaction costs through the NSG.

| Information Challenges | Mitigating role/feature of NSG |
|-------------------------|--------------------------------|
| Information about others’ preferences | • Guidelines require assurances and acceptance of IAEA safeguards by recipients  
• Institutionalized discussion and renegotiation in light of constantly evolving technologies and procedures |
| Information about the present and future | • Guidelines and trigger list set expectations  
• Information about compliance provided quickly to all members  
• Institutionalized discussion and renegotiation in light of constantly evolving technologies and procedures |
| Information about compliance | • Institutionalized renegotiation enforces norms of reciprocation  
• Guidelines and trigger list reduces vagueness of NPT (Article III–IV); sets a more specific marker of cooperation or defection  
• Information about compliance provided quickly to all members |

| Commitment Challenges | Mitigating role/feature of NSG |
|-----------------------|--------------------------------|
| Credible commitment issues due to time-inconsistency | • Institutionalized discussion and renegotiation in light of constantly evolving technologies and procedures |
| Credible commitment issues associated with domestic political incentives | • NSG procedures allow countries to set own domestic laws and procedures to come in line with guidelines; relatively easier to align with domestic political incentives from the start |

| Tensions over Distribution of Costs & Benefits | Mitigating role/feature of NSG |
|-----------------------------------------------|--------------------------------|
| Distributional issues | • Consensus decision rules  
• Institutionalized discussion and renegotiation in light of constantly evolving technologies and procedures  
• NSG procedures allow countries to set own domestic laws and procedures to come in line with guidelines; marginally constrains NSG as cartel (relative to alternative institutional arrangements) |

| Free-Riding and Improving Enforcement | Mitigating role/feature of NSG |
|--------------------------------------|--------------------------------|
| General | • Regular meetings and reevaluation of guidelines, trigger lists, and any transfer denials reduce uncertainties, increase shadow of future |
| Free-riding challenges | • Regular meetings and reevaluation of guidelines, trigger lists, and any transfer denials reduce uncertainties; relative clarity of preferences |
| Focal points in coordination games | • Regular meetings and reevaluation of guidelines, trigger lists, and any transfer denials reduce uncertainties; relative clarity of preferences |

guidelines do put the recipient state on the record in a way that would provide information to future potential suppliers. In recent work, Rebecca Gibbons (2020) argues this is part of the reason supplier states used membership in nuclear nonproliferation regime institutions as a precondition for nuclear supply, particularly after the mid-1970s.

Second, the guidelines and the trigger list provide information that directly addresses the ambiguities over “peaceful uses” and “peaceful activities” in the NPT. These guidelines have “helped to establish a clear standard against which to judge applications to export trigger list items” (Anthony, Ahlström, and Fedchenko 2007, 19). The effect is not simply establishing information; the information in this case dramatically reduces uncertainty and ensures predictability (Tate 1990). As such, the informational function of the NSG addresses both information about compliance as well as expectations about the future state of the world with respect to the issue of nuclear transfers. This was important in the early years after the NPT given the questions of whether nonproliferation policies would be barriers to international nuclear trade (Anthony, Ahlström, and Fedchenko 2007, 19).
The constant re-evaluation of the guidelines and trigger lists also provides regular and re-occurring opportunities for the parties to gather information about changes in each other’s preferences and marginally reduce commitment issues due to time-inconsistencies.

Third, the NSG provides specific information about compliance with its guidelines. This is particularly useful as the NSG operates as a cartel with the nuclear “haves” (the nuclear suppliers) in the position of oligopolists. Despite the profit incentives associated with collusion, one of the inherent challenges in oligopolies is the “problem of policing a collusive agreement” given the potentially larger profit incentives associated with violating it (Stigler 1964, 44, 46). The incentive to undercut the NSG is likely even stronger in cases where a potential buyer has been previously denied, and there have been important instances of noncompliance throughout the NSG’s history (e.g. Braun and Chyba 2004; Kemp 2014). However, compliance issues are more complicated when the other actors are not aware of others’ noncompliance. At their core, these are information challenges (Stigler 1964). In 1992, NSG members produced a Memorandum of Understanding (MOU) that ties together the previous two informational features in an effort to attack these inherent incentives (Nuclear Suppliers Group 1992). Whenever a supplier denies a transaction under NSG guidelines it agrees to immediately notify the rest of the members. Subsequently, the other members cannot supply those materials to the state that has been denied without first consulting with the supplier that originally denied the transaction. In the third year following the denial, the denying state reviews the basis for its initial decision and informs the other suppliers of its conclusions.

Fourth, the structure of the NSG is designed to reinforce the three previous information-related functions. While there is no formal Secretariat for the NSG, the Permanent Mission of Japan to the International Organizations in Vienna acts as the official point of contact, collecting and distributing documents and assisting with the logistics of the annual Plenary meeting. Within the NSG, there are several groups and meetings all designed to promote a continuous flow of information. The NSG Consultative Group (GC) consists of all members and meets at least twice per year, providing members a forum in which they can exchange information on issues of concern related to the guidelines and their various technical provisions. In addition, the annual NSG Plenary meeting begins its week with the NSG Information Exchange Meeting (IEM). The IEM provides members with another forum for sharing information about the challenges of implementing the guidelines. The IEM also includes meetings of various sub-groups, including the NSG Licensing and Enforcement Experts Meeting (LEEM), offering venues for discussion about more specific aspects of implementation. In 2013, the NSG agreed to establish a Technical Experts Group (TEG) to provide the CG with updates on technical advancements in order to ensure that the trigger list and guidelines remain up to date. Finally, in the late 1990s, Los Alamos National Laboratory developed the NSG Information Sharing System (NISS). This secure and networked database allows members to upload and share information in real time about movements of materials and equipment as well as information about transfer denials. This rapid flow of information reduces the chances that a denied party can quickly seek the materials elsewhere. Thus, the NISS is critical in making sure information about a denial is propagated before another country can undercut the NSG and supply to the denied country (Anthony, Ahlström, and Fedchenko 2007, 30–31).
In addition, the fact that the NSG guidelines and trigger list are subject to institutionalized renegotiation in light of technological advancements reduces uncertainty and therefore transaction costs. Koremenos’ research suggests that where the ex ante variance of the outcome of any agreement (due to uncertainty) is large relative to the costs of renegotiating, the “parties will integrate planned renegotiation in to international agreements” (Koremenos 2001, 296). These “voice alternatives” make states “more willing to join such arrangements in the first place and, if problems do arise, to remain loyal to them” (Grieco 1990, 234).

It is worth noting that easing some of the information-related challenges, these features may also have knock-on benefits for the other challenges. For example, improvements in information quality and quantity can help to establish norms of reciprocation (Jervis 1982) – shared understandings based on regime-related information that “regime-supporting behavior will be reciprocated in the future” (Keohane 1982, 343). These repeated interactions can extend the shadow of the future can mitigate the challenges of free-riding or defecting (Axelrod 1984). This is a promising area for future research on the NSG.

Beyond mitigating information challenges, NSG institutions address several other challenges. The flexibility with which the group operates – establishing guidelines and a trigger list and then allowing members to modify their own domestic laws and procedures as necessary – likely emerged out of political necessity. However, it also helps with at least two of the aforementioned challenges. First, it mitigates some of the distributional issues inherent in the regime (Müller and Tokhi 2019). Nonproliferation is inherently discriminatory (Nye 1981, 22), and in one light the NSG’s cartel structure reinforces the divisions between the nuclear weapon states (NWS) and the “have nots” (the non-nuclear weapon states, “NNWS”) in the broader regime, even if on paper the division in the NSG is between nuclear suppliers and nuclear importers. Allowing member states to interpret the guidelines in the context of their own domestic politics and industries, creates a level of heterogeneity within the NSG leading to relatively diversified price structures compared to a purely homogeneous oligopoly. While this obviously does not eliminate the concerns of the NNWS, it is an institutional effect that marginally constrains the power of the NWS.

Second, this domestic flexibility helps combat some of the commitment issues associated with domestic political incentives (Putnam 1988; Cowhey 1993; Fearon 1994). As states make promises within the NSG or the nonproliferation regime more broadly, those promises lack credibility if it is clear that domestic politics will make it difficult to make good on those promises. The flexibility embedded in the NSG’s institutional structures allows member countries are able to navigate toward the guidelines in whatever ways best fits their domestic political realities rather than have to impose a single, agreed-upon set of procedures. Thus, on the margin, commitments made within the NSG are more credible than they would be otherwise.

All bodies within the NSG operate via consensus. This method of decision-making emerged in the context of the original seven suppliers but has remained the modus

---

2In this light, there is a potential cost associated with a move toward using acceptance of the Additional Protocol (AP) as the standard for the transfer of nuclear materials. It may be worth it in the end, but it is important to think through the ways that any increase in standardization of the NSG may have negative consequences.
**What Does This Mean for the Broader Regime?**

It is important to be explicit about the fact that this analysis is predicated on treating the NSG as a component of the larger nuclear nonproliferation regime. By extension, this implies that the nuclear nonproliferation regime is more than the NPT. Regimes contain multiple important norms and institutions and all of these are important for understanding the regime as a whole (Hasenclever, Mayer, and Rittberger 1997; Young and Levy 1999). The health of the nonproliferation enterprise (i.e. the regime overall) cannot be understood without analyzing the ways in which the other institutional pieces (e.g. the NSG) do or do not work to solve some of the inherent challenges states face operating in an anarchic environment (Fields and Enia 2009; Enia and Fields 2018).

In both form and function, the NSG was designed and has evolved to mitigate several of challenges to international cooperation and coordination. Many of these challenges are inherent to cooperation and coordination within the international system. However, in thinking about the way the NSG functions within the broader nonproliferation regime, it is important to recognize that the NPT actually makes a number of these challenges more difficult. The NPT remains a critical statement of first principles and its language the result of political realities of the time. However, a least four of the NPT’s features and effects necessitate institutions like the NSG if the broader regime is to be effective.

First, the NSG is one of the institutions that allows the regime to move past the vagueness of NPT terms like “peaceful use.” In many types of international cooperation, there is an inherent informational challenge associated with compliance: it can be difficult to know whether other states are complying or defecting. However, when the dividing line between compliance and noncompliance is so fuzzy (e.g. “peaceful use”), it makes things more difficult or at least more complicated. In establishing and revising its guidelines and trigger list, the NSG has clarified this line in a way that, relative to the alternatives of no language or vague language, serves the goal of nonproliferation while protecting markets for the other uses for the underlying technologies and materials.

Second, in dividing the world between the NWS and the NNWS, the NPT increases the tensions associated with distributional issues within the regime. Again, it is difficult to imagine that the NPT could have been set up in any other fashion given the political realities of the time. However, nonproliferation efforts are always attempting to overcome “haves” versus “have nots” perceptions, even more so in light of NNWS perceptions about whether the NWS have lived up to their Article VI commitments. In this light, the fact that the NSG gives all suppliers equal decision-making voice through institutionalized consensus, allows member countries to arrive at their own domestic laws and procedures in order to meet the guidelines, and distributes knowledge about evolving technologies, challenges, and strategies related to nuclear transfer serves to alleviate some of these distributional tensions. This is not to say that the NSG completely

*operandi* of the NSG throughout its four decades and growth in membership to forty-eight states. While this increase in membership does raise questions about the efficacy of consensus decision-making in the future, it does serve a useful purpose regarding distributional challenges. Relative to other possible decision-making institutions, consensus is an institutional means of combating power disparities between the NWS and NNWS.
erases these tensions (Latham and Bow 1998; McGoldrick 2011). But if one asks, “Relative to what?” it is easier to see the marginal benefits of the NSG for the regime relative to a world without an institutional arrangement in which states cooperate and coordinate on issues of nuclear transfer.

Third, outside of the United Nations Security Council, the NPT has no specific enforcement mechanism. As such, states within the regime need to turn to other alternatives to punish defectors. In one light, the NSG indirectly provides some of these informal punishment mechanisms (Koremenos 2013). When the NSG agreed to make full-scope safeguards a condition of supply in 1992, it marginally increased the incentives for states to implement safeguards. Notwithstanding the costs and the perspective that such threats of denial are a violation of NWS obligations under the NPT, the adoption of the AP as the new standard would serve some of the same enforcement purposes. Within the NSG, there are also more minor mechanisms of enforcement. For example, NSG’s various information groups and access to NISS provide one such example. These are the types of club goods from which members can be excluded for noncompliance.

Fourth, the NSG has traditionally provided a pathway for non-NPT signatories to be brought into the regime. The French, who were not signatories to the NPT at the time, were instrumental in shaping the early development of the NSG, and one of the reasons US officials (and others) felt the French participation was important (contra the NPT-only Zangger Committee) as it might encourage their broader cooperation on nonproliferation issues (Burr 2014). The United States used similar reasoning to try to Indonesia, Japan and Egypt to join the nonproliferation regime more fully in the late 1970s and early 1980s (Gibbons 2020).

Three non-signatories of the NPT commonly recognized as nuclear weapon states – Israel, India and Pakistan – all have some relationship with the NSG. While the Israelis are not NSG members, they adhere to the guidelines. India and Pakistan are not signatories to the NPT, but have both applied for membership. While India’s and Pakistan’s membership applications and the recent exceptions granted to India have been a huge source of controversy and are likely to influence the effectiveness of the NSG going forward (Hibbs 2016, 2017), the NSG plays an important role as a pathway for regime-consistent behavior for nuclear weapon states for whom NPT membership seems a non-starter.

It is unwise to downplay or otherwise ignore these effects. The last two decades of assessments of the nuclear nonproliferation regime have tended to focus too much on the instances of apparent non-compliance (e.g. DPRK, Iran) and the actions of NPT outsiders. To be clear, these are important metrics. However, they are not the only metrics. The challenges of cooperation in the international system are consistent and no less problematic simply because the issue is one with potentially existential consequences. Future research must continue to focus on the underlying political economies of the nuclear nonproliferation regime in order to better capture the complexities of the relationship between economic and security concerns. It is critical that we understand the ways in which other important formal and informal regime institutions, beyond just the NSG, mitigate these challenges.

**Disclosure Statement**

No potential conflict of interest was reported by the author.
Notes on Contributor

Jason Enia is an Associate Professor and Chair of the Political Science Department at Sam Houston State University (SHSU). He is the Founding Director of SHSU’s Center for the Study of Disasters and Emergency Management (CDEM).

ORCID

Jason Enia http://orcid.org/0000-0003-2992-9684

References

Anthony, I., C. Ahlström, and V. Fedchenko. 2007. "Reforming Nuclear Export Controls: The Future of the Nuclear Suppliers Group." 22. SIPRI Research Report. Stockholm: Stockholm International Peace Research Institute (SIPRI).

Axelrod, R. 1984. The Evolution of Cooperation. New York: Basic Books.

Braun, C., and C. F. Chyba. 2004. "Proliferation Rings: New Challenges to the Nuclear Nonproliferation Regime." International Security 29 (2): 5–49.

Burr, W. 2014. "A Scheme of ‘Control’: The United States and the Origins of the Nuclear Suppliers’ Group, 1974–1976." The International History Review 36 (2): 252–276. doi:10.1080/07075332.2013.864690.

Chayes, A., and A. H. Chayes. 1993. “On Compliance.” International Organization 47 (2): 175–205.

Cowhey, P. F. 1993. "Domestic Institutions and the Credibility of International Commitments: Japan and the United States." International Organization 47 (2): 299–326.

Downs, G., and D. M. Rocke. 1995. Optimal Imperfection? Domestic Uncertainty and Institutions in International Relations. Princeton (NJ): Princeton University Press.

Enia, J. 2014. “Explaining Dynamics and Stasis in the Nuclear Nonproliferation Regime.” In State Behavior and the Nuclear Nonproliferation Regime, edited by J. Fields, 19–39. Athens: University of Georgia Press.

Enia, J., and J. Fields. 2018. “On the Health of the Nuclear Nonproliferation Regime.” New Perspectives 26 (1): 44–49.

Fearon, J. D. 1994. “Domestic Political Audiences and the Escalation of International Disputes.” The American Political Science Review 88 (3): 577–592. doi:10.2307/2944796.

Fearon, J. D. 1995. “Rationalist Explanations for War.” International Organization 49 (3): 379–414. doi:10.2307/2706903.

Fearon, J. D. 1998. “Bargaining, Enforcement, and International Cooperation.” International Organization 52 (2): 269–305. doi:10.2307/2601276.

Fields, J., and J. S. Enia. 2009. “The Health of the Nuclear Nonproliferation Regime: Returning to a Multidimensional Evaluation.” The Nonproliferation Review 16 (2): 173–196.

Gheorghe, E. 2019. “Proliferation and the Logic of the Nuclear Market.” International Security 43 (4): 88–127.

Gibbons, R. D. 2020. “Supply to Deny: The Benefits of Nuclear Assistance for Nuclear Nonproliferation.” Journal of Global Security Studies. doi:10.1093/jogss/ogz059.

Grieco, J. 1990. Cooperation among Nations. Ithaca, NY: Cornell University Press.

Group, N. S. 1992. “Nuclear Suppliers Group: Memorandum of Understanding Implementing Guidelines for Transfers of Nuclear-Related Dual-Use Equipment, Material, and Related Technology.” International Legal Materials 31 (5): 1094–1134.

Haas, P. 1990. Saving the Mediterranean. New York, NY: Columbia University Press.

Hasenclever, A., P. Mayer, and V. Rittberger. 1997. Theories of International Regimes. Cambridge: Cambridge University Press.
Hibbs, M. 2016. “Toward a Nuclear Suppliers Group Policy for States Not Party to the NPT.” Carnegie Endowment for International Peace. February 12. https://carnegieendowment.org/2016/02/12/toward-nuclear-suppliers-group-policy-for-states-not-party-to-npt-pub-62758.

Hibbs, M. 2017. “Eyes on the Prize: India’s Pursuit of Membership in the Nuclear Suppliers Group.” The Nonproliferation Review 24 (3-4): 275–296. doi:10.1080/10736700.2018.1436253.

Jervis, R. 1982. “Security Regimes.” International Organization 36 (2): 357–378.

Kemp, R. S. 2014. “The Nonproliferation Emperor Has No Clothes: The Gas Centrifuge, Supply-Side Controls, and the Future of Nuclear Proliferation.” International Security 38 (4): 39–78. doi:10.1162/ISEC_a_00159.

Keohane, R. O. 1982. “The Demand for International Regimes.” International Organization 36 (2): 325–355.

Keohane, R. O. 1984. After Hegemony: Cooperation and Discord in the World Political Economy. Princeton, N.J.: Princeton University Press.

Kerr, P. K., and M. B. Nikitin. 2011. Nuclear Cooperation with Other Countries: A Primer. Washington, DC: Congressional Research Service.

Knopf, J., ed. 2016. International Cooperation on WMD Nonproliferation. Athens, GA: University of Georgia Press.

Koch, L. L. 2019. “Frustration and Delay: The Secondary Effects of Supply-Side Proliferation Controls.” Security Studies 28 (4): 773–806.

Koremenos, B. 2001. “Loosening the Ties that Bind: A Learning Model of Agreement Flexibility.” International Organization 55 (2): 289–325.

Koremenos, B. 2005. “Contracting around International Uncertainty.” American Political Science Review 99 (4): 549–565.

Koremenos, B. 2013. “What’s Left Out and Why? Informal Provisions in Formal International Law.” Review of International Organizations 8 (2): 137–162. doi:10.1007/s11558-012-9159-4.

Koremenos, B. 2016. The Continent of International Law: Explaining Agreement Design. Cambridge: Cambridge University Press.

Koremenos, B., C. Lipson, and D. Snidal. 2001. “The Rational Design of International Institutions.” International Organization 55 (4): 761–799.

Krasner, S. D., ed. 1983. International Regimes. Ithaca: Cornell University Press.

Kurosawa, M. 2020. “The US Initiative on Creating an Environment for Nuclear Disarmament.” Journal for Peace and Nuclear Disarmament. doi:10.1080/25751654.2020.1834802.

Kutchesfahani, S. Z. 2019. “Regional Initiatives toward a Nuclear Weapons Free World: The Case of Nuclear Weapons Free Zones.” J. E. Doyle edited by, Nuclear Safeguards, Security, and Nonproliferation (Second,59–76.Boston: Butterworth-Heinemann. doi:10.1016/B978-0-12-803271-8.00003-5

Kydland, F. E., and E. C. Prescott. 1977. “Rules Rather than Discretion: The Inconsistency of Optimal Plans.” The Journal of Political Economy 85 (3): 473–492.

Latham, A., and B. Bow. 1998. “Multilateral Export Control Regimes: Bridging the North-South Divide.” International Journal 53 (3): 465–486. doi:10.2307/40203324.

Marcoux, C. 2009. “Institutional Flexibility in the Design of Multilateral Environmental Agreements.” Conflict Management and Peace Science 26 (2): 209–228. doi:10.1177/0738894208101130.

Martin, L. L. 1992. “Interests, Power, and Multilateralism.” International Organization 46 (4): 765–792.

McGoldrick, F. 2011. “The Road Ahead for Export Controls: Challenges for the Nuclear Suppliers Group.” Arms Control Today 41 (1): 30–36.

Müller, H. 1993. “The Internalization of Principles, Norms, and Rules by Governments: The Case of Security Regimes.” In Regime Theory and International Relations, edited by V. Rittberger, 361–388. Oxford: Oxford University Press.

Müller, H. 1995. “Regime Robustness, Regime Attractivity and Arms Control Regimes in Europe.” Cooperation and Conflict 30 (3): 287–297.
Müller, H., and A. Tokhi. 2019. “The Contestation of the Nuclear Non-Proliferation Regime.” In Contested World Orders: Rising Powers, Non-Governmental Organizations, and the Politics of Authority beyond the Nation-State, edited by M. D. Stephen and Z. Michael, 202–244. Oxford: Oxford University Press.

Nguyen, V. P., and M.-S. Yim. 2019. “Nonproliferation and Security Implications of the Evolving Civil Nuclear Export Market.” Sustainability 11 (7): 1830. doi:10.3390/su11071830.

North, D. C. 1990. Institutions, Institutional Change and Economic Performance. Cambridge: Cambridge University Press.

Nye, J. S. 1981. “Maintaining a Nonproliferation Regime.” International Organization 35 (1): 15–38.

Oye, K. A. 1985. “Explaining Cooperation under Anarchy: Hypotheses and Strategies.” World Politics 38 (1): 1–24. doi:10.2307/2010349.

Powell, R. 2006. “War as a Commitment Problem.” International Organization 60 (1): 169–203.

Putnam, R. D. 1988. “Diplomacy and Domestic Politics: The Logic of Two-Level Games.” International Organization 42 (3): 427–460.

Rublee, M. R. 2008. “Taking Stock of the Nuclear Nonproliferation Regime: Using Social Psychology to Understand Regime Effectiveness.” International Studies Review 10 (3): 420–450.

Rublee, M. R. 2009. Nonproliferation Norms: Why States Choose Nuclear Restraint. Athens, GA: University of Georgia Press.

Sandler, T. 2004. Global Collective Action. Cambridge: Cambridge University Press.

Schelling, Thomas C. 1980. “The Strategy of Conflict.” In 2nd Ed. Cambridge, MA: Harvard University Press.

Shirazyan, S. 2019. “Building A Universal Counter-Proliferation Regime: The Institutional Limits of United Nations Security Council Resolution 1540.” Journal of National Security Law & Policy 10: 125.

Smith, R. K. 1987. “Explaining the Non-Proliferation Regime: Anomalies for Contemporary International Relations Theory.” International Organization 41 (2): 253–281.

Stigler, G. J. 1964. “A Theory of Oligopoly.” Journal of Political Economy 72 (1): 44–61.

Tate, T. M. 1990. “Regime-Building in the Non-Proliferation System.” Journal of Peace Research 27 (4): 399–414.

Verdier, D. 2008. “Multilateralism, Bilateralism, and Exclusion in the Nuclear Proliferation Regime.” International Organization 62 (3): 439–476.

Young, O. R. 1991. “Political Leadership and Regime Formation: On the Development of Institutions in International Society.” International Organization 45 (3): 281–308. doi:10.1017/S0020818300033117.

Young, O. R., and M. A. Levy. 1999. “The Effectiveness of International Environmental Regimes.” In The Effectiveness of International Environmental Regimes: Causal Connections and Behavioral Mechanisms, edited by O. R. Young, 1–32. Cambridge, MA: MIT Press.