

**The Politics of Nuclear Cooperation:  
Why States Share Nuclear Weapons Technology**

Gregory D. Koblentz  
Visiting Assistant Professor  
School of Foreign Service  
Georgetown University

Revised February 15, 2006

Prepared for delivery at the 2005 Annual Meeting of the  
American Political Science Association, September 1-4, 2005.  
Copyright by the American Political Science Association.

This paper addresses a crucial yet unexamined aspect of nuclear proliferation: why do states and non-state actors share nuclear weapons technology? This question, which has profound implications for U.S. nonproliferation policy, has gone virtually unasked by scholars and remains largely unanswered by the literature on nuclear proliferation.<sup>1</sup> This lacuna in the nonproliferation literature is remarkable given the amount of attention focused on nuclear proliferation. The study of nuclear proliferation has focused instead on three other aspects of the issue: why states want these weapons<sup>2</sup>, why states forgo or abandon nuclear weapons<sup>3</sup>, and the strategic consequences of nuclear proliferation.<sup>4</sup>

Nuclear sharing also poses an unheralded puzzle in international relations. Why would states share the most powerful weapons technology ever invented with other, potentially hostile, states? Indeed, the anarchic nature of international relations and the destructive power of these weapons implies that this type of nuclear cooperation should be rare indeed. According to John Mearsheimer, “The established nuclear powers will be reluctant to give the new nuclear powers technical help in building secure deterrents because it runs against the grain of state behavior to transfer military power to others, and because of the fear that sensitive military technology could be turned against the donor state if that technology were further transferred to its adversaries.”<sup>5</sup> In addition, states will also fear that the recipient, even a trustworthy fellow democracy, may one day become an adversary itself.<sup>6</sup> This confidence in the unattractiveness of nuclear sharing is

---

<sup>1</sup> For early discussions of the possibility of state-sponsored nuclear proliferation, see George Quester, *The Politics of Nuclear Proliferation* (Baltimore, M.D.: Johns Hopkins University Press, 1973), pp. 198-210; and Henry S. Rowen and Richard Brody, “Nuclear Potential and Possible Contingencies,” in Joseph A. Yager and Richard K. Betts, ed., *Nonproliferation and U.S. Foreign Policy* (Washington, D.C.: Brookings Institution, 1980), pp. 217-224.

<sup>2</sup> Bradley A. Thayer, “The Causes of Nuclear Proliferation and the Utility of the Nuclear Nonproliferation Regime,” *Security Studies*, Vol. 4, No. 3 (Spring 1995), pp. 463-519; Tanya Ogilvie-White, “Is There a Theory of Nuclear Proliferation? An Analysis of the Contemporary Debate,” *Nonproliferation Review*, Vol. 4, No. 1 (Fall 1996), pp. 43-60; Scott Sagan, “Why Do States Build Nuclear Weapons? Three Models in Search of a Bomb,” *International Security*, Vol. 21, No. 3 (Winter 1996/97), pp. 54-86; Benjamin Frankel, “The Brooding Shadow: Systemic Incentives and Nuclear Weapons Proliferation,” in Zachary S. Davis and Benjamin Frankel, eds., *The Proliferation Puzzle: Why Nuclear Weapons Spread (and What Results)* (London: Frank Cass, 1993), pp. 37-78; Richard K. Betts, “Paranooids, Pygmies, Pariahs and Nonproliferation Revisited,” in Davis and Frankel, eds., *The Proliferation Puzzle*, pp. 100-124; and Peter R. Lavoy, “Nuclear Myths and the Causes of Nuclear Proliferation,” in Davis and Frankel, eds., *The Proliferation Puzzle*, pp. 192-212.

<sup>3</sup> Mitchell Reiss, *Bridled Ambitions: Why Countries Constrain Their Nuclear Capabilities* (Washington, D.C.: Woodrow Wilson Center Press, 1995); T.V. Paul, *Power Versus Prudence: Why Nations Forgo Nuclear Weapons* (Montreal: McGill-Queen’s University Press, 2000); Ariel Levite, “Never Say Never Again: Nuclear Reversal Revisited,” *International Security*, Vol. 2, No. 3 (Winter 2002/03), pp. 59-88; and Kurt M. Campbell, Robert J. Einhorn, and Mitchell B. Reiss, eds., *The Nuclear Tipping Point: Why States Reconsider Their Nuclear Choices* (Washington, D.C.: Brookings Institution Press, 2004).

<sup>4</sup> Bradley A. Thayer, “The Risk of Nuclear Inadvertence: A Review Essay,” *Security Studies*, Vol. 3, No. 3 (Spring 1994), pp. 428-493; Peter D. Feaver, “Proliferation Optimism and Theories of Nuclear Operations,” in Davis and Frankel, eds., *The Proliferation Puzzle*, pp. 159-191; Peter R. Lavoy, “The Strategic Consequences of Nuclear Proliferation: A Review Essay,” *Security Studies*, Vol. 4, No. 4 (Summer 1995), pp. 695-753; David J. Karl, “Proliferation Pessimism and Emerging Nuclear Powers,” *International Security*, Vol. 21, No. 3 (Winter 1996/97), pp. 87-119; Devin Hagerty, *The Consequences of Nuclear Proliferation: The Lessons of South Asia* (Cambridge, Mass.: MIT Press, 1998); Victor A. Utgoff, ed., *The Coming Crisis: Nuclear Proliferation, U.S. Interests, and World Order* (Cambridge, Mass.: MIT Press, 2000); and Scott D. Sagan and Kenneth N. Waltz, *The Spread of Nuclear Weapons: A Debate Renewed* (New York: W.W. Norton, 2003).

<sup>5</sup> John Mearsheimer, “Back to the Future: Instability in Europe After the Cold War,” *International Security*, Vol. 15, No. 1 (Summer 1990), pp. 39-40.

<sup>6</sup> *Ibid.*, p. 50.

belied by the extent of nuclear cooperation that has already occurred. Since the dawn of atomic age, there have been 13 cases of states sharing nuclear weapon technology with another state.

This gap in our theoretical and empirical understanding of nuclear proliferation is distressing since the current wave of proliferation is driven largely by this phenomenon. The current nuclear crises with Iran and North Korea were triggered by their development of uranium enrichment facilities using equipment, materials, and know-how supplied by the Pakistani scientist A.Q. Khan with varying degrees of complicity by officials in Islamabad. Khan's network also transferred enrichment technology, as well as the design for a nuclear warhead, to Libya. To highlight the prevalence of nuclear sharing, it is worth noting that the warhead design was provided to Pakistan by China which was itself a recipient of extensive nuclear assistance from the Soviet Union. The beneficiaries of Khan's nuclear entrepreneurship are now able to enter the international black market as purveyors of nuclear materials, technology, and weapons. North Korea has emerged as the most likely candidate for further state-sponsored nuclear proliferation.<sup>7</sup> Indeed, the transfer of nuclear materials or weapons to another state or terrorist group constitutes one of the last "red lines" in the Bush Administration's policy towards North Korea.

Even more worrisome than international nuclear sharing would be the transfer of fissile material or nuclear weapons from a state to a terrorist group. The potential for states to transfer weapons of mass destruction to terrorist groups that they sponsor has been noted since the 1980s. Following September 11, the nexus between states developing weapons of mass destruction and sponsoring terrorist groups appeared to be even more threatening. During the build-up to the war with Iraq, the Bush Administration repeatedly highlighted the potential risk that Saddam Hussein could transfer such weapons to Al Qaeda. Another dimension of this problem emerged at this time with reports that former senior members of the Pakistani nuclear establishment had met with members of Al Qaeda and the Taliban regime.<sup>8</sup> This episode raised the concern that non-state actors could act as conduits for nuclear materials or weapons to other non-state actors. To date, there have been no confirmed reports of a state providing nuclear, biological, or chemical weapons to a terrorist group. As John Lewis Gaddis has observed, "To take comfort in this pattern, however, is like trying to find reassurance in an extended game of Russian roulette: sooner or later the odds will turn against you."<sup>9</sup> Examining the history and causes of inter-state nuclear sharing, as well as the emerging evidence on the role of non-state actors in nuclear

---

<sup>7</sup> The Bush Administration has accused North Korea of shipping uranium hexafluoride to Libya although the evidence made public to date is largely circumstantial. See David E. Sanger and William J. Broad, "Evidence is Cited Linking Koreans to Libya Uranium," *New York Times*, May 23, 2004, p. A1; David E. Sanger and William J. Broad, "Tests Said to Tie Deal on Uranium to North Korea," *New York Times*, February 2, 2005, p. A1; Glenn Kessler, "North Korea May Have Sent Libya Nuclear Material, U.S. Tells Allies," *Washington Post*, February 2, 2005, p. A1; and Glenn Kessler and Dafna Linzer, "Nuclear Evidence Could Point to Pakistan," *Washington Post*, February 3, 2005, p. A18.

On potential North Korean-Iranian nuclear links see, Ze'ev Schiff, *Weapons of Mass Destruction in the Middle East: The View From Israel* (Houston, TX: Rice University, March 2003), pp. 7-11; "Report: Iran Nuke Experts Visited N. Korea This Year," *Reuters*, June 11, 2003; David E. Sanger and William J. Broad, "Evidence is Cited Linking Koreans to Libya Uranium," *New York Times*, May 23, 2004, p. A1; and Louis Charbonneau, "N. Korea Provides Nuclear Aid to Iran-Intel Reports," *Reuters*, July 6, 2005.

<sup>8</sup> David Albright and Holly Higgins, "A Bomb for the Ummah," *Bulletin of the Atomic Scientists*, Vol. 59, No. 2 (March/April 2003), pp. 49-55; and White House, "Day 100 of the War on Terrorism: More Steps to Shut Down Terrorist Support Networks," *White House Press Release*, December 20, 2001, <http://www.whitehouse.gov/news/releases/2001/12/20011220-8.html>

<sup>9</sup> John Lewis Gaddis, "Grand Strategy in the Second Term," *Foreign Affairs*, January/February 2005, p. 11.

sharing, would contribute to the debate on the likelihood that states would share such nuclear weapons with terrorists.<sup>10</sup>

Understanding the determinants of nuclear sharing, and the conditions under which it is most likely to occur, are crucial to addressing the threat of state-sponsored nuclear proliferation. The goal of this paper is to describe the phenomenon of nuclear sharing, assess the risks for the nuclear nonproliferation regime, and develop a framework for analyzing the motives of state and non-state actors to engage in this behavior.

### **Defining and Bounding the Problem**

This paper defines nuclear sharing as the knowing and willful transfer of fissile material (uranium-235 enriched to greater than 20% or plutonium-239), nuclear weapons, or the means to produce these weapons, including fissile material production facilities and warhead design information, to a non-nuclear actor. This definition of nuclear sharing excludes sales of nuclear technology by private entities without the knowledge of their host government (such as the support provided by German firms and individuals to the Iraqi nuclear program in the 1980s), the theft of nuclear technology by a state (such as the Soviet Union's atomic espionage during the 1940s), the illicit procurement and smuggling of nuclear technology (such as that engaged in by Pakistan since the 1970s), or the provision of civilian nuclear technology for peaceful purposes that could be used to produce nuclear weapons (such as Canada's supply of the CIRUS research reactor to India in the 1960s). In addition, this definition excludes joint custody arrangements for nuclear weapons such as those used by NATO whereby American nuclear warheads deployed on foreign soil remained under U.S. control. The transfer of ballistic missiles and/or the means to produce them is frequently a component of nuclear sharing. The transfer of delivery systems that can be mated with nuclear warheads, but were transferred for use as conventional weapons (such as the U.S. sale of F-16s to Pakistan) are also excluded from this definition.

States have engaged in nuclear sharing since the dawn of the atomic age. Over the past sixty years, there have been at least 13 cases of nuclear sharing (see Table 1). The frequency of this behavior should dispel the myth put forward by George Quester that, "The good news is that nations having already acquired nuclear explosives are not so likely to be willing to share such weapons with the next "nth"."<sup>11</sup> Although nuclear sharing is currently associated with "rogue" actors such as A.Q. Khan and North Korea, it is worth noting that every declared nuclear weapon state has engaged in nuclear sharing at some point. Nuclear sharing has also played a key role in the global spread of nuclear weapons. The sharing of nuclear weapons technology was crucial to the development of nuclear weapons by China and Israel and accelerated the British and Pakistani programs. Nuclear sharing would have been the source of Iraqi and Libyan nuclear weapons if their programs had not been halted by outside intervention. The history of nuclear sharing is also characterized by four cases where the provider of nuclear weapon technology had second thoughts and terminated the cooperation prematurely. Such cases provide a useful mechanism for studying changes in a government's motivation to engage in nuclear sharing.

---

<sup>10</sup> For analyses of the likelihood of this scenario, see Richard A. Falkenrath, Robert D. Newman, and Bradley A. Thayer, *America's Achilles Heel: Nuclear, Biological and Chemical Terrorism and Covert Attack* (Cambridge, Mass.: MIT Press, 1998), pp. 28, 62, 94-95; Paul R. Pillar, *Terrorism and U.S. Foreign Policy* (Washington, D.C.: Brookings Institution, 2003), pp. xx-xxi, 164; Jasen J. Castillo, "Nuclear Terrorism: Why Deterrence Still Matters," *Current History*, December 2003, pp. 426-431; and Stephen Walt, "In the National Interest," *Boston Review*, February/March 2005, <http://bostonreview.net/BR30.1/walt.html>.

<sup>11</sup> George Quester, "The Statistical "n" of "nth" Nuclear Weapon States," *Journal of Conflict Resolution*, Vol. 27, No. 1 (March 1983), p. 175.

**TABLE 1. Cases of Nuclear Weapon Technology Cooperation**

Provider	Recipient	Duration	Nature of Assistance	Outcome
United States	United Kingdom	1943-1946	Enrichment, Reprocessing, Warhead Design	Terminated by the United States <sup>12</sup>
Soviet Union	China	1957-1960	Enrichment, Reprocessing, Warhead Design, Delivery Systems	Terminated by the Soviet Union <sup>13</sup>
France	Israel	1956-1960	Reactor, Reprocessing, Delivery Systems	Terminated by France <sup>14</sup>
United States	United Kingdom	1958-present	Warhead Design, Delivery Systems	Ongoing <sup>15</sup>
United States	France	1972-present	Warhead Design, Delivery Systems	Ongoing <sup>16</sup>
France	Pakistan	1973-1978	Reprocessing	Cancelled by France <sup>17</sup>
West Germany	Brazil	1975-?	Enrichment, Reactors, Reprocessing	Enrichment and reprocessing aspects cancelled in 1980s <sup>18</sup>
Israel	South Africa	1975-?	Tritium, Ballistic Missiles	Unknown <sup>19</sup>
France/Italy	Iraq	1975-1981	Reactor, Reprocessing	Reactor destroyed by Israel <sup>20</sup>
China	Pakistan	1976-?	Warhead Design,	Unknown <sup>21</sup>

<sup>12</sup> Andrew Pierre, *Nuclear Politics: The British Experience with an Independent Strategic Force, 1939-1970* (London: Oxford University Press, 1970); Margaret Gowing, *Britain and Atomic Energy, 1939-1945* (New York: St. Martin's Press, 1964); and Septimus H. Paul, *Nuclear Rivals: Anglo-American Atomic Relations, 1941-1952* (Columbus, OH: Ohio State University Press, 2000).

<sup>13</sup> John W. Lewis and Xue Litai, *China Builds the Bomb* (Stanford, Calif.: Stanford University Press, 1988); Evgeny A. Negin and Yuri M. Smirnov, "Did the USSR Share Atomic Secrets with China?" *Parallel History Project on NATO and the Warsaw Pact: China and the Warsaw Pact*, October 2002; Viktor M Gobarev, "Soviet Policy toward China: Developing Nuclear Weapons 1949-1969," *Journal of Slavic Military Studies*, Vol. 12, No. 4 (December 1999), pp. 1-53; and Sergei Goncharenko, "Sino-Soviet Military Cooperation," in Odd Arne Westad, ed., *Brothers in Arms: The Rise and Fall of the Sino-Soviet Alliance, 1945-1963* (Washington, D.C.: Woodrow Wilson Center Press, 1998), pp. 141-164.

<sup>14</sup> Avner Cohen, *Israel and the Bomb* (New York: Columbia University Press, 1998).

<sup>15</sup> Timothy Botti, *The Long Wait: The Forging of the Anglo-American Nuclear Alliance, 1945-1958* (New York: Greenwood Press, 1987); Jan Melissen, *The Struggle for Nuclear Partnership: Britain, the United States and the Making of an Ambiguous Alliance, 1952-1959* (Gronigen: Styx, 1993); Ian Clark, *Nuclear Diplomacy and the Special Relationship: Britain's Deterrent and America, 1957-1962* (New York: Oxford University Press, 1994).

<sup>16</sup> Richard H. Ullman, "The Covert French Connection," *Foreign Policy*, No. 75 (Summer 1989), pp. 3-33.

<sup>17</sup> Weissman and Krosney, *The Islamic Bomb*, pp. 74-75.

<sup>18</sup> Norman Gall, "Atoms for Brazil, Dangers For All," *Foreign Policy*, No. 23 (Summer 1976), pp. 155-201; and John R. Redick, *Nuclear Illusions: Argentina and Brazil*, Occasional Paper No. 25 (Washington, D.C.: Henry L. Stimson Center, December 1995), p. 9.

<sup>19</sup> Peter Liberman, "The Rise and Fall of the South African Bomb," *International Security*, Vol. 26, No. 2 (Fall 2001), pp. 45-86; and Peter Liberman, "Israel and the South African Bomb," *The Nonproliferation Review*, Vol. 11, No. 2 (Summer 2004), pp. 1-35.

<sup>20</sup> Pierre Pean, *Les Deux Bombes* (Paris: Fayard, 1982); Steve Weissman and Herbert Krosney, *The Islamic Bomb: The Nuclear Threat to Israel and the Middle East* (New York: New York Times Books, 1981); and Jed C. Snyder, "The Road to Osiraq: Baghdad's Quest for the Bomb," *Middle East Journal*, Vol. 37, No. 4 (Autumn 1983), pp. 565-593.

			Reprocessing	
Pakistan	Iran	1987-1999	Enrichment	Unknown <sup>22</sup>
Pakistan	North Korea	1997-2001/2002	Enrichment, Warhead Design?	Unknown <sup>23</sup>
Pakistan	Libya	1997-2003	Enrichment, Warhead Design	Terminated by Libya <sup>24</sup>

<sup>21</sup> T.V. Paul, "Chinese-Pakistani Nuclear/Missile Ties and Balance of Power Politics," *Nonproliferation Review*, Vol. 10, No. 2 (Summer 2003), pp. 21-29.

<sup>22</sup> David Albright and Corey Hinderstein, "The Centrifuge Connection," *Bulletin of the Atomic Scientists*, Vol. 60, No. 2 (March/April 2004), pp. 61-66; and Guarav Kampani, "Proliferation Unbound: Nuclear Tales From Pakistan," *CNS Research Story*, February 23, 2004, <http://cns.miiis.edu/pubs/week/040223.htm>.

<sup>23</sup> Guarav Kampani, "Second Tier Proliferation: The Case of North Korea and Pakistan," *Nonproliferation Review*, Vol. 9, No. 3 (Fall-Winter 2002), pp. 107-116; and Il-Young Kim and Lakhvinder Singh, "The North Korean Nuclear Program and External Connections," *Korean Journal of Defense Analysis*, Vol. 16, No. 1 (Spring 2004), pp. 73-98.

<sup>24</sup> Kampani, "Proliferation Unbound"; and David Albright and Corey Hinderstein, "Unraveling the A.Q. Khan and Future Proliferation Networks," *The Washington Quarterly*, Vol. 28, No. 2 (Spring 2005), pp. 111-128.

**TABLE 2. Cases of Attempted Nuclear Weapon Technology Cooperation**

Requester	Source	Type of Assistance Requested	Date
Australia	United Kingdom	Nuclear Weapons	1956-1963 <sup>25</sup>
Federal Republic of Germany	France	Nuclear Weapons	1957-1958 <sup>26</sup>
Italy	France	Nuclear Weapons	1957-1958 <sup>27</sup>
Egypt	Soviet Union	Nuclear Weapons	1965 <sup>28</sup>
Indonesia	China	Nuclear Weapons	1965 <sup>29</sup>
Egypt	China	Nuclear Weapons	1967 <sup>30</sup>
Taiwan	United States	Reprocessing	1969 <sup>31</sup>
Libya	China	Nuclear Weapons	1970 <sup>32</sup>
Libya	Soviet Union	Nuclear Weapons	1971 <sup>33</sup>
Taiwan	West Germany	Reprocessing	1972-1973 <sup>34</sup>
Libya	Pakistan	Reprocessing	1973-? <sup>35</sup>
North Korea	China	Nuclear Weapons	1975 <sup>36</sup>

<sup>25</sup> Jim Walsh, "Surprise Down Under: The Secret History of Australia's Nuclear Ambitions," *Nonproliferation Review*, Vol. 5, No. 1 (Fall 1997), pp. 1-20; Wayne Reynolds, "Rethinking the Joint Project: Australia's Bid for Nuclear Weapons, 1945-1960," *Historical Journal* 41 (1998), pp. 853-873; and Jacques E.C. Hyman, "Isotopes and Identity: Australia and the Nuclear Weapons Option, 1949-1999," *Nonproliferation Review*, Vol. 7, No. 1 (Spring 2000), pp. 1-23.

<sup>26</sup> Mervyn O'Driscoll, "'Les Anglo-Saxons', F-I-G and the Rival Conceptions of 'Advanced' Armaments Research and Development Co-operation in Western Europe, 1956-58," *Journal of European Integration History*, Vol. 4, No. 1 (1998), pp. 105-130; Leopoldo Nuti, "The F-I-G Story Revisited," *Storia Delle Relazioni Internazionali* 13 (1998), pp. 69-101; and Matthias Kuntzel, *Bonn and the Bomb: German Politics and the Nuclear Option* (London: Pluto Press, 1995).

<sup>27</sup> Leopoldo Nuti, "'Me Too Please': Italy and the Politics of Nuclear Weapons, 1945-1970," *Diplomacy and Statecraft*, Vol. 4, No. 1 (March 1993), pp. 114-148; Nuti, "The F-I-G Story Revisited"; and O'Driscoll, "'Les Anglo-Saxons', F-I-G and the Rival Conceptions of 'Advanced' Armaments Research and Development Co-operation in Western Europe."

<sup>28</sup> James Walsh, *Bombs Unbuilt: Power, Ideas, and Institutions in International Politics*, PhD dissertation, (Cambridge, Mass.: Massachusetts Institute of Technology, June 2001), pp. 145-174.

<sup>29</sup> Robert M. Cornejo, "When Sukarno Sought the Bomb: Indonesian Nuclear Aspirations in the Mid-1960s," *Nonproliferation Review*, Vol. 7, No. 2 (Summer 2000), pp. 31-43.

<sup>30</sup> Walsh, *Bombs Unbuilt*, pp. 145-174.

<sup>31</sup> Leonard Spector, *Nuclear Proliferation Today: The Spread of Nuclear Weapons, 1984* (New York: Vintage, 1984), pp. 342-343.

<sup>32</sup> Weissman and Krosney, *The Islamic Bomb*, pp. 55-57; and Mohamed Heikal, *The Road to Ramadan* (New York: Ballantine Books, 1975), pp. 70-71.

<sup>33</sup> Shai Feldman, *Nuclear Weapons and Arms Control in the Middle East* (Cambridge, Mass.: MIT Press, 1997), p. 63.

<sup>34</sup> William Burr, ed., *New Archival Evidence on Taiwanese "Nuclear Intentions", 1966-1976*, National Security Archive Electronic Briefing Book No. 19, October 13, 1999, <http://www.gwu.edu/~nsarchiv/NSAEBB/NSAEBB20/>

<sup>35</sup> Weissman and Krosney, *The Islamic Bomb*, pp. 57-61; Rodney W. Jones, *Nuclear Proliferation: Islam, the Bomb and South Asia*, Washington Papers no. 82 (Beverly Hills, Calif.: Sage, 1981), pp. 48-49; Rodney W. Jones, "Pakistan: Emerging Nuclear Supplier Issues," in William C. Potter, ed., *International Nuclear Trade and Nonproliferation: The Challenge of the Emerging Suppliers* (Lexington, Mass.: Lexington Books, 1990), pp. 227-243; and Don Oberdorfer, "Pakistan: The Quest for the Atomic Bomb," *Washington Post*, August 27, 1979, p. A1.

<sup>36</sup> Kathryn Weathersby, *The History of North Korean Attitudes Towards Nuclear Weapons and Efforts to Acquire Nuclear Capability*, e-Dossier No. 17 (Washington, D.C.: Cold War International History Project, May 17, 2005), pp. 17-18.

Taiwan	France	Reprocessing	1975 <sup>37</sup>
South Korea	France	Reprocessing	1975-1976 <sup>38</sup>
Libya	India	Reprocessing	1978-1979 <sup>39</sup>
Iran	Russia	Enrichment	1995 <sup>40</sup>

Aside from these cases of nuclear cooperation, there have also been at least 15 cases where states have attempted to acquire nuclear weapon capabilities from other states, but were rebuffed (see Table 2). Australia, Egypt, the Federal Republic of Germany, Italy, Indonesia, Libya, and North Korea requested the transfer of nuclear weapons from one of the declared nuclear weapon states. Libya, South Korea, and Taiwan solicited spent fuel reprocessing technologies while Iran sought a uranium enrichment facility based on gas centrifuges. Most of these states were developing nations with insufficient human capital and technical infrastructure to develop nuclear weapons indigenously. Libya was particularly active in attempting to use its oil wealth to purchase nuclear weapon capabilities from abroad. In 1975, Libyan leader Colonel Muammar Qaddafi hopefully boasted that, “A few years ago we could scarcely procure a squadron of fighter planes. Tomorrow, it will be possible to buy an atomic bomb and its components.”<sup>41</sup> Although Libyan attempts in the 1970s to acquire nuclear weapons or fissile material production capabilities from the Soviet Union, China, Pakistan, and India failed, Libya finally found a willing supplier in Pakistan in the late 1990s. China was the nation most sought after for nuclear weapons assistance. This was likely due to China’s status as the first developing nation to enter the nuclear club and Beijing’s anti-nonproliferation and anti-imperialism rhetoric in the 1960s. Despite this rhetoric, China engaged in nuclear sharing with only one nation—Pakistan—and this cooperation was motivated by security concerns, not ideology.

Finally, there are two cases of states that considered requesting nuclear weapon capabilities from other states but decided against this course of action. During government debates in Sweden and Switzerland on the acquisition of nuclear weapons, the purchase of such weapons from abroad was ruled out due to these nations’ long histories of neutrality, their desire to maintain independent foreign policies, and their emphasis on self-reliance in military affairs.<sup>42</sup>

<sup>37</sup> Weissman and Krosney, *The Islamic Bomb*, pp. 152-153.

<sup>38</sup> Jungmin Kang and H.A. Feiveson, “South Korea’s Shifting and Controversial Interest in Spent Fuel Reprocessing,” *Nonproliferation Review* (Spring 2001), pp. 70-78.

<sup>39</sup> Rodney Jones, “India,” in Potter, ed., *International Nuclear Trade and Nonproliferation*, pp. 160-165, 176 fn 28; and Keith Bradsher, “India Official Says Qaddafi Sought Atom-Arms Technology in 1970s,” *New York Times*, October 10, 1991, p. A11.

<sup>40</sup> David Albright, “The Russian-Iranian Reactor Deal,” *Nonproliferation Review* (Spring 1995), pp. 49-51; Vladimir Orlov and Alexander Vinnikov, “The Great Guessing Game: Russia and the Iranian Nuclear Issue,” *Washington Quarterly*, Vol. 28, No. 2 (Spring 2005), pp. 49-66; and Robert J. Einhorn and Gary Samore, “Ending Russian Assistance to Iran’s Nuclear Bomb,” *Survival*, Vol. 44, No. 2 (Summer 2002), pp. 51-70.

<sup>41</sup> *Le Point*, January 20, 1975, p. 38 cited in Dunn, “Nuclear “Grey Marketeering,”” p. 110

<sup>42</sup> On Swiss attitudes towards purchasing nuclear weapons from abroad, see Paul, *Power Versus Prudence*, pp. 91-98; and Juerg Stuessi-Lautenberg, *Historical Abstract on the Question of Swiss Nuclear Arms Program*, December 31, 1995.

For the similar debate in Sweden in the 1960s, see Paul, *Power Versus Prudence*, pp. 84-91; and Thomas Jonter, *Sweden and the Bomb: The Swedish Plans to Acquire Nuclear Weapons, 1945-1972*, Report 01:33 (Stockholm, Sweden: Swedish Nuclear Power Inspectorate, September 2001).

## Explaining Nuclear Sharing

The most extensive discussion in the nuclear nonproliferation literature of the motives behind nuclear sharing revolves around the so-called “Islamic bomb.” In 1979, former Pakistani Prime Minister Zulfikar Ali Bhutto, the architect of Pakistan’s nuclear weapons program, wrote, “We know that Israel and South Africa have full nuclear capability. The Christian, Jewish and Hindu civilizations have this capability. The communist powers also possess it. Only the Islamic civilization was without it, but that position was about to change.”<sup>43</sup> Bhutto’s successor, General Muhammad Zia-ul-Haq, shared this sentiment. In a 1978 interview, he stated that, “China, India, the USSR, and Israel in the Middle East possess the atomic arm. No Muslim country has any. If Pakistanis had such a weapon, it would reinforce the power of the Muslim world.”<sup>44</sup> Coming on the heels of revelations about Pakistan’s covert procurement of uranium enrichment technology and the Iranian revolution sparked by Ayatollah Khomeini, the prospect of an “Islamic bomb” growing out of nuclear cooperation between Pakistan and oil-rich Muslim states suddenly seemed plausible and frightening. According to Pervez Hoodbhoy, “The Islamic bomb evokes fearsome images: the power of nuclear annihilation in the hands of dictators, holy war and warriors, and terrorists.”<sup>45</sup> The notion of an “Islamic bomb” did indeed capture the public’s imagination, as evidenced by a BBC television program and three books on the subject.<sup>46</sup> Concerns about an “Islamic bomb” were also fueled by reports in the late 1970s that Libya, having failed to obtain nuclear weapons from the Soviet Union and China, had provided financial assistance and natural uranium to support Pakistan’s nuclear weapon program.<sup>47</sup> The security studies community, however, was much more sanguine about the possibility that Pakistan would share nuclear weapon technology with other states.

Throughout the 1980s and 1990s, several nuclear proliferation analysts expressed skepticism about the likelihood that Pakistan would share its nuclear weapons or related technologies with other Muslim states. In 1983, George Quester wrote that the fear of an “Islamic bomb” is overblown “since Pakistan may already have learned what every other entrant into the nuclear weapons club has learned: that it has an interest in closing the clubroom door behind itself.”<sup>48</sup> Quester believed that Pakistan’s restraint would be based on “simple common sense and prudence.”<sup>49</sup> In 1985, Rodney Jones wrote that, “It seems most unlikely that Pakistan would directly trade away nuclear weapons, fissile material, or even explicit promises of nuclear security support; even if Pakistan were able to accumulate a surplus on its perceived national requirements, the anticipated repercussions from such transfers would be much too severe. It is conceivable but doubtful that Pakistan would physically export sensitive technology.”<sup>50</sup> By 1990, he judged that, “Western estimates of the likelihood that that Pakistan will become a

---

<sup>43</sup> Zulfikar Ali Bhutto, *If I Am Assassinated*..... (1979) cited in Jones, *Nuclear Proliferation*, p. 8.

<sup>44</sup> Cited in Weissman and Krosney, p. 161.

<sup>45</sup> Pervez Hoodbhoy, “Myth-Building: The “Islamic” Bomb,” *Bulletin of the Atomic Scientists*, Vol. 49, No. 5 (June 1993), pp. 42-49.

<sup>46</sup> BBC-TV Panorama Investigative Team, “The Birth of the Islamic Bomb,” 1980; D.K. Palit and P.K.S. Namboodiri, *Pakistan’s Islamic Bomb* (New Delhi: Vikas, 1979); Weissman and Krosney, *The Islamic Bomb*; and Jones, *Nuclear Proliferation*.

<sup>47</sup> Jones, *Nuclear Proliferation*, pp. 48-49.

<sup>48</sup> Quester, “The Statistical “n” of “n<sup>th</sup>” Nuclear Weapon States,” p. 174.

<sup>49</sup> *Ibid.*, p. 175.

<sup>50</sup> Rodney W. Jones, “Nuclear Supply Policy and South Asia,” in Rodney W. Jones, Cesare Merlini, Joseph F. Pilat, and William C. Potter, eds., *The Nuclear Suppliers and Nonproliferation* (Lexington, Mass.: Lexington Books, 1985), p. 172.

nuclear supplier to sensitive countries in the Middle East probably has been exaggerated by a failure to take into account political and social barriers in regional relations.”<sup>51</sup>

Peter Lavoy and Shai Feldman also dismissed the possibility of Pakistan pursuing an “Islamic bomb”. They believed that fear of Pakistan sharing nuclear technology or weapons with other Muslim nations was unwarranted since doing so would reduce Pakistan’s status as the sole nuclear weapon state in the Islamic world.<sup>52</sup> In addition, nuclear sharing by Pakistan would be counterproductive since it would risk provoking Israeli military action or strategic cooperation with Pakistan’s main rival, India. Finally, sharing nuclear technology or weapons would violate Pakistan’s private pledge to the United States to exercise nuclear restraint and risk severely disrupting relations with the United States.<sup>53</sup>

Despite this consensus that Pakistan would not transfer nuclear technology to other Muslim states, Pakistan has emerged as the worst nuclear proliferator in the twentieth century. Dr. Khan’s network, with varying levels of complicity by senior officials in Islamabad, provided uranium enrichment technology to Iran, Libya, and North Korea and nuclear warhead design information to at least Libya. This technology was also reportedly offered to Iraq, Egypt, Syria, and Saudi Arabia, although none of these countries are believed to have accepted.<sup>54</sup> The full range of states that received offers or engaged the services of Khan’s network is currently unknown. In addition, retired Pakistani nuclear scientists have been linked to Al Qaeda and the Taliban. The failure of respected regional and nonproliferation experts to forecast the emergence of Pakistan as a source of nuclear proliferation highlights the need for a better understanding of the motives and conditions that underlie this behavior.

### *The State of the Literature*

Determining the conditions under which nuclear sharing has occurred, and will occur in the future, is crucial to formulating effective strategies to reduce the dangers posed by state-sponsored nuclear proliferation. The extent of nuclear sharing has been recognized by only a handful of analysts.<sup>55</sup> Even fewer have sought to explain this behavior. Bradley Thayer suggests that states may share nuclear weapons technology due to national interest, avarice, or alliance relations.<sup>56</sup> Lewis Dunn cites economic incentives, ideological affinities, and security concerns as possible motivators for nuclear sharing by governments or mercenary scientists.<sup>57</sup> Neither author discusses the history of nuclear sharing, provides a theoretical basis for these explanations of this behavior, or tests the explanatory power of competing theories against the empirical evidence. The question of why states would share nuclear weapons technology, the conditions

---

<sup>51</sup> Jones, “Pakistan,” in Potter, ed., *International Nuclear Trade and Nonproliferation*, p. 225.

<sup>52</sup> Lavoy, “The Strategic Consequences of Nuclear Proliferation,” p. 746; and Feldman, *Nuclear Weapons and Arms Control in the Middle East*, p. 41.

<sup>53</sup> Feldman, *Nuclear Weapons and Arms Control in the Middle East*, pp. 41-43.

<sup>54</sup> Albright and Hinderstein, “Unraveling the A.Q. Khan and Future Proliferation Networks,” p. 113.

<sup>55</sup> See Thayer, “The Causes of Nuclear Proliferation and the Utility of the Nuclear Nonproliferation Regime,” pp. 500-501; Lavoy, “The Strategic Consequences of Nuclear Proliferation,” pp. 745-746; and Liberman, “Israel and the South African Bomb,” p. 67.

<sup>56</sup> Thayer, “The Causes of Nuclear Proliferation and the Utility of the Nuclear Nonproliferation Regime,” pp. 500-501.

<sup>57</sup> Lewis A. Dunn and Herman Kahn, *Trends in Nuclear Proliferation, 1975-1995: Projections, Problems, and Policy Options*, HI-2336-RR/3, Prepared for ACDA Contract No. ACDA/PAB-264 (Croton-on-Hudson, N.Y.: Hudson Institute, May 15, 1976); Lewis A. Dunn, “Nuclear “Gray Marketeering,”” *International Security*, Vol. 1, No. 3 (Winter 1977), pp. 107-118; and Lewis A. Dunn, *Controlling the Bomb: Nuclear Proliferation in the 1980s* (New Haven, Conn.: Yale University Press, 1982).

under which this is likely to occur, and the security implications of such transfers has been examined only on a case-by-case basis.<sup>58</sup> The purpose of this paper is to lay the foundation for a systematic, comparative analysis of this phenomenon and an assessment of its implications for international relations theory and nonproliferation strategy.

### **Nuclear Sharing and International Relations Theory**

Nuclear sharing represents an unheralded puzzle in international relations. Why would states share the most powerful military technology ever developed with other states? Due to the anarchic nature of international politics and the perpetual possibility of conflict, the distribution of military capabilities is crucial to the conduct of international politics. As a result, states should be impeded from engaging in nuclear cooperation due to four features of international politics: uncertainty of intentions, concerns with relative gains, fear of cheating, and unwillingness to accept asymmetric dependence.<sup>59</sup> These impediments to cooperation are especially strong in the field of military affairs where miscalculations can impose severe penalties. While evidence of these obstacles can be found in the history of nuclear sharing, they were not sufficient to prevent the widespread nuclear sharing that has occurred since the dawn of the atomic age.

#### *Obstacles to Cooperation*

The first impediment to cooperation is that the intentions of states are uncertain and unpredictable. Therefore, states worry that cooperating with a partner today could lead to the strengthening of an enemy tomorrow. As Jervis has noted, “Minds can be changed, new leaders can come to power, values can shift, new opportunities and dangers can arise.”<sup>60</sup> In early 1959, Soviet Premier Nikita Khrushchev began to have doubts about the October 1957 New Defense Technical Accord which pledged the Soviet Union to provide ballistic missiles and nuclear technology, including a prototype atomic bomb, to China. Chairman Mao Zedong’s rhetoric about nuclear weapons being “paper tigers”, his hyperbole about the ability of China to survive a nuclear war, and his initiation of the 1958 Taiwan Straits crisis without warning Moscow beforehand, raised concerns that the Chinese would not remain reliable allies. By mid-1959, the Soviets had informed the Chinese that they would not supply a prototype atomic bomb and they withdrew all technical advisors in 1960.<sup>61</sup>

Second, as a result of this uncertainty and the anarchic nature of international politics, states will assess the benefits of cooperation from the perspective of relative gains. As Grieco states, “*the fundamental goal of states in any relationship is to prevent others from achieving advances in their relative capabilities.*”<sup>62</sup> According to Waltz, “When faced with the possibility of cooperating for mutual gain, states that feel insecure must ask how the gain will be divided.

---

<sup>58</sup> For studies of recent cases of nuclear sharing, see Jason D. Ellis, “Beyond Nonproliferation: Secondary Supply, Proliferation Management, and U.S. Foreign Policy,” *Comparative Strategy*, Vol. 20, No. 1 (January-March 2001), pp. 1-24; Kampani, “Second Tier Proliferation,” pp. 107-116; Paul, “Chinese-Pakistani Nuclear/Missile Ties and Balance of Power Politics,” pp. 21-29; Liberman, “Israel and the South African Bomb,” pp. 46-80; Chaim Braun and Christopher F. Chyba, “Proliferation Rings: New Challenges to the Nuclear Nonproliferation Regime,” *International Security*, Vol. 29, No. 2 (Fall 2004), pp. 5-49; and Andrew J. Coe, “North Korea’s New Cash Crop,” *The Washington Quarterly*, Vol. 28, No. 3 (Summer 2005), pp. 73-84.

<sup>59</sup> Kenneth Waltz, *Theory of International Politics* (New York: McGraw Hill, 1979), pp. 105-106; and Joseph Grieco, “Anarchy and the Limits of Cooperation: A Realist Critique of the Newest Liberal Institutionalism,” *International Organization*, Vol. 42, No. 3 (Summer 1988), p. 487.

<sup>60</sup> Robert Jervis, “Cooperation Under the Security Dilemma,” *World Politics*, Vol. 30, No. 2 (January 1978), p. 168.

<sup>61</sup> Lewis and Xue, *China Builds the Bomb*, p. 63; and Gobarev, “Soviet Policy toward China,” p. 26.

<sup>62</sup> Grieco, “Anarchy and the Limits of Cooperation,” p. 498. (emphasis in original)

They are compelled to ask not ‘Will both of us gain?’ but ‘Who will gain more?’ If an expected gain is to be divided, say, in the ratio of two to one, one state may use its disproportionate gain to implement a policy to damage or destroy the other. Even the prospect of large absolute gains for both parties does not elicit their cooperation so long as each fears how the other will use its increased capabilities.”<sup>63</sup> Thus, states are less likely to engage in cooperation that benefits a partner more than themselves.

Concerns over relative gains prevented the United States and United Kingdom from undertaking joint research on the use of uranium for weapons for two years during World War II. In 1941, the United States sought to form a joint project with the British whose uranium research was much more advanced. The British demurred until mid-1942 when they perceived that the scale and sophistication of American research had exceeded theirs. By this time, the United States preferred to continue to pursue their program independently, and it was with great reluctance, and with many restrictions, that they accepted British participation in the Manhattan Project as a junior partner in August 1943.<sup>64</sup>

The third impediment to international cooperation is that in the absence of a central authority to enforce promises, states will be concerned that their potential partner will cheat and use a cooperative arrangement to secretly increase its power. According to Charles Lipson, it is the “special peril of defection” that makes cooperation in security affairs so difficult.<sup>65</sup> A related concern is that poor security in the recipient state would allow a third party to benefit from this cooperation.

Both of these fears were stumbling blocks in early Anglo-American nuclear cooperation. During the fall of 1941, the British put off American requests for closer cooperation due to the possibility that the results of British research would fall into enemy hands due to America’s laxer secrecy laws.<sup>66</sup> Two years later, one of the key stumbling blocks for Anglo-American nuclear cooperation was the fear by American officials that Great Britain’s proposal for a joint project was motivated by the desire to gain knowledge that would be used to compete commercially in the field of atomic energy after the war. The August 1943 Quebec Agreement was reached only after Prime Minister Winston Churchill explicitly renounced British interest in post-war industrial and commercial applications of nuclear technology except as permitted by the United States. As a safeguard, the agreement restricted the exchange of information on the design, construction, and operation of large-scale nuclear facilities.<sup>67</sup>

The fourth obstacle to international cooperation is that states will seek to avoid becoming dependent on other, potentially hostile, states. In a self-help system, it is safer to rely on your own weapons to defend yourself as opposed to relying on allies of uncertain reliability. Even when cooperation does take place, however, states remain sensitive to the development of asymmetrical dependencies that could be exploited. Although small states may not be able to afford foregoing interdependence, larger states will attempt to control what they depend on or reduce their dependence.<sup>68</sup> As Grieco has noted, “An advantaged partner, states may worry,

---

<sup>63</sup> Waltz, *Theory of International Politics*, p. 105.

<sup>64</sup> Pierre, *Nuclear Politics*, pp. 20-49.

<sup>65</sup> Charles Lipson, “International Cooperation in Economic and Security Affairs,” *World Politics*, Vol. 37, No. 1 (October 1984), p. 14.

<sup>66</sup> The United States was not yet at war with Germany and Japan so it did not yet have tighter controls over scientific information with potential national security implications. Pierre, *Nuclear Politics*, p. 27.

<sup>67</sup> In contrast, the exchange of information regarding scientific research and development was to be “full and effective”. Ibid., pp. 44-46, 345-346.

<sup>68</sup> Waltz, *Theory of International Politics*, p. 107, 168-170.

could use increased influence arising from its enjoyment of relative gains to force them to accept progressively less favorable terms in the joint arrangement in which the gap originated, and in arrangements in other domains as well.”<sup>69</sup>

Fear of asymmetric dependence was clearly a factor for the British in their cooperation with the United States and with the Chinese in receiving assistance from the Soviet Union. In advising against entering into nuclear cooperation with the United States in the early 1940s, Lord Cherwell, Churchill’s senior scientific advisor, argued that, “However much I may trust my neighbour, and depend upon him, I am very much averse to putting myself completely at his mercy and would therefore not press the Americans to undertake this work.”<sup>70</sup> Chairman Mao was also unwilling to become entirely dependent on the Soviet Union for nuclear technology. At the same time that he sought nuclear assistance from Khrushchev, Mao also bolstered China’s indigenous nuclear capabilities. One of the elements of nuclear weapons policy adopted by the Central Military Commission in mid-1958 was that, “In the process of developing nuclear weapons, we should not imitate other countries.”<sup>71</sup> According to John Lewis and Xue Litai, “the duality of dependency and self-reliance in China’s quest for nuclear weapons endured right to the moment Soviet aid terminated.”<sup>72</sup>

### *The Nuclear Revolution and Nuclear Cooperation*

An argument could be made that the nuclear revolution has reduced the relevance of some of these barriers to cooperation. Robert Jervis and Robert Powell have described how the likelihood of international cooperation can be expected to increase when the balance of military technology favors the defender.<sup>73</sup> Nuclear weapons strengthen the defender by providing the state with the ability to inflict unacceptable damage upon an aggressor. Since secure second-strike capabilities can be measured in absolute terms, relative capabilities are no longer central to securing a state’s vital interests and thus sensitivity to relative gains is greatly diminished.<sup>74</sup> Thus, the effects of nuclear cooperation do not result in relative gains that are convertible, fungible or useful for anything but deterrence. By alleviating concerns over relative gains, the nuclear revolution should facilitate nuclear cooperation.

There are two flaws with this argument. The first flaw is that the strongest academic proponents of the nuclear revolution also believe that national leaders have not grasped the fundamental meaning of this revolution. While American declaratory policy briefly endorsed this concept, procurement and doctrine have consistently reflected attempts to escape the nuclear revolution.<sup>75</sup> During the Cold War both superpowers invested considerable resources in developing counterforce and defensive capabilities to gain a nuclear advantage over their rival;

---

<sup>69</sup> Joseph Grieco, “Understanding the Problem of International Cooperation,” in David Baldwin, ed., *Neorealism and Neoliberalism: The Contemporary Debate* (New York: Columbia University Press, 1993), p. 315.

<sup>70</sup> Pierre, *Nuclear Politics*, p. 28.

<sup>71</sup> Lewis and Xue, *China Builds the Bomb*, p. 70.

<sup>72</sup> *Ibid.*, p. 71.

<sup>73</sup> Jervis, “Cooperation under the Security Dilemma,” pp. 167-214; Powell, “Absolute and Relative Gains,” in Baldwin, ed., *Neorealism and Neoliberalism*, pp. 209-233; and Powell, “Anarchy in International Relations Theory: the Neorealist-Neoliberal Debate,” *International Organization*, Vol. 48, No. 2 (Spring 1994), pp. 334-338.

<sup>74</sup> Robert Jervis, *The Meaning of the Nuclear Revolution* (Ithaca, N.Y.: Cornell University Press, 1989), pp 4-8.

<sup>75</sup> Robert Jervis, *The Illogic of American Nuclear Strategy* (Ithaca, N.Y.: Cornell University Press, 1984); Henry S. Rowen, “The Evolution of Strategic Nuclear Doctrine,” in Laurence Martin, ed., *Strategic Thought in the Nuclear Age* (Baltimore, M.D.: Johns Hopkins University Press, 1979), pp. 131-156; and Aaron Friedberg, “A History of the U.S. Strategic ‘Doctrine’, 1945-1980,” *Journal of Strategic Studies*, Vol. 3, No. 4 (December 1980), pp. 37-71.

neither side was content with secure second-strike forces.<sup>76</sup> If American and Soviet policy makers did not believe that the nuclear revolution made them secure and they continued to measure their security in relative terms, it is highly unlikely that this logic motivated their sharing of nuclear weapons technology with other states. The second flaw with this argument is that the nuclear revolution is predicated on both states having secure second-strike capabilities. A nuclear arsenal vulnerable to a first-strike is destabilizing and negates the value of the nuclear revolution. Nuclear sharing for the explicit purpose of helping a state develop a secure second-strike capability, namely ballistic missile submarines, was a feature of only later Anglo-American and Franco-American cooperation.<sup>77</sup> However, Franco-Israeli, Israeli-South African, and Sino-Pakistani nuclear cooperation also included the provision of ballistic missiles or missile production technologies that could have given the recipient a secure second-strike capability against a regional adversary.<sup>78</sup> It is not known, however, to what extent these transfers of missiles and missile technology were motivated by strategic calculations or economic interests.

### **Models of Nuclear Sharing**

Despite these obstacles to cooperation, there have been 13 cases of states providing nuclear weapons technology to other states. There are three models that are useful in explaining why states have been willing to engage in nuclear cooperation: security, parochial interest, and culture. In summary, the three primary forces that lead states to overcome the strong impediments to nuclear cooperation are fear, greed, and ideology. It should be noted that none of the cases of nuclear sharing uncovered to date can be explained wholly by any single model. Indeed, different models may have greater explanatory power at different phases of nuclear sharing. Also, the motivations of the state providing the nuclear technology and the state obtaining it may be different. Nonetheless, these models serve a practical purpose in differentiating the causes of nuclear sharing and highlighting the conditions that lead to its initiation, continuation, and termination.

#### *Security Model*

According to the security model, states engage in nuclear cooperation to counter external threats to vital national interests.<sup>79</sup> Under this model, states are highly sensitive to the risks of

---

<sup>76</sup> John Mearsheimer, *The Tragedy of Great Power Politics* (New York: Norton, 2001), p. 230.

<sup>77</sup> On U.S. assistance to the British and French strategic missile submarine programs, see Robert S. Norris, Andrew S. Burrows, and Richard W. Fieldhouse, *Nuclear Weapons Databook, Vol. V: British, French, and Chinese Nuclear Weapons* (Boulder, Col: Westview Press, 1994), pp. 99-121 and 190-193.

Although the Soviet Union provided China in 1959 with the equipment, components and technical data required to assemble a Golf-class diesel submarine capable of firing ballistic missiles and an R-11FM missile (a naval version of the Scud missile with a range of 162 kilometers), it refused to provide any technology for nuclear-powered submarines or solid propellant sub-launched missiles. John W. Lewis and Xue Litai, *China's Strategic Seapower: The Politics of Force Modernization in the Nuclear Age* (Stanford, Calif.: Stanford University Press, 1994), pp. 12-15, 131-133.

<sup>78</sup> The Soviet Union provided a small number of sample Tu-16 medium bombers and R-1 (Scunner) and R-2 (Sibling) ballistic missiles to China in the 1950s. These delivery systems did not have the range to reach the continental United States, but they could have reached American bases in Asia. However, it is not believed that these delivery systems were deployed with nuclear warheads. See Norris, Burrow, and Fieldhouse, *Nuclear Weapons Databook, Vol. V*, pp. 358-367.

<sup>79</sup> For other applications of the security model to nuclear proliferation issues, see Scott Sagan, "Why Do States Build Nuclear Weapons? Three Models in Search of a Bomb," *International Security*, Vol. 21, No. 3 (Winter 1996/97), pp. 57-63; and Scott Sagan, "The Origins of Military Doctrine and Command and Control Systems," in Peter Lavoy,

cooperation in a field as important and sensitive as nuclear weapons, but these risks are outweighed by the danger of not engaging in such behavior in the face of a significant external threat. Decisions to engage in nuclear sharing are driven by calculations of the balance of threat.<sup>80</sup> This model is based on neorealist international relations theory which posits that in order to survive in an anarchic international system, states must arm themselves or ally with other states for protection against external threats. There are three ways that security concerns can lead to nuclear sharing.

First, a state may want to help an ally develop nuclear weapons in order to confront a common enemy based on the logic that “the enemy of my enemy is my friend”. Joseph Grieco has noted that a state’s sensitivity to relative gains, one of the key impediments to cooperation, is lower when the partner is a long-time ally, both states face an external threat, and when the relative gains in the domain of cooperation are not highly convertible or fungible across domains.<sup>81</sup> As a result, there may be situations in which a state may welcome an ally’s relative increase in capabilities.<sup>82</sup> As Peter Liberman has observed, “In general, states will fear the relative gains of nearby, powerful, offensively armed, and hostile nations more than those of distant, weak, defensively armed, and friendly ones.”<sup>83</sup> This version of the security model predicts that nuclear sharing should only occur between close allies and that the cooperation be designed to counter a common enemy and limit the ability of the recipient to threaten the provider. American assistance to the British nuclear weapons program beginning in 1958 and to the French program beginning in 1972 appears to be examples of this motivation.<sup>84</sup>

Nuclear sharing may also be used by states as a means to avoid offering or accepting an extended deterrent commitment. Such commitments are fraught with uncertainty and typically require costly actions to signal the credibility of the deterrer.<sup>85</sup> Providing a nuclear weapon capability to the threatened state would allow that state to engage in direct deterrence of the potential aggressor. States seeking to develop nuclear weapons to counter a severe external threat may find cooperation attractive because it enables them to achieve a more sophisticated capability more quickly and more cheaply than an indigenous effort. This motivation should be strongest where states face the toughest and most important cases of extended deterrence. Historically, however, this motivation for nuclear sharing has been weakest or most constrained in these cases. During the early Cold War, the United States refused to aid British and French nuclear weapons programs and consistently rejected providing such support to West Germany, South Korea, or Taiwan. Although China was the Soviet Union’s most important and most besieged ally in the 1950s, Moscow dragged its feet in assisting Beijing’s nuclear weapons program and abruptly terminated its assistance in 1960. An exception to this finding, however, is China’s support for Pakistan’s nuclear and missile programs. China’s assistance in these fields

---

Scott Sagan, and James Wirtz, eds., *Planning the Unthinkable: How New Powers Will Use Nuclear, Biological and Chemical Weapons* (Ithaca, N.Y.: Cornell University Press, 2000), pp. 23-30, 39-42.

<sup>80</sup> On balance of threat, see Stephen Walt, *The Origins of Alliances* (Ithaca, N.Y.: Cornell University Press, 1987).

<sup>81</sup> Grieco, “Understanding the Problem of International Cooperation,” pp. 323-324.

<sup>82</sup> Joseph Grieco, *Cooperation Among Nations: Europe, America, and Non-Tariff Barriers* (Ithaca, N. Y.: Cornell University Press), pp. 46-47.

<sup>83</sup> Peter Liberman, “Trading With the Enemy: Security and Relative Economic Gains,” *International Security*, Vol. 21, No. 1 (Summer 1996), p. 151.

<sup>84</sup> It is worth noting that the United States provided this assistance only after both nations had achieved a thermonuclear weapon capability which ameliorated concerns about relative gains and the assistance was primarily for strategic retaliatory forces aimed at a common adversary, the Soviet Union.

<sup>85</sup> See Thomas C. Schelling, *Arms and Influence* (New Haven, Conn.: Yale University Press, 1966), pp. 36-69.

has enabled Pakistan to balance against their common adversary, India, without requiring China to commit its own troops or nuclear weapons to defend Pakistani territory.<sup>86</sup>

A third security-related motivation for engaging in nuclear sharing is to obtain items of military value such as other types of nuclear technology or delivery systems. This type of nuclear cooperation need not take place as part of a formal alliance. Israeli-South African cooperation and Pakistani-North Korean cooperation appears to have been motivated by the mutual gains available through high-tech bartering. In the 1970s, Israel traded 30 grams of tritium, which is useful in boosting the explosive yield of nuclear weapons, for 600 tons of natural uranium, which Israel needed to fuel its Dimona reactor.<sup>87</sup> The Pakistani-North Korean military relationship which emerged in the 1990s appears to have involved a trade of Pakistani uranium enrichment technology for North Korean ballistic missile technology.<sup>88</sup>

### *Parochial Interest Model*

The parochial interest model emphasizes the role of private interests of organizations and individuals as the motivation for nuclear sharing. Under this model, the main actors are domestic and transnational individuals and groups whose objective is to maximize private gains.<sup>89</sup> These actors will most likely be drawn from the military and the nuclear energy establishment. These actors are motivated to engage in nuclear cooperation by the prospect of increasing their size, budget, power, autonomy, and/or prestige. Each actor, however, has different incentives for nuclear cooperation.

Military leaders are primarily interested in obtaining desired weapons on time at the lowest cost so they will seek the most cost-effective means of obtaining new weapons. The greater the economies of scale that can be achieved through joint research, development, and production, the greater the incentive to collaborate. Weapons that entail high unit costs, small production runs, and are research-intensive—such as nuclear weapons and delivery systems—are prime candidates for reaping large gains through cooperation.<sup>90</sup> As a result, military leaders are likely to support or lobby for nuclear cooperation with other states if it holds the prospect of reducing the cost of obtaining nuclear weapons or delivery systems for themselves.

Domestic nuclear establishments (nuclear energy agencies as well as civilian nuclear firms) are motivated by their desire to maximize private gains.<sup>91</sup> For the nuclear establishment in the exporting state, the revenue gained from nuclear sharing can be used to subsidize the development of a domestic nuclear energy industry and to increase the competitiveness of this industry in international markets. Current or former members of this establishment can also engage in nuclear sharing on an individual basis or as part of a non-government organization. For these nuclear mercenaries, the primary motivation is financial gain. The nuclear establishment in the importing state will seek or support nuclear cooperation that provides it with fissile material production and processing technology that will bolster its domestic industry and provide the

---

<sup>86</sup> Paul, "Chinese-Pakistani Nuclear/Missile Ties and Balance of Power Politics," pp. 21-29.

<sup>87</sup> Liberman, "The Rise and Fall of the South African Bomb," p. 52; and Liberman, "Israel and the South African Bomb," p. 9.

<sup>88</sup> Kampani, "Second Tier Proliferation," pp. 107-116.

<sup>89</sup> Andrew Moravcsik, "Taking Preferences Seriously: A Liberal Theory of International Politics," *International Organization*, Vol. 51, No. 4 (Autumn 1997), pp. 528-530.

<sup>90</sup> Andrew Moravcsik, "Armaments Among Allies: European Weapons Collaboration, 1975-1985," in Peter Evans, Harold Jacobson, and Robert Putnam, eds., *Double-Edge Diplomacy: International Bargaining and Domestic Politics* (Berkeley, Calif: University of California Press, 1993), pp. 131-132.

<sup>91</sup> Much as the conventional arms producers discussed in Moravcsik, "Armaments Among Allies," pp. 132-133.

foundation for future growth, as opposed to the acquisition of nuclear weapons and delivery systems.

The parochial interest model challenges the relative gains and unitary rational actor assumptions of the security model. Under this model, states engage in nuclear sharing in order to obtain material benefits (cash, weapons, or natural resources) for sub-state actors either as an end itself or as a means to an end (bureaucratic autonomy and prestige). Under the parochial interest model, actors are motivated by absolute rather than relative gains. Military organizations and nuclear establishments, however, have different preferences for the form of nuclear cooperation: weapons for the military and technology versus technology or profits for nuclear establishments and mercenaries. Nuclear sharing, therefore, is not the result of a top-down political decision, but a bottom-up lobbying campaign by self-interested domestic actors. Under this model, decisions to engage in nuclear sharing are the result of multiple competing actors seeking to maximize their private interests, not the national interest. As a result, a government's decision may not be "rational" since it is the outcome of log-rolling and coalition-building between domestic actors and not the result of a strategic cost and benefit analysis of alternative courses of action.<sup>92</sup>

Australia's consideration of the acquisition of nuclear weapon capabilities from Great Britain in the 1950s illustrates the competing incentives of military and nuclear actors. The Royal Australian Air Force first proposed the purchase of tactical nuclear weapons from Great Britain and served as the main lobbyist for the initiative. The British air force and Ministry of Supply supported this request with the hope that Australia would also purchase British-made bombers which would reduce the cost of these aircraft to the Royal Air Force. The Australian Atomic Energy Commission submitted a competing proposal to construct a plutonium production reactor and reprocessing facility with British assistance. Ultimately, the Australian government did not pursue either proposal, but as Jim Walsh has noted, "Indeed, the only thing more surprising than Australia's interest in nuclear weapons was Britain's willingness to provide them."<sup>93</sup>

### *Cultural Model*

According to the cultural model, nuclear sharing is a function of shared beliefs and identities including religion and ideology. According to the cultural perspective, the roots of decisions to engage in nuclear sharing can be found in historical experiences and myths, religious beliefs, identities, ideologies, and norms.<sup>94</sup> As Scott Sagan has described, "Strategic choice is determined by different cultural influences on decision makers and not by the rational pursuit of similar national security or functional organizational interests. Individual leaders act according to what they believe is appropriate behavior, not according to clear and objective interests shared by all leaders."<sup>95</sup> Under the culture model, actors are driven not by absolute gains or relative gains, but by collective gains. Cooperative relationships with other actors who share their beliefs or identity are evaluated based on the expected joint payoff.<sup>96</sup> An exception to this is when the proposed cooperation touches upon "positional goods", such as status within a

---

<sup>92</sup> Sagan, "Why Do States Build Nuclear Weapons?" pp. 63-73.

<sup>93</sup> Walsh, "Surprise Down Under," pp. 1-20.

<sup>94</sup> Sagan, "The Origins of Military Doctrine and Command and Control Systems," pp. 30-35, 42-45.

<sup>95</sup> *Ibid.*, " p. 30.

<sup>96</sup> Arthur A. Stein, *Why Nations Cooperate: Circumstance and Choice in International Relations* (Ithaca, N.Y.: Cornell University Press, 1990), pp. 163-167, 201.

specific community, which engenders relative gains concerns.<sup>97</sup> Under the cultural model, identity trumps national interest and parochial interests.<sup>98</sup>

Arthur Stein has observed that the President John F. Kennedy's decision at the December 1962 Nassau Conference to sell Polaris submarine-launched ballistic missiles to Great Britain was an example of a decision based on joint gains.<sup>99</sup> After the United States cancelled the air-launched Skybolt missile which it had promised to provide to Great Britain, Prime Minister Harold Macmillan asked Kennedy to replace it with the Polaris system. Kennedy's advisors were opposed to this idea and some saw this incident as an opportunity to cease nuclear cooperation with Britain all together.<sup>100</sup> Secretary of Defense Robert McNamara had recently criticized the concept of small independent nuclear forces as "dangerous, expensive, prone to obsolescence and lacking in credibility as a deterrent."<sup>101</sup> Although this critique was aimed at the French *force de frappe*, it applied equally to Great Britain's pursuit of an independent deterrent. An independent British nuclear force also undermined America's new strategy of flexible and controlled nuclear response which required centralized command and control of Western nuclear weapons. Therefore, providing Polaris would not be in the United States strategic self-interest. In addition, the material costs of refusing to supply Polaris were minimal. Macmillan explicitly reassured Kennedy that the British would continue their strategic nuclear cooperation in other fields: the stationing of American Polaris submarines at Holy Loch, the operation of the Fylingdales early warning radar station, and the use of RAF bases by American aircraft.<sup>102</sup> Parochial interests also can not explain this decision.

Scholars have highlighted the importance of the "special relationship" between the United States and Great Britain as a key factor in persuading Kennedy to agree to Macmillan's request for Polaris.<sup>103</sup> Kennedy was sensitive to the domestic political difficulties that the Skybolt cancellation caused Macmillan as well as the long history of Anglo-American cooperation on nuclear weapons and other strategic issues. After Nassau, Kennedy told Theodore Sorensen, "Looking at it from their point of view...it might well be concluded that...we had an obligation to provide an alternative."<sup>104</sup> Told that he had been soft on Macmillan at Nassau, Kennedy responded, "If you were in that kind of trouble, you would want a friend."<sup>105</sup> Kennedy's explanation of his decision reflects the importance of his perception of the British as belonging to a special category that carried with it particular norms of behavior. As Andrew Pierre has observed, "For reasons of history, culture, mutual faith in democratic government, and common purpose, the United States has always looked at Britain through a special prism."<sup>106</sup>

---

<sup>97</sup> Robert Keohane, *After Hegemony* (Princeton, N.J.: Princeton University Press, 1984), p. 54.

<sup>98</sup> See Ronald L. Jepperson, Alexander Wendt, and Peter J. Katzenstein, "Norms, Identity, and Culture in National Security," in Peter J. Katzenstein, ed., *The Culture of National Security: Norms and Identity in World Politics* (New York: Columbia University Press, 1996), pp. 33-75.

<sup>99</sup> Stein, *Why Nations Cooperate*, pp. 155-163.

<sup>100</sup> The opposition was based on alliance politics and nonproliferation, not the fear that Great Britain would use these weapons against the United States. In addition, there was no consideration of maximizing relative gains vis-avis the British. *Ibid.*, p. 161.

<sup>101</sup> Pierre, *Nuclear Politics*, pp. 208-209.

<sup>102</sup> The agreement to station American ballistic missile submarines at Holy Loch was made in 1960 at the same time that the Skybolt agreement was reached.

<sup>103</sup> Pierre, *Nuclear Politics*, p. 241; and Stein, *Why Nations Cooperate*, pp. 159-160.

<sup>104</sup> Theodore C. Sorensen, *Kennedy* (New York: Harper and Row, 1965), p. 566.

<sup>105</sup> *Ibid.*, p. 559.

<sup>106</sup> Pierre, *Nuclear Politics*, p. 241.

From this perspective, breaking a promise was dishonorable and was simply not in the repertoire of acceptable behavior.

### *Strategies for Enhancing the Likelihood of Cooperation*

The security, parochial interest and culture models highlight the importance of different motivations for overcoming the high barriers to sharing such a valuable commodity as nuclear weapons technology. For example, each model posits a different mechanism for overcoming the problem of relative gains. In the standard neorealist conception of relative gains, a state's utility function is defined as  $U=V-k(W-V)$  where  $U$  represents the state's utility,  $V$  represents the state's gain from cooperation,  $W$  is the partner's gain from cooperation, and  $k$  is the state's sensitivity to relative gains. Under the security model,  $k$  is less than zero due to the positive externalities that a state experiences by sharing nuclear weapons technology with an ally facing a common enemy or avoiding an extended deterrence commitment. Under the parochial interest model, actors engaged in nuclear sharing are motivated by their private gains which are measured in absolute terms so their utility function is  $U=V$ . Under the culture model, actors are motivated by the prospect of joint gains so their utility function is  $U=V+W$ .

There are also a number of other strategies that states use to promote cooperation while safeguarding their interests. These strategies include changing the structure of payoffs, lengthening the shadow of the future, following a policy of reciprocity, engaging in issue-linkage, and using regimes to reduce transaction costs and the costs of gathering information.

The structure of payoffs in a proposed cooperative relationship can be manipulated to reduce the likelihood of defection. One straightforward but not necessarily simple way is to increase the magnitude of gains from mutual cooperation relative to the gains from exploitation. Actors that entail high specific costs—either material or reputational—as part of cooperation should be less likely to defect. For example, publicly announcing an agreement magnifies the reputation cost of breaking the agreement.<sup>107</sup> Although most nuclear sharing is conducted secretly, Anglo-American cooperation after 1958 was highly publicized. When the Kennedy Administration abruptly cancelled the Skybolt missile that had been promised to Britain in 1960 and was advertised by Macmillan's Conservative Party as the keystone of an independent deterrent, it caused a domestic political crisis for Macmillan. At Nassau, Macmillan described himself to Kennedy as a ship that looked seaworthy but was about to sink. Macmillan successfully used the domestic political fallout caused by the Skybolt cancellation to convince Kennedy to replace that weapon system with Polaris.<sup>108</sup>

Lengthening the shadow of the future facilitates cooperation by increasing the value of future payoffs relative to current payoffs and providing more timely and reliable information about a partner's actions.<sup>109</sup> One technique to lengthen the shadow of the future is to break a single agreement into multiple smaller agreements phased over time. For example, although Libya contracted to buy a "turn-key" uranium enrichment facility from the A.Q. Khan network in 1997, the nuclear assistance provided by the network was divided into stages. First, Libya received 20 pre-assembled centrifuges with aluminum rotors, components to assemble 200 more centrifuges, and a small quantity of hexafluoride uranium gas for enrichment in the centrifuges.

---

<sup>107</sup> Kenneth A. Oye, "Explaining Cooperation Under Anarchy: Hypotheses and Strategies," in Kenneth A. Oye, ed., *Cooperation Under Anarchy* (Princeton, N.J.: Princeton University Press, 1986), pp. 9-11.

<sup>108</sup> Pierre, *Nuclear Politics*, pp. 226, 233-235.

<sup>109</sup> Oye, "Explaining Cooperation Under Anarchy," pp. 12-13; and Robert Axelrod and Robert O. Keohane, "Achieving Cooperation Under Anarchy: Strategies and Institutions," in Baldwin, *Neorealism and Neoliberalism*, pp. 92-94.

After making progress creating a pilot-scale uranium enrichment plant with these centrifuges, Libya received 2 more advanced centrifuges with maraging steel rotors from Pakistan in late 2000 and placed an order for 5,000 more units. Libya later increased the order to 10,000 centrifuges with deliveries of components commencing in December 2002.<sup>110</sup>

A policy of reciprocity—rewarding cooperation with cooperation and defection with defection—can also be an effective means of increasing the likelihood of cooperation. The effectiveness of this strategy depends on the ability of a state to reliably distinguish between cooperation and defection among other actors and to respond in kind. It is easiest if the definitions of cooperation and defection are clear, acts of cooperation and defection are highly visible, and if the actors are unitary. Because reciprocity requires flexibility, control is important: internal factional, organizational or bureaucratic dysfunctions may limit the ability of states to implement a tit-for-tat strategy.<sup>111</sup>

Issue linkage is another strategy for improving the prospects of cooperation. Issue linkage provides a state with additional bargaining leverage by making one's own behavior contingent on others' actions on other issues. This strategy can be pursued as a *quid pro quo* or be used to turn a one-time deal into an iterated relationship involving multiple issues.<sup>112</sup> The French decision to provide a plutonium production reactor and reprocessing plant to Israel was implicitly linked to Israeli participation in the joint Anglo-French operation to seize the Suez Canal from Egypt. While not an explicit *quid pro quo* or a condition for Israeli involvement in the operation, the French political leadership approved the sale of a 10MW reactor to Israel at the end of the secret Sevres conference in October 1956 which cemented the tripartite military operation against Egypt. When the intervention stalled in November due to international pressure and Soviet threats, French leaders agreed to upgrade their nuclear assistance to Israel as compensation for Israel's withdrawal from the Sinai. As a result, the deal for the Dimona reactor was changed in October 1957 to include a larger reactor capable of producing ten to fifteen kilograms of plutonium per year along with the necessary spent fuel reprocessing and waste storage facilities.<sup>113</sup>

Regimes composed of principles, norms, rules and decision-making procedures can provide a useful means for reinforcing incentives for cooperation. Regimes can change the payoff structure between partners by generating norms that are internalized by states or generating information that can change interests. Regimes can also lengthen the shadow of the future by institutionalizing interactions and can facilitate the use of reciprocal strategies by limiting definitional ambiguity, reducing transaction costs, and increasing transparency.<sup>114</sup> During World War II, the United States and Britain tried but failed to create a regime to govern a joint nuclear weapons program. Each side proposed the creation of an institution to coordinate

---

<sup>110</sup> International Atomic Energy Agency (IAEA) Board of Governors, *Implementation of the NPT Safeguards Agreement of the Socialist People's Libyan Arab Jamahiriya*, GOV/2004/12 (Vienna, Austria: February 20, 2004); IAEA Board of Governors, *Implementation of the NPT Safeguards Agreement of the Socialist People's Libyan Arab Jamahiriya*, GOV/2004/33 (Vienna, Austria: May 28, 2004); and IAEA Board of Governors, *Implementation of the NPT Safeguards Agreement of the Socialist People's Libyan Arab Jamahiriya*, GOV/2004/59 (Vienna, Austria: August 30, 2004).

<sup>111</sup> Oye, "Explaining Cooperation Under Anarchy," pp. 14-16.

<sup>112</sup> Axelrod and Keohane, "Achieving Cooperation Under Anarchy," p. 99-101; and Oye, "Explaining Cooperation Under Anarchy," p. 17.

<sup>113</sup> Although on paper the reactor was rated at 24MW, it is believed to have been designed to operate at two to three times that power. Cohen, *Israel and the Bomb*, pp. 53-59.

<sup>114</sup> Oye, "Explaining Cooperation Under Anarchy," pp. 9-11, 16-20; and Axelrod and Keohane, "Achieving Cooperation Under Anarchy," pp. 94-97, 109-110.

such a program when they knew they would be the junior partner. Both times, the state with the more advanced nuclear program rejected the proposal. The Quebec Agreement of August 1943 created a Combined Policy Committee staffed by senior American and British officials to “ensure full and effective collaboration” towards the development of nuclear weapons. The extent of collaboration, however, was strictly limited by the United States and the committee never became the bi-national governing body that the British hoped it would be.<sup>115</sup>

### **Implications for the Nonproliferation Regime and International Security**

Nuclear sharing is an especially dangerous route of nuclear proliferation for three reasons. Nuclear sharing makes nuclear proliferation harder to stop, more destabilizing when it happens, and increases the risk of further proliferation.

First, nuclear sharing accelerates the pace of proliferation, increases the range of states capable of acquiring nuclear weapons, and reduces the warning time that a state is pursuing nuclear weapons. Typically, states take ten years to develop nuclear weapons.<sup>116</sup> The provision of nuclear weapons, materials, equipment or know-how could save a country many years and hundreds of millions of dollars. With the help of the Khan network, Libya assembled a laboratory-scale uranium enrichment plant in five years; a feat it had been unable to do on its own for the previous twenty years. In 2002, the CIA estimated that North Korea’s uranium enrichment program, established in 2000 on the basis of Pakistani technology, could result in weapons-grade uranium by mid-decade.<sup>117</sup> The sharing of nuclear weapons or construction of turn-key fissile material production facilities would allow even states with minimal nuclear infrastructure to become nuclear weapon states. Before renouncing its nuclear weapons program in December 2003, Libya had contracted with the A.Q. Khan network for the construction of a 10,000-centrifuge uranium enrichment facility which could produce enough highly enriched uranium for up to ten nuclear weapons a year. Nuclear sharing would also circumvent the international nuclear export control system which would diminish the warning time that a state was pursuing nuclear weapons. The combination of faster and less easily detected proliferation would reduce the amount of time that other states have to use diplomacy, incentives, and sanctions to persuade a state to abandon its nuclear weapon ambitions.

Second, nuclear sharing makes nuclear proliferation more dangerous and destabilizing. The prospect of instant nuclear powers raises the risk that leaders will not fully appreciate the power of these weapons and their strategic effects or that the regime that obtains them will be highly unstable. One of the key arguments of nuclear optimists for why nuclear weapons promote stability is that the long lead time, administrative skills, and substantial technical resources required for the production of nuclear weapons means that unstable or radical regimes are unlikely to master them.<sup>118</sup> In addition, the neighbors of such states will have less time to adapt to the new strategic situation. States that enter the nuclear club through “proliferation by purchase” may not have the requisite domestic scientific and technical expertise to safely and securely produce and handle nuclear weapons. This raises the risk of nuclear accidents, insecure arsenals, and clumsy nuclear operations that alarm neighboring states.

---

<sup>115</sup> Pierre, *Nuclear Politics*, pp. 26-63.

<sup>116</sup> Leonard S. Spector, “Strategic Warning and New Nuclear States,” *Defense Intelligence Journal*, Vol. 3, No. 1 (Spring 1994), pp. 33-52.

<sup>117</sup> Untitled CIA estimate for Congress, November 19, 2002, <http://www.fas.org/nuke/guid/dprk/nuke/cia111902.html>.

<sup>118</sup> Kenneth N. Waltz, “More May Be Better,” in Sagan and Waltz, *The Spread of Nuclear Weapons*, pp. 10-11.

Third, as the number of states with access to nuclear weapons technology grows, the possibility of further state-sponsored proliferation also increases. Less developed states are more likely to seek nuclear cooperation with other states, or even terrorist groups, to offset the costs of their nuclear weapons programs. North Korea, for example, may begin to view its nuclear weapons program as it does its ballistic missile program: not only as a military deterrent, but also as a source of much-needed hard currency. Furthermore, the increased availability of fissile material and nuclear weapons, especially in states that have not had the time to develop the physical, organizational, cultural, and technological components of an effective nuclear security system, raises the risk of theft by terrorists. Finally, as the easiest path to nuclear weapon acquisition, nuclear sharing poses a severe challenge to the global nonproliferation norm. The transfer of nuclear weapons technology, or even the prospect of it, may have a domino effect and jumpstart or accelerate nuclear weapons programs in other states.

## **Conclusion**

The sharing of nuclear weapons technology has been a crucial yet underappreciated factor in the proliferation of nuclear weapons. The British, Chinese, Pakistani, and Israeli programs benefited significantly from the knowing and willful transfer of nuclear weapons technology by foreign governments. Iraqi and Libyan acquisition of nuclear weapons would have been due to state-sponsored proliferation if outside intervention had not halted these programs. The current nuclear crises with Iran and North Korea were triggered by their acquisition of uranium enrichment technology from Pakistan. In total, there have been 13 cases of states sharing nuclear weapons technology with other states and another 15 cases of states unsuccessfully seeking such assistance.

The extent of nuclear sharing has gone largely unexamined by nonproliferation and international relations scholars. As a result, our understanding of why states offer and seek nuclear cooperation is severely lacking. The question of why states would share nuclear weapons technology, the conditions under which this is likely to occur, and the security implications of such transfers has been examined only on a case-by-case basis. This paper applies three models of decision-making that have been used profitably to analyze other aspects of nuclear proliferation to examine the motivations behind nuclear sharing. This analytical framework provides the foundation for a systematic, comparative analysis of state-sponsored nuclear proliferation and its implications for international relations theory and nonproliferation strategy. Evidence of security concerns, parochial interests, and cultural influences as motivating factors can be found in several known cases of nuclear cooperation. Further research is required to weigh the relative importance of each of these factors in decisions to engage in nuclear cooperation. Crafting an effective nonproliferation strategy to address the threat of state-sponsored nuclear proliferation requires a solid understanding of the determinants of nuclear sharing and the conditions which enable this behavior.