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Appendix – Coding Rules and Case Synopses

In this appendix we explain the procedures we used to determine the position of each potential proliferator during the run-up to its nuclearization or abandonment in terms of three of our independent variables: the level of security threat faced by the potential proliferator, its relative power vis-à-vis adversaries, and the level of allied protection it enjoyed. We do so in two steps. First, we lay out the general rules we developed to code states as adversaries or allies. Second, we describe our coding decisions case by case, providing brief summaries of, and select citations from, the case-specific literature. Results are summarized in Table 1, at the end of the Appendix.

1. Rules for Coding Adversaries and Allies

To characterize the strategic environment faced by the potential proliferator during the run-up to its nuclear acquisition or forbearance in terms of the level of security threat it faced, its relative power vis-à-vis its adversaries, and the level of allied protection it enjoyed, we used the following coding rules:

We first code adversaries, which we define as countries perceived by the potential proliferator as independent direct security threats that could warrant the acquisition of nuclear weapons. Two states are independent direct security threats if they make independent decisions to engage in war, may care about different security problems, and may engage in war against the potential proliferator without the support of each other. To code them, we canvassed the secondary and, often, primary literature on each case in an effort to determine which states the potential proliferator considered to be its independent direct security threats, against whom the nuclear investment would, if realized, provide additional security and bargaining power. These are the states that are most likely to consider a preventive attack against the potential proliferator.

We then investigate the role of nuclear powers as either allies of the potential proliferator or of its adversary/adversaries. In other words, we seek to determine which side, if any, nuclear powers would be likely to take in an eventual conflict between the potential proliferator and its adversary/adversaries. Finally, we code the type of the alliance, either formal or informal. We proceed as follows.

1) Side of the nuclear power: We look at the behavior of the nuclear power in past ICB crises, triggered after the beginning of the nuclear age in 1945 and terminated before the end of the calendar year in which the potential proliferator's nuclear program ended. We look at the set of crises in which the potential proliferators and at least one of its adversaries were crisis actors on opposite sides.

    a) If there is a crisis in which the potential proliferator and at least one of its adversaries were crisis actors on opposite sides, and the nuclear power was a crisis actor as well, we take the latest such crisis (i.e., the last such crisis to have taken place prior to the end of the potential proliferator's nuclear program). If the nuclear power was on the same side as the potential proliferator in the crisis, we code it as an ally of the potential proliferator. If the nuclear power was on the opposite

side of the potential proliferator, we code it an ally of the adversary/adversaries.[1]

b) If there is a crisis in which the potential proliferator and at least one of its adversaries were crisis actors on opposite sides, but none in which the nuclear power was a crisis actor as well, and the nuclear power is a superpower (i.e., the United States throughout the period or the U.S.S.R. until the end of the Cold War in 1989), we take the latest crisis in which (i) the potential proliferator and at least one of the adversaries were crisis actors on opposite sides, (ii) the superpower was actively involved, and (iii) the involvement of the superpower was viewed favorably by one side and unfavorably by the other.[2] If at that time the superpower had no formal defensive alliance with the potential proliferator or any of its adversaries involved in the crisis, then it is coded as an ally of the potential proliferator if its involvement is viewed favorably by the potential proliferator and unfavorably by at least one of the adversaries and coded as an ally of the adversary/adversaries if its involvement is viewed unfavorably by the potential proliferator and favorably by at least one of the adversaries. If at that time the superpower had a formal defensive alliance with the potential proliferator and did not have a formal defensive alliance with at least one of the adversaries who were crisis actors, the superpower is coded as an ally of the potential proliferator. If at that time the superpower had no formal defensive alliance with the potential proliferator and had a formal defensive alliance with at least one of the adversaries who were crisis actors, the superpower is coded as an ally of the adversary/adversaries.[3]

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[1] We view Russia (1991-) as a different country from the U.S.S.R. (1945-91) so that the behavior of the U.S.S.R. in ICB crises is not used to determine Russia's side between the potential proliferator and the adversary/adversaries.

[2] The ICB dataset codes the level of involvement of the United States and the U.S.S.R. in the variables 'usinv' and 'suinv', respectively. The superpower is 'actively involved' in a crisis if its level of involvement is greater than 'not involved' or 'non-intervention or neutrality' (i.e., the variable 'usinv' or 'suinv' takes a value greater than 2). The perception of the involvement of the United States and U.S.S.R. is codified in the variables 'usfavr' and 'sufavr' respectively.

[3] This means that we do not use the perception of the actors in cases in which the superpower has a formal defensive alliance with actor(s) on one side of the crisis. In such cases, the expectation is that the superpower would fight alongside its protégé in future crises. An expectation of support is compatible with the superpower having actively attempted to defuse past crises in order to avoid entrapment, causing its protégé to have viewed its involvement unfavorably. This need not mean that the superpower would not fight alongside its protégé were it to deem it necessary. Had it deemed it so in past crises, it would have been a crisis actor. At the same time, this rule means that unless a nuclear power is a superpower (the U.S.S.R. from 1945 to 1989 and United States throughout the period), we do not consider it an ally of either potential proliferator or adversary unless it has been an actor in a crisis opposing the potential proliferator and at least one of the adversaries during the period mentioned in 1.a. This means that nuclear powers other than the superpowers are not coded as nuclear allies of either the potential proliferator or the adversary/adversaries even if they have a formal military alliance with one of these sides or have been involved in relevant crises and their involvement was viewed favorably by one side and unfavorably by the other. It is only for the superpowers that we use their formal defensive alliances and their involvement (short of being an actor) in relevant crisis – and the favorable/unfavorable perception of this involvement by the potential proliferator and adversary/adversaries – to code them as allies of either side. This restriction on our criterion for coding nuclear states other than the superpowers as allies of either side has two justifications. First, in what concerns formal defensive alliances, nuclear allies that possess limited interests and power-projection capabilities (i.e., those that are not superpowers) often possess formal defensive alliances with superpowers. When the latter are involved as adversaries in a nuclear proliferation case, it would be incorrect to count their nuclear allies as co-adversaries. For example, it would not make empirical sense to count China as an adversary of Swedish or Swiss nuclearization alongside the U.S.S.R. in the late 1960s despite China's nuclear status after 1964 and the Sino-Soviet Treaty of Friendship, Alliance, and Mutual Assistance. Likewise, given their limited power-projection, it would not make sense to count

c) If there is no crisis where the potential proliferator and at least one of the adversaries were crisis actors on opposite sides, and the nuclear power is a superpower, we consider, first, the configuration of formal defensive alliances of the superpower at the end of the potential proliferator's nuclear weapons program.
   i) If the superpower had a formal defensive alliance with the potential proliferator and had no formal defensive alliance with any of the adversaries, we code it as an ally of the potential proliferator.
   ii) If the superpower had no formal defensive alliance with the potential proliferator and had a formal defensive alliance with at least one of the adversaries, we code it as an ally of the adversary/adversaries.
   iii) If the superpower had no formal defensive alliance with the potential proliferator or any of its adversaries, we determine that the superpower is an ally of one of the countries if both the superpower and the country in question expected and prepared for the superpower to assist the country if it were attacked by its adversary(ies).

2) Format of the alliance: The alliance between the nuclear power and a country, as determined in point 1), is *formal* if there is a formal defensive alliance between the two countries at the end of the potential proliferator's nuclear program and it is *informal* otherwise.

France or the United Kingdom as co-adversaries of China alongside the United States in the run-up to 1964 despite their nuclear status plus NATO and Manila Pact membership; or to count Pakistan as a co-adversary of Iraq alongside the United States in 1991 despite the U.S.-Pakistan Bilateral agreement. Second, in what concerns involvement in a crisis short of being a crisis actor, this information is unavailable in the ICB dataset, and in any case would likely generate imprudent codings as allies of states that were unlikely or unwilling to intervene as a crisis actor in a future crisis between the potential proliferator and the adversary/adversaries.

2. Case-by-Case Coding Decisions

In this section, we provide brief summaries of each case, specifying how the rules laid out above determine our codings of adversary/adversaries and nuclear allies in each of the historical cases of nuclear exploration or pursuit, which are listed alphabetically.

Algeria (1983-93;Libya+Morocco{US},—)

Coding of adversaries: Starting in 1963, Algeria had multiple clashes with Morocco over disputed areas of the Sahara, leading to an enduring rivalry from 1984. In 1975-6, 1979, and 1987, Algeria also clashed with Morocco over its support of the Polisario movement, which fought for the independence of Western Sahara, over which Morocco claimed sovereignty. Algeria's relations with Libya were close in some periods, leading the two countries to sign a mutual defense pact in Hassi Mas'ud, Algeria, in 1975. Yet relations soured when Algeria perceived that Libya was attempting to grow its regional influence. Algeria was concerned about Libya's announced merger with Chad in January 1981 and its growing influence over the Polisario movement. The border between Libya and Algeria, the subject of a conflicting, nonratified treaty from 1934, was also a major source of friction.

Coding of nuclear powers: At the time Algeria abandoned its nuclear program in 1993, the United States, Russia, the United Kingdom, France, China, Israel, India, South Africa, and Pakistan were nuclear powers. The last crisis in which Algeria and any adversary (in this case, Morocco) were crisis actors on opposite sides, the United States was actively involved and its involvement was viewed favorably by one side, unfavorably by the other is ICB 261, Moroccan March (1975-6). In this crisis, U.S. involvement was viewed favorably by Morocco, unfavorably by Algeria. Since the United States did not possess a formal defensive alliance with Morocco in 1993, we code it as an informal ally of Morocco. There was no crisis between the end of World War II and the end of 1993 in which Algeria and either Libya or Morocco were crisis actors on opposite sides and any nuclear power was a crisis actor. Thus, Russia, the United Kingdom, France, China, Israel, India, South Africa, and Pakistan are coded as allies of neither side. To summarize our coding of nuclear powers, we code the United States as Morocco's informal nuclear ally.

Selected bibliography for coding of adversaries:

Bennett, D. Scott. 1998. "Integrating and Testing Models of Rivalry Duration." *American Journal of Political Science*. Vol. 42, No. 4, pp. 1200-32.

Deeb, Mary-Jane. 1989. "Inter-Maghribi Relations since 1969: A Study of the Modalities of Unions and Mergers." *Middle East Journal*. Vol. 43, No. 1, pp. 20-33.

Deutch, John M. 1991. "The New Nuclear Threat." *Foreign Affairs.* Vol. 71, No. 4, pp. 120-34.

Tertrais, Bruno. 2009. "The Middle East's Next Nuclear State." *Strategic Insights*. Center for Contemporary Conflict at the Naval Postgraduate School, Monterey, California. Vol. 8, No. 1.

Zartman, I. William. 1987. "Foreign Relations of North Africa." *Annals of the American Academy of Political and Social Science*. Vol. 489, pp. 13-27.

Argentina (1968-90; —;—)

Coding of adversaries: Argentina's nuclear program is often portrayed as having been motivated by a security threat emanating from Brazil. In our view, there is little if any empirical support for this claim. Other than Brazil, the only possible security threat against which Argentina might have tried to develop a nuclear-weapons capability was the Soviet Union, which rhetorically opposed the conservative military

regime that ruled Argentina during much of its period of nuclear exploration. We do not find any evidentiary support for this claim either in the primary or secondary literature, however, and so we dismiss it. Instead, we see Argentina's nuclear program, like Brazil's, as having been motivated primarily by the country's quest for autonomy and secondarily by the need to approach energy independence in order to ensure economic development. As Hymans (2001, 154) argues in what remains the most thorough study of the case written in English language and using Argentine primary sources, "Argentina's nuclear program was not aimed at building nuclear weapons." In fact, Argentina and Brazil cooperated extensively in trying to circumvent the restrictions imposed by the NPT and U.S. non-proliferation efforts regarding the supply of nuclear technology and materials by nuclear states to non-NPT members. It would be unjustified, therefore, to code Brazil as Argentina's adversary in the latter's nuclear effort.

During the Peronist regime, between 1946-55, the country established its nuclear-energy agency (CNEA) and started pursuing civilian nuclear energy. It inaugurated its first research reactor in 1958, three years after Perón had been replaced by the military, which continued to support the nuclear program. In 1964-67, during the negotiations for the Treaty of Tlatelolco – which established a nuclear-weapons free zone in Latin America and the Caribbean – Argentina and Brazil coordinated their nuclear policies for the first time, opposing the treaty. The two countries also jointly opposed the NPT on the grounds that it was discriminatory, impinged on state sovereignty, and would hinder the technological development of non-nuclear states. In 1968, Argentina began to operate Latin America's only chemical processing plant for reclaiming plutonium from spent fuel, on a pilot scale. (This led to the coding that the military component of Argentina's nuclear program started in 1968.) This technological advancement, combined with Argentina's opposition to non-proliferation treaties, led to strong suspicion in the United States that the country was keen to develop nuclear weapons. At the same time, U.S. leaders were puzzled by a concomitant development: "in contrast to India and Pakistan, neither Argentina nor Brazil in the late 1960s perceived the other as having the intention to introduce instability into the Southern Cone by building nuclear weapons" (Hymans 2001, 161).

This view that Argentina was not seeking to acquire nuclear weapons is corroborated by Buenos Aires's decision in 1973 to opt for a Canadian deal to supply its second nuclear-power reactor, eschewing a German offer that included the latest (ultracentrifuge) uranium enrichment technology (Hymans 2001, 165). Still, following the 1974 Indian "peaceful nuclear explosion," and as part of the United States increased pressure on suppliers of nuclear technology and materials, Washington began an effort to curb the Argentine nuclear program, along with that of its neighbor, Brazil. In 1977, U.S. Vice-President Walter Mondale visited West Germany to try to dissuade it from supplying nuclear technology to Brazil. This prompted stronger ties between Argentina and Brazil in the nuclear domain. In fact, the two countries issued a joint communiqué calling for nuclear collaboration, attempting to surmount the barriers set in place by the new non-proliferation regime – and the renewed U.S. focus on stymieing the spread of nuclear weapons. The following year, Argentina and Brazil signed an agreement resolving the issues in the River Plate region – the source of the last direct conflict between the two countries, in 1828. (In recent decades, the main conflict of interests between the two countries revolved around the use of shared hydroelectric resources at Iguaçu. Being a limited issue, this would not benefit from nuclear-weapons possession as a bargaining tool.)

At the same time, reacting to the 1977 Symington Act and the 1978 Non-Proliferation Energy Act by the U.S. Congress, which precluded supplies of enriched uranium to non-signatory countries, Argentina started a secret uranium-enrichment program. In 1980, Brazil and Argentina signed an agreement for nuclear fuel cycle cooperation. The country's military regime suffered a setback with its defeat at the hands of British

forces in the Falklands War in 1982, but this outcome led to further rapprochement with Brazil, which played a supportive role during the conflict. The secret uranium-enrichment facility was discovered in 1983, working to enrich uranium at the 20% level (sufficient for powering nuclear reactors, but below the 90% level required for nuclear weapons). This is consistent with Argentine goals to develop a fleet of nuclear-powered submarines – and with the view that the country did not aim to acquire nuclear weapons. The United States saw this development as a threat, starting increased international economic and diplomatic pressure on both Argentina and Brazil.

In January the following year, newly-elected civilian President Alfonsín – who was determined to pursue peaceful nuclear energy as part of his autonomy program but worried about the security perceptions the nuclear program might generate in Brasilia and Washington – declared that Argentina was committed exclusively to the peaceful use of nuclear energy. Then, in late 1985, Alfonsín and Brazilian President José Sarney established a joint committee chaired by their foreign ministers to coordinate the countries' nuclear policies. Starting in 1987, the two presidents embarked on a series of state visits to previously restricted nuclear facilities in each other's country. The following year, the two countries signed the Iperó Joint Declaration on Nuclear Policy. In July 1989, Carlos Menem was elected President of Argentina. His administration wholeheartedly pursued a policy of alignment with the United States, and this led him to want to boost the country's non-proliferation credentials. As a consequence of this policy shift, and a similar shift implemented by Brazil's new President Collor de Mello, the two signed the Declaration on the Common Nuclear Policy of Brazil and Argentina in November 1990, promising to renounce nuclear tests, draft a mutual inspection agreement, establish a framework for implementation of IAEA safeguards, and amend and ratify Tlatelolco. (This Declaration led to the coding of Argentina's nuclear program ending in 1990.)

In sum, Argentina did not possess a significant security threat that propelled it to aim at developing nuclear weapons. Its reluctance to join the nonproliferation regime – like Brazil's – stemmed from its goal of national autonomy and economic development. Once the country saw that these goals would be better achieved by pursuing a rapprochement with Brazil and a policy of stronger alignment with the United States, it reversed its nuclear policy, joining the non-proliferation regime in 1995.

Coding of nuclear powers: N/A, since we are unable to identify Argentina's potential adversaries.

Selected bibliography for coding of adversaries:

Carasales, Julio Cesar. 1995. "The Argentine-Brazilian Nuclear Rapprochement." *The Nonproliferation Review*. Vol. 2, No. 3, pp. 39-48.

Carasales, Julio C. 1999. "The So-Called Proliferator that Wasn't: The Story of Argentina's Nuclear Policy." *The Nonproliferation Review*. Vol. 6, No. 4, pp. 51-64.

Gamba-Stonehouse, Virginia. 1991. "Argentina and Brazil." In *Security with Nuclear Weapons? Different Perspectives on National Security*, edited by Regina Cowen Karp, pp. 229-56. Oxford: Oxford University Press.

Goldemberg, José, and Harold A. Feiveson. 1994. "Denuclearization in Argentina and Brazil." *Arms Control Today*. Vol. 24, No., pp. 10-4.

Hymans, Jacques. 2001. "Of Gauchos and Gringos: Why Argentina Never Wanted the Bomb, and Why the United States Thought It Did." *Security Studies*. Vol. 10, No. 3, pp. 153-85.

Paul, T.V. 2000. *Power versus Prudence: Why States Forgo Nuclear Weapons*, Chapter 6. Montreal: McGill-Queen's University Press.

Redick, John R., Julio C. Carasales, and Paulo S. Wrobel. "Nuclear Rapprochement: Argentina, Brazil, and

the Non-Proliferation Regime." *Washington Quarterly*. Vol. 18, No. 1, pp. 107-22.
Reiss, Mitchell. 1995. *Bridled Ambition: Why Countries Constrain their Nuclear Capabilities*, Chapter 3. Washington, DC: Woodrow Wilson Center Press.

Australia (1956-61;Indonesia+China[USSR],[US])

Coding of adversaries: Since its inception in 1956, the Australian nuclear program was aimed at deterring a potential Chinese threat. Given Beijing's activist foreign policy, Canberra's government viewed China as Australia's main geopolitical threat. Australia's nuclear quest was a reaction to its worsening security situation vis-à-vis China as a consequence of the withdrawal of British forces from theaters east of Suez after the 1956 crisis. Given China's perceived intention to create its own sphere of influence in South East Asia and Australasia, Canberra decided to pursue nuclear weapons. At the beginning of the 1960s, Australia's military also feared a potential threat from Indonesia given the activist, anti-status quo, and often belligerent policy of the Sukarno government.

Coding of nuclear powers: At the time Australia abandoned its first nuclear program in 1961, the United States, Soviet Union, United Kingdom, and France were nuclear powers (plus China, which we coded above as Australia's adversary). There is no ICB crisis between the end of World War II and the end of 1961 in which Australia was a crisis actor. Thus, France and the United Kingdom are not coded as allies of either side. In 1961, the United States had a formal defensive alliance with Australia (ATOP treaty 3260 [Southeast Asia Collective Defense Treaty, a.k.a. Manila Pact]). We therefore code it as a formal ally of Australia. In 1961, the U.S.S.R. had a formal defensive alliance with China (ATOP treaty 3200 [Sino-Soviet Treaty of Friendship, Alliance, and Mutual Assistance]). We therefore code it as a formal ally of China. To summarize our coding of nuclear powers, we code the United States as Australia's formal nuclear ally and the USSR as China's formal nuclear ally.

Selected bibliography for coding of adversaries:
Fitzpatrick, Mark and Tim Huxley. 2009. *Preventing Nuclear Dangers in Southeast Asia and Australasia*, Chapter 12. London: International Institute for Strategic Studies.
Hymans, Jacques E. C. 2006. *The Psychology of Nuclear Proliferation: Identity, Emotions, and Foreign Policy*, Chapter 5. Cambridge: Cambridge University Press.
Leah, Christine M. 2012. "U.S. Extended Nuclear Deterrence and Nuclear Order: An Australian Perspective." *Asian Security*. Vol. 8, No. 2, pp. 93-114.
Walsh, Jim. 1997. "Surprise Down Under: The Secret History of Australia's Nuclear Ambitions." *Nonproliferation Review*, Vol. 5, No. 1, pp. 1-20.

Australia (1967-72;China[USSR],[US])

Coding of adversaries: China's nuclear acquisition in 1964 led Australia to reinitiate its nuclear efforts. Canberra's government was convinced that Beijing would be willing to resort to nuclear coercion and, if necessary, nuclear war in pursuit of its regional sphere of influence. Furthermore, the perception of a significant conventional threat emanating from China led the Australian military to consider the value of tactical nuclear weapons. Given Sukarno's toppling and replacement with the more conservative Suharto's regime in 1965-66, Indonesia was no longer a threat during this later period, leading us to code China as the sole adversary by the end of Australia's nuclear program.

Coding of nuclear powers: At the time Australia abandoned its second nuclear program in 1972, the United States, Soviet Union, United Kingdom, France, and Israel were nuclear powers (plus China, which we coded above as Australia's adversary). There is no ICB crisis between the end of World War II and the end of 1972 in which Australia was a crisis actor. Thus, the United Kingdom, France and Israel are not coded as allies of either side. In 1972, the United States had a formal defensive alliance with Australia (ATOP treaty 3260 [Southeast Asia Collective Defense Treaty, a.k.a. Manila Pact]). We therefore code it as a formal ally of Australia. In 1972, the U.S.S.R. had a formal defensive alliance with China (ATOP treaty 3200 [Sino-Soviet Treaty of Friendship, Alliance, and Mutual Assistance]). We therefore code it as a formal ally of China. To summarize our coding of nuclear powers, we code the United States as Australia's formal nuclear ally and the USSR as China's formal nuclear ally.

Selected bibliography for coding of adversaries:

Fitzpatrick, Mark and Tim Huxley. 2009. *Preventing Nuclear Dangers in Southeast Asia and Australasia*, Chapter 12. London: International Institute for Strategic Studies.

Hymans, Jacques E. C. 2006. *The Psychology of Nuclear Proliferation: Identity, Emotions, and Foreign Policy*, Chapter 5. Cambridge: Cambridge University Press.

Leah, Christine M. 2012. "U.S. Extended Nuclear Deterrence and Nuclear Order: An Australian Perspective." *Asian Security*. Vol. 8, No. 2, pp. 93-114.

Walsh, Jim. 1997. "Surprise Down Under: The Secret History of Australia's Nuclear Ambitions." *Nonproliferation Review*. Vol. 5, No. 1, pp. 1-20.

Brazil (1953-90;—,—)

Coding of adversaries: Brazil's nuclear program is often portrayed as having been motivated by a security threat emanating from Argentina. In our view, there is little if any empirical support for this claim. Other than Argentina, the only possible security threat against which Brazil might have tried to develop a nuclear-weapons capability was the Soviet Union, which rhetorically opposed the conservative military regime that ruled Brazil during much of its period of nuclear exploration. We do not find any evidentiary support for this claim either in the primary or secondary literature, however, and so we dismiss it. Instead, we see Brazil's nuclear program, like Argentina's, as having been motivated primarily by the country's quest for autonomy and secondarily by the need to approach energy independence in order to ensure economic development. Brazilian leaders saw great economic prospects in the nuclear industry – in both its energy and peaceful nuclear explosions (PNE) components – and, given the country's wealth in natural uranium, wanted to use this industry as an economic engine for the country's development. They therefore saw U.S. efforts to preclude them from acquiring nuclear technology and the NPT regime more broadly as attempts by nuclear powers to ensure Brazil's external dependency. As Carlo Patti, in the most thorough treatment of the topic using primary sources, writes:

> Brazil kept for sixty years the strategic objective to master the technology for producing nuclear energy, and particularly to acquire the capability to enrich uranium. If we compare the documentation of early 1950s … and early-1990s …, we can observe that the goal to achieve was the same: to create a national and autonomous nuclear program, with a full control over sensitive technologies, for conferring Brazil a strategic asset for its future. … [T]he Brazilian aim was not to develop a nuclear bomb but to have the capability to produce it. In at least two occasions – 1984 and 1990 – the Brazilian government refused the proposal coming from the military sectors to develop an atomic device. The rationale of the program was connected to the economic and industrial development of the country

> (a source for supporting the growth). The involvement of the military, particularly the Brazilian Navy, was limited to the construction of a nuclear submarine. (Patti 2012, 17)

Furthermore, Brazil and Argentina cooperated extensively in trying to circumvent the restrictions imposed by the NPT and U.S. non-proliferation efforts regarding the supply of nuclear technology and materials by nuclear states to non-NPT members. There is no good reason, therefore, to code Argentina as Brazil's adversary in the latter's nuclear effort.

In 1953, secret negotiations between Brazilian officials and former Nazi scientists culminated in a secret deal to ship three gas centrifuges for uranium enrichment to Brazil. (This led to the coding that the military component of Brazil's nuclear program started in 1953.) This deal was uncovered and failed. Two years later, Brazil signed a deal for the development of peaceful nuclear technology and uranium exploration with the United States. Then, in 1956, President Juscelino Kubitschek created a national nuclear commission (CNEN) in response to a congressional inquiry that concluded that Brazil was dependent on the United States in nuclear matters. By 1963, the first Brazilian experimental nuclear reactor began to operate. In 1964-67, during the negotiations for the Treaty of Tlatelolco – which established a nuclear-weapons free zone in Latin America and the Caribbean – Brazil and Argentina coordinated their nuclear policies for the first time, opposing the treaty. The two countries also jointly opposed the NPT on the grounds that it was discriminatory, impinged on state sovereignty, and would hinder the technological development of non-nuclear states. At the same time, U.S. leaders were puzzled by a concomitant development: "in contrast to India and Pakistan, neither Argentina nor Brazil in the late 1960s perceived the other as having the intention to introduce instability into the Southern Cone by building nuclear weapons" (Hymans 2001, 161).

Brazilian technological development in the nuclear area continued with a U.S. supplied Westinghouse reactor and a 1969 agreement with West Germany for scientific and technical cooperation. In 1972, Brazil hired this U.S. firm to build its first nuclear power plant, Angra I. Nuclear fuel would be supplied internationally. Following the May 1974 Indian PNE, however the United States increased pressure on supplies of nuclear technology and materials, and Washington began an effort to curb the Brazilian nuclear program, along with that of its neighbor, Argentina. In this context, the U.S. Atomic Energy Commission cut off all future contracts for uranium enrichment and retroactively classified two Brazilian contracts as "conditional." This led Brazil into further cooperation with West Germany, drawing vehement opposition from Washington. The agreement with Germany aimed at Brazilian technological independence in the nuclear realm. Since the country possessed vast uranium reserves, this would in practice mean complete nuclear autonomy, the key Brazilian goal with its nuclear program. The agreement covered the entire fuel cycle, including two particularly contentious clauses through which Bonn agreed to supply Brazil with a plutonium reprocessing plant and an experimental uranium enrichment facility, each of which could potentially produce weapons-grade fissile material.

Although some analysts suspect that this deal was also prompted by a desire to build a nuclear-weapons capability, we find no evidence in support of this claim. In 1977, U.S. Vice-President Walter Mondale visited West Germany to try to dissuade it from supplying nuclear technology to Brazil. This prompted stronger ties between Brazil and Argentina in the nuclear domain. In fact, the two countries issued a joint communiqué calling for nuclear collaboration, attempting to surmount the barriers set in place by the new non-proliferation regime – and the renewed U.S. focus on stymieing the spread of nuclear weapons. The following year, Brazil and Argentina signed an agreement resolving the issues in the River Plate region – the source of the last direct conflict between the two countries, in 1828. (In recent decades, the main conflict of interests between the two countries revolved around the use of shared hydroelectric resources at Iguaçu.

Being a limited issue, this would not benefit from nuclear-weapons possession as a bargaining tool.)
In 1979, in an attempt to circumvent the restrictions to the sale of uranium to non-NPT signatory states put in place by the passage of the 1977 Symington Act and the 1978 Non-Proliferation Energy Act by the U.S. Congress, Brazil started a secret uranium-enrichment program. According to a 1985 classified memo to Brazilian President Figueiredo, the goal of this program was to "develop the national capability for the broad use of nuclear energy, also including naval propulsion and the production of peaceful nuclear devices" (quoted by Patti 2012, 203). The program enlisted support of other non-NPT members: China, Iraq, and South Africa. In 1980, Brazil and Argentina signed an agreement for nuclear fuel cycle cooperation. Furthermore, Brazil was friendly toward Argentina during its conflict with the United Kingdom over the Falklands War in 1982, leading to further rapprochement between the two countries. This happened just as Brazil inaugurated Angra I and the Brazilian Navy completed its first centrifuge.

During the last years of the Brazilian military regime, the armed forces pressed for the creation of an explosive nuclear device. In 1984, the Air Force proposed that President Figueiredo authorize a PNE to take place in March 1985, on the eve of the inauguration of the first democratically elected Brazilian president after two decades of military dictatorship, thereby symbolizing the accomplishments of the military regime. Fearing international repercussions and seeing no security benefit, Figueiredo decided against it.

In late 1985, civilian President José Sarney and his Argentine counterpart Alfonsín established a joint committee chaired by their foreign ministers to coordinate the countries' nuclear policies. Starting in 1987, the two presidents embarked on a series of state visits to previously restricted nuclear facilities in each other's country. The following year, the two countries signed the Iperó Joint Statement on Nuclear Policy. In 1990, Collor de Mello was elected President of Brazil. His administration wholeheartedly pursued a policy of alignment with the United States, and this led him to want to boost the country's non-proliferation credentials. As a consequence of this policy shift, and a similar shift implemented by Argentina's new President Carlos Menem, the two signed the Declaration on the Common Nuclear Policy of Brazil and Argentina in November 1990, promising to renounce nuclear tests, draft a mutual inspection agreement, establish a framework for implementation of IAEA safeguards, and amend and ratify Tlatelolco. That same year, President Collor de Mello shut down the parallel uranium-enrichment program.

Brazil, like Argentina, wanted better relations with the United States so as to benefit from the more benign international environment that would follow the end of the Cold War. At the same time, the economic potential of PNEs was now a mirage given the U.S.-Soviet ban. Finally, the reciprocal determination in Buenos Aires to continue rapprochement with Brazil meant that Brasília had more to lose. As Patti (2012, 225) writes, "[i]nternationally two factors explained the attitude of Collor de Mello: the US-USSR decision to ban pacific nuclear explosions; and discussions with Argentina." (These events plus the above-mentioned Declaration led to the coding of Brazil's nuclear program ending in 1990.) In sum, Brazil did not possess a significant security threat that propelled it to aim at developing nuclear weapons. Its reluctance to join the nonproliferation regime – like Argentina's – stemmed from its goal of national autonomy and economic development. Once the country saw that these goals would be better achieved by pursuing a rapprochement with Argentina and a policy of stronger alignment with the United States, it reversed its policy, joining the non-proliferation regime in 1998, once the country had already achieved its goal of autonomy by mastering the whole range of technologies necessary for producing nuclear energy.

Coding of nuclear powers: N/A, since we are unable to identify Brazil's potential adversaries.

Selected bibliography for coding of adversaries:

Barletta, Michael. 1997. "The Military Nuclear Program in Brazil." Stanford: Center for International Security and Arms Control working paper.

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Oliveira, Odete Maria de. 1999. *Os Descaminhos do Brasil Nuclear*. Rio Grande do Sul: Editora INIJUI.

Patti, Carlo. 2012. *Brazil in the Global Nuclear Order*. Università degli Studi di Firenze, doctoral dissertation.

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Reiss, Mitchell. 1995. *Bridled Ambition: Why Countries Constrain their Nuclear Capabilities*, Chapter 3. Washington, DC: Woodrow Wilson Center Press.

Wrobel, Paulo Sérgio. 1991. *Brazil, the Non-Proliferation Treaty and Latin America as a Nuclear Weapon-Free Zone*. London: King's College, University of London, Ph.D. Thesis in War Studies.

China (1955-64;Taiwan+US,[USSR])

Coding of adversaries: Beijing decided to pursue nuclear weapons in direct response to U.S. nuclear threats issued at the end of the Korean War in 1953 and also during the first Taiwan Straits crisis of 1954-55. In fact, disputes with the United States were recurrent starting in 1949, leading to an enduring rivalry between 1969 and 1972. Chairman Mao therefore authorized a full-scale military nuclear effort in 1955, leading to nuclear acquisition in 1964. Shortly thereafter, the Sino-Soviet split would make Beijing repurpose its nuclear arsenal to deter a Soviet threat. At the time of nuclear acquisition, however, the primary direct threat to China's security emanated from the United States.

Coding of nuclear powers: At the time China acquired nuclear weapons in 1964, the U.S.S.R., United Kingdom, and France were nuclear powers (plus the United States, which we coded above as China's adversary). There is no past crisis in which China and either Taiwan or the United States are crisis actors, while at the same time either the United Kingdom or France are crisis actors. Thus, the United Kingdom and France are coded as allies of neither China nor Taiwan and the US. The latest crisis in which China and one of its adversaries are crisis actors on opposite sides, and the USSR is also a crisis actor, is ICB crisis 133, Korean War II (1950-1). In this crisis, the U.S.S.R. is on the opposite side of the United States. Furthermore, in 1964, the U.S.S.R. had a formal defensive alliance with China (ATOP treaty 3200 [Sino-Soviet Treaty of Friendship, Alliance, and Mutual Assistance]). We therefore code it as a formal ally of China.

Selected bibliography for coding of adversaries:

Bennett, D. Scott. 1998. "Integrating and Testing Models of Rivalry Duration." *American Journal of Political Science.* Vol. 42, No. 4, pp. 1200-32.

Goldstein, Avery. 2000. *Deterrence and Security in the 21st Century: China, Britain, France, and the Enduring Legacy of the Nuclear Revolution*, Chapters 3-4. Stanford: Stanford University Press.

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Sagan, Scott. 1996. "Why Do States Build Nuclear Weapons? Three Models in Search of a Bomb." *International Security*. Vol. 21, No. 3, pp. 54-86.

Egypt (1955-67;Israel{France+UK+US},{USSR})

Coding of adversaries: Disputes between Egypt and Israel were recurrent since the foundation of the state of Israel in 1948, leading to an enduring rivalry between 1968 and 1979. In 1955, three years after coming to power, Gamal Abdel Nasser created the Atomic Energy Authority (AEA). The mission of the AEA was to focus on civilian applications but also to keep military options open. In 1959, upon learning that Israel was pursuing the bomb, Nasser declared that an Israeli bomb could trigger a war and insisted upon Egypt also obtaining the atomic bomb at any price. The Six Day War of 1967 had a severe impact on the Egyptian economy and all AEA capital projects were canceled.

Coding of nuclear powers: At the time Egypt abandoned its nuclear program in 1967, the United States, U.S.S.R., United Kingdom, France, and China (plus Israel, which we coded above as Egypt's adversary). The latest crisis to be initiated after the end of World War II and terminated by the end of 1967 in which Egypt and Israel are crisis actors on opposite sides, and the United States is a crisis actor, is ICB crisis 222, the Six Day War (1967). This is also the latest crisis to be initiated after the end of World War II and terminated by the end of 1967 in which Egypt and Israel are crisis actors on opposite sides and the United States is a crisis actor. In this crisis, the United States is on the same side as Israel. Furthermore, in 1967, the United States does not have a formal defensive alliance with Israel. We therefore code it as an informal ally of Israel. Also in this crisis, the U.S.S.R. is on the same side as Egypt. In 1967, the U.S.S.R. does not have a formal defensive alliance with Egypt. We therefore code it as an informal ally of Egypt. The latest crisis to be initiated after the end of World War II and terminated by the end of 1967 in which Egypt and Israel are crisis actors on opposite sides of the crisis, and the United Kingdom and France are crisis actors, is ICB crisis 152, the Suez Nationalization War (1956-7). The United Kingdom and France are on the same side as Israel. In 1967, neither the United Kingdom nor France had formal defensive alliances with Israel. We therefore code the United Kingdom and France as informal allies of Israel. Finally, there is no ICB crisis between the end of World War II and the end of 1967 in which Egypt and Israel are crisis actors on opposite sides of the crisis and China is a crisis actor. Thus, we code China as an ally of neither Egypt nor Israel. To summarize, we code the Soviet Union as Egypt's informal nuclear ally and France, the United Kingdom, and the United States as Israel's informal nuclear allies.

Selected bibliography for coding of adversaries:

Bennett, D. Scott. 1998. "Integrating and Testing Models of Rivalry Duration." *American Journal of Political Science*. Vol. 42, No. 4, pp. 1200-32.

Einhorn, Robert J. 2004. "Egypt: Frustrated but Still on a Non-Nuclear Course," in *The Nuclear Tipping Point. Why States Reconsider their Nuclear Choices*, edited by Kurt M. Campbell, Robert J. Einhorn and Mitchell B. Reiss, pp. 43-82. Washington, D.C.: Brookings Institution Press.

Solingen, Etel. 2007. *Nuclear Logics: Contrasting Paths in East Asia and the Middle East*, Chapter 11. Princeton, N.J.: Princeton University Press.

Walsh, James J. 2001. *Bombs Unbuilt: Power, Ideas and Institutions in International Politics*. Ph.D diss., Massachusetts Institute of Technology.

France (1946-60;USSR,[UK+US])

Coding of adversary/adversaries: The French Atomic Energy Commission was created in October 1945, and over time increased its emphasis on military applications of nuclear technology. Since the end of the Second World War, France perceived the Soviet Union as its most serious security threat, on the European continent and elsewhere around the world. The Soviet Union posed a threat not only to the French mainland but also to French interests around the world. For example, Moscow issued a direct nuclear threat against France during the Suez crisis of 1956. France believed that a nuclear deterrent was a cheaper and more effective alternative to a conventional deterrent against the Soviet Union. After Soviet aggression, German resurgence was the second most important security concern for French policymakers. We do not include West Germany as an adversary, however, since it entered NATO in 1955, and thenceforth became much less of a security concern for France. The prospects of war with West Germany were significantly reduced more than three years before the end of France's nuclear-weapons program, the period on which we focus our attention.

Coding of nuclear powers: At the time France acquired nuclear weapons in 1960, the United States and the United Kingdom were nuclear powers (plus the Soviet Union, which we coded above as one of France's adversaries). The latest crisis in which France is a crisis actor against its adversary, the USSR, and the United States (United Kingdom) is also a crisis actor is ICB crisis 168, Berlin Deadline (1958-9). In this crisis, the United States (United Kingdom) is on the same side as France (according to the dyadic version of the ICB dataset). Furthermore, in 1960, the United States and United Kingdom both had a formal defensive alliance with France (ATOP treaties 3180 [Charter of the North Atlantic Treaty Organization] and 3260 [Southeast Asia Collective Defense Treaty, a.k.a. Manila Pact]). We therefore code the United States and United Kingdom as formal allies of France.

Selected bibliography for coding of adversaries:

Bennett, D. Scott. 1998. "Integrating and Testing Models of Rivalry Duration." *American Journal of Political Science*. Vol. 42, No. 4, pp. 1200-32.

Kohl, Wilfred L. 1971. *French Nuclear Diplomacy*. Princeton, NJ: Princeton University Press.

Mongin, Dominique. 1997. *La bombe atomique française, 1945-58*. Bruxelles: Bruylant.

Soutou, Georges-Henri. 1989. "La Politique Nucléaire de Pierre Mendès France." *Relations Internationales*. Vol. 59, pp. 317-30.

India (1954-74;China+Pakistan[US],{USSR})

Coding of adversaries: In January 1954, the Indian Atomic Energy Commission set up the Atomic Energy Establishment, Trombay, later called the 'Indian Los Alamos.' In the early years, Prime Minister Nehru pledged the peaceful nature of the nuclear program. In May 1974, India conducted its first nuclear test, calling it a 'peaceful nuclear explosion.' An important strategic concern for India was its rivalry with China, with whom it engaged in border clashes in the late 1950s and early 1960s, losing a war in October 1962. (These disputes led to an enduring rivalry from 1971.) India was also in the midst of a noteworthy rivalry with Pakistan, with whom it clashed on multiple occasions since independence and partition, including a war in 1971, in which India supported East Pakistan into becoming an independent state, Bangladesh. (India and Pakistan are coded as having an enduring rivalry since 1967.)

Coding of nuclear powers: At the time India acquired nuclear weapons in 1974, the United States, Soviet Union, United Kingdom, France, and Israel were nuclear powers (plus China, which we coded above as one of India's adversaries). There is no crisis in which India and either of the adversaries are crisis actors on opposite sides of the crisis, and any nuclear power is a crisis actor as well. Therefore, the United Kingdom, France, and Israel are allies of neither India nor China or Pakistan. The latest crisis in which India and one of the adversaries (in this case, Pakistan) are crisis actors on opposite sides of the crisis, the United States and U.S.S.R. are actively involved, and their involvement is viewed favorably by one side and unfavorably by the other is ICB crisis 242, Bangladesh (1971). At the time of this crisis the United States is a formal ally of Pakistan, not India. Furthermore, the United States has a formal defensive alliance with Pakistan in 1974 (ATOP treaty 3355 [US-Pakistan Bilateral Agreement]). We therefore code the United States as a formal nuclear ally of Pakistan. At the time of this same crisis, the U.S.S.R. is a formal ally of neither Pakistan nor India. Furthermore, the involvement of the U.S.S.R. in this crisis is viewed favorably by India, unfavorably by Pakistan. Finally, the Soviet Union did not have a defensive pact with India in 1974. We therefore code the Soviet Union as an informal ally of India. To summarize, we code the U.S.S.R. as India's informal nuclear ally and the United States as Pakistan's formal nuclear ally.

Selected bibliography for coding of adversaries:

Bennett, D. Scott. 1998. "Integrating and Testing Models of Rivalry Duration." *American Journal of Political Science*. Vol. 42, No. 4, pp. 1200-32.

Ganguly, Sumit. 1999. "India's Pathway to Pokhram II: The Prospects and Sources of India's Nuclear Weapons Program." *International Security*. Vol. 23, No. 4, pp. 148-77.

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Iran (1974-78;Iraq{USSR},[US])

Coding of adversaries: In 1974, the shah established the Atomic Energy Agency of Iran and concluded agreements with Western powers for the procurement of nuclear material. Iran regarded Iraq as its main security threat, engaging in two disputes with Iraq over the Shatt-al-Arab (1959, 1969). The relationship between Iran and Iraq is considered an enduring rivalry starting in 1973. After the removal of the Shah, all nuclear agreements with the United States were terminated.

Coding of nuclear powers: As of the end of 1978, the United States, Soviet Union, United Kingdom, France, China, Israel, and India were nuclear powers. There is no crisis where Iran and Iraq are crisis actors on opposite sides of the crisis and any other nuclear power is a crisis actor. Therefore, we code the United Kingdom, France, China, Israel, and India as allies of neither Iran nor Iraq. The latest crisis in which Iran and Iraq are crisis actors on opposite sides of the crisis, the United States (Soviet Union) is actively involved and its involvement is viewed favorably by one side and unfavorably by the other is ICB crisis 172, Shatt-al-Arab I (1959-60). At the time of the crisis, the United States had a formal defensive alliance with Iran (ATOP treaty 3365 [US-Iran Bilateral Defense Treaty]), and none with Iraq. Since the same treaty was in place in 1978, we code the United States as a formal ally of Iran. At the time of the crisis, the Soviet Union had no formal defensive alliance with either Iran or Iraq. Furthermore, the involvement of the Soviet Union was viewed favorably by Iraq, unfavorably by Iran. Finally, since the Soviet Union did not have a formal alliance with Iraq in 1978, we code it as an informal ally of Iraq. To summarize, we code the United States as Iran's formal ally and the Soviet Union as Iraq's informal ally.

Selected bibliography for coding of adversaries:

Albright, David. 2012. Appendix A "Timeline of Iran's Path to Nuclear Weapons" in *Reassessing the Implications of a Nuclear-Armed Iran*, by Judith S. Yaphe and Charles D. Lutes, pp. 49-52. Washington, D.C.: Institute for National Strategic Studies, National Defense University.

Bennett, D. Scott. 1998. "Integrating and Testing Models of Rivalry Duration." *American Journal of Political Science*. Vol. 42, No. 4, pp. 1200-1232.

Sciolino, Elaine. 2003. "Nuclear Ambitions Aren't New for Iran," *New York Times*, June 22.

Iran (1984-;Israel+US[France+UK],—)

Coding of adversaries: The Islamic Republic of Iran set up a nuclear research reactor at Isfahan in 1984. The Iran-Iraq War (1980-8) played an important role in reviving Iran's nuclear program. The perceived threat from Iraq, however, was greatly reduced after the removal of Saddam Hussein in the 2003 U.S.-led invasion, and for that reason we do not include Iraq as an adversary. The overthrow of the Shah led to a deterioration of relations with Israel, given Iran's support of Hezbollah and Hamas and inflammatory declarations. It also led to a deterioration of relations with the United States, starting with the hostage crisis of 1979, and continuing with the Bush administration policy of regime change and of preemptive approach to dealing with future threats. Israel and the United States were primary crisis actors in two ICB crises regarding Iran's nuclear program, in 2003 and 2006.

Coding of nuclear powers: As of 2007, Russia, the United Kingdom, France, China, India, Pakistan, and North Korea were nuclear powers (plus Israel and the United States, which we coded above as Iran's adversaries). The latest crisis in which Iran and at least one of the adversaries (in this case, the United States) are crisis actors on opposite sides of the crisis and the United Kingdom (France) is also a crisis actor is ICB crisis 448, Iran Nuclear II (2006-7). The United Kingdom (France) was on the same side as the United States. Furthermore, the United Kingdom (France) had a formal defensive alliance with the US in 2007 (ATOP treaty 3180 [Charter of the North Atlantic Treaty Organization]). We therefore code the United Kingdom (France) as a formal ally of the United States. There is no crisis in which Iran and any of the adversaries are crisis actors on opposite sides of the crisis and any of the other nuclear powers are crisis actors. Therefore, we code Russia, China, India, Pakistan, and North Korea as allies of neither Iran nor Israel or the United States.

Selected bibliography for coding of adversaries:

Bahgat, Gawdat. 2006. "Nuclear Proliferation: The Islamic Republic of Iran." *International Studies Perspectives*. Vol. 7, No. 2, pp. 124-36.

Bowen, Wyn Q. and Jonathan Brewer. 2011. "Iran's nuclear challenge: nine years and counting." *International Affairs*. Vol. 87, No. 4, pp. 923-43.

Sagan, Scott. 2006. "How to Keep the Bomb from Iran." *Foreign Affairs*. Vol. 85, No. 5, pp. 45-59.

Israel (1949-67;Egypt+Iraq+Jordan+Syria{USSR},{France+UK+US})

Coding of adversaries: Following independence in 1948, Israel's security environment was hostile to its existence, with a coalition of adversaries outmatching its conventional capabilities. Egypt, Iraq, Jordan, and Syria, as well as Lebanon fought Israel when it was created in 1948. We consider the first four states as independent and significant security threats since they fought Israel on different fronts and different territorial issues. Egypt was involved in a crisis with Israel over the Israeli incursion in Sinai in 1948-9 and

the nationalization of the Suez canal in 1956. Iraq, unlike the other above-mentioned states, did not sign an armistice with Israel. Jordan was involved in a crisis with Israel over its support of Palestinian infiltrators, when Israel raided the village of El Samu in November 1966. Syria was involved in a crisis with Israel in 1951 over the drainage of the Hula valley in the demilitarized zone between the two countries. We do not consider Lebanon to be a significant and independent security threat. There is no crisis in which Lebanon single-handedly confronted Israel and Lebanon did not participate in the Six-Day War, in which the other four above-mentioned states participated. Israel initiated the Six-Day War after spotting Egyptian reconnaissance aircraft over its Dimona nuclear facility.

Coding of nuclear powers: When Israel acquired nuclear weapons in 1967, the United States, Soviet Union, United Kingdom, France, and China were nuclear powers. The latest crisis to be initiated after the end of World War II and terminated before the end of 1967 in which Israel and at least one of the adversaries (in this case, Egypt, Syria, and Jordan) are crisis actors on opposite sides, and the United States (Soviet Union) is a crisis actor, is ICB crisis 222, the Six Day War (1967). In that crisis, the United States is on the same side as Israel. Furthermore, the United States does not have a formal alliance with Israel in 1967. We therefore code it as Israel's informal ally. In that same crisis, the Soviet Union is on the opposite side of Israel. Furthermore, the Soviet Union does not have a formal alliance with Egypt or Syria in 1967. We therefore code it as an informal ally of Egypt and Syria. The latest ICB crisis in which Israel and at least one of the adversaries (in this case, Egypt) are crisis actors on opposite sides of the crisis and the United Kingdom (France) is a crisis actor is ICB crisis 152, Suez Nationalization War (1956-7). In this crisis, the United Kingdom (France) is on the same side as Israel. Furthermore the United Kingdom (France) does not have a formal alliance with Israel in 1967. We therefore code the United Kingdom (France) as Israel's informal ally. Finally, there are no ICB crises prior to the end of 1967 in which Israel and at least one of the adversaries are crisis actors on opposite sides and China is a crisis actor. Therefore, China is an ally of neither Israel nor any of its adversaries. To summarize, we code the United States, United Kingdom, and France as informal allies of Israel and the Soviet Union as an informal ally of Egypt and Syria.

Selected bibliography for coding of adversaries:

Bass, Warren. 2003. *Support Any Friend: Kennedy's Middle East and the Making of the U.S.-Israel Alliance.* Oxford: Oxford University Press.

Cohen, Avner. 1998. *Israel and the Bomb*. New York, N.Y.: Columbia University Press.

Little, Douglas. 1993. "The Making of a Special Relationship." *International Journal of Middle East Studies*. Vol. 25, No. 4, pp. 563-85.

Italy (1957-58;USSR,[US])

Coding of adversaries: Italy was a signatory of the North Atlantic Treaty in April 1949 and regarded the Soviet Union as its most serious external threat. Italy invested in close relations with its Western allies for access to the bomb and improved security. In 1955, it set up to host the U.S. Southern European Task Force (SETAF), which would soon be equipped with nuclear weapons. In 1957-1958, it secretly negotiated with France and West Germany for the joint production of nuclear weapons. A close alliance with the United States also offered great domestic political benefits for pro-Western Italian governments, given the strength of the Communist opposition in Italy.

Coding of nuclear powers: At the time Italy abandoned its nuclear program in 1958, the United States and the United Kingdom were nuclear powers (plus the Soviet Union, which we coded above as Italy's adversary). There is no crisis initiated after the end of World War II and terminated before the end of 1958

in which Italy and the Soviet Union are crisis actors on opposite sides of the crisis. Therefore we code the United Kingdom as an ally of neither Italy nor the Soviet Union. The United States is a formal ally of Italy because it is a superpower and has a formal defensive alliance with Italy in 1958 (ATOP treaty 3180 [Charter of the North Atlantic Treaty Organization]). To summarize, we code the United States as Italy's formal ally.

Selected bibliography for coding of adversaries:

Melissen, Jan. 1994. "Nuclearizing NATO, 1957-1959: The 'Anglo-Saxons', Nuclear Sharing and the Fourth Country Problem." *Review of International Studies*. Vol. 20, No. 3, pp. 253-75.

Nuti, Leopoldo. 1993. "'Me too, please': Italy and the Politics of Nuclear Weapons, 1945-1975." *Diplomacy and Statecraft*. Vol. 4, No. 1, pp. 114-148.

Nuti, Leopoldo. 2011. "Italy's Nuclear Choices." UNISCI Discussion Paper No. 25, pp. 167-182.

Libya (1970-2003;US,—)

Coding of adversaries: Libya's nuclear program was initially aimed at boosting the country's role in the regional confrontation with Israel. During the 1980s, however, the Libyan regime gradually reconciled itself with a secondary role in that regard. At the same time, a different rationale emerged for the nuclear program: the need for a strategic deterrent capable of discouraging foreign intervention. This need became ever more important as Libya's relations with the United States worsened. Libyan anti-U.S. actions included approving the 1979 attacks on the U.S. embassy in Tripoli; ordering Libyan jets to fire at U.S. aircraft in the Mediterranean in 1981; and, above all, the 1987 Lockerbie bombing, which killed 270 people, including several U.S. citizens. In fact, the previous year President Reagan launched air strikes on Tripoli and Benghazi as punishment for Tripoli's ordering of a bombing in Berlin that killed two U.S. soldiers. Corroborating the view that the United States was the principal adversary of Libyan nuclearization, a 1990-91 strategic reevaluation of the value of the nuclear program conducted in Tripoli concluded that, without the Soviet counterweight, a U.S. preventive intervention was now more likely, leading Libya to make several attempts during the following decade to offer the end of its nuclear program in exchange for normalization of relations with the West. Seeing its openings rebuffed and suspicious of U.S. motives, Libya intensified its nuclear efforts in the mid-1990s in an attempt to develop the ultimate deterrent. This threat of U.S. intervention was perceived as having become graver after the 9/11 terrorist attacks, prompting a final push by the Qaddafi regime to trade its nuclear program. A more open U.S. administration accepted this offer, leading to the end of the Libyan nuclear program in 2003.

Coding of nuclear powers: At the time Libya abandoned its nuclear program in 2003, Russia, the United Kingdom, France, China, India, and Pakistan were nuclear powers (plus the United States, which we coded above as Libya's adversary). There is no crisis in which Libya and the United States are crisis actors on opposite sides of the crisis and any other nuclear power is a crisis actor. Therefore, we code no other nuclear power as an ally of either Libya or the United States.

Selected bibliography for coding of adversaries:

Alterman, Jon B. 2006. "Libya and the US: The Unique Libyan Case." *Middle East Quarterly*. Vol. 13, No. 1, pp. 21-29.

Bowen, Wyn Q. 2006. *Libya and Nuclear Proliferation: Stepping Back from the Brink*. London: Routledge for the International Institute for Strategic Studies.

Braut-Hegghammerab, Malfrid. 2006. "Libya's Nuclear Turnaround: What lies beneath?" *The RUSI Journal*. Vol. 151, No. 6, pp. 52-55.

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Takeyh, Ray. 2001. "The Rogue Who Came in from the Cold," *Foreign Affairs*, Vol. 80, No. 3, pp. 62-72.

North Korea (1965-2006;S.Korea+US,[China])

Coding of adversaries: North Korea pursued nuclear weapons for more than four decades before acquiring them in 2006. During this period, North Korea faced direct independent security threats from South Korea and the United States, two countries it fought during the Korean War of 1950-53, a conflict that technically never ended because the 1953 armistice was never followed by a peace treaty. During the war, the United States issued nuclear threats against North Korea. In the aftermath of the war, a large U.S. military force was kept in South Korea, where it is still present today. Frequent militarized disputes pitting North Korea against South Korea starting in 1949 led the two countries to be considered enduring rivals starting in 1970. North Korea has also been an enduring rival of the United States starting since 1975. In the post-Cold War, the absence of a Soviet counterweight to the United States and increasing U.S.-China interdependence made the U.S. threat to North Korea more serious.

Coding of nuclear powers: At the time North Korea acquired nuclear weapons in 2006, Russia, the United Kingdom, France, China, Israel, India, and Pakistan were nuclear powers (plus the United States, which we coded above as one of North Korea's adversaries). There is no crisis in which North Korea and either South Korea or the United States are crisis actors on opposite sides, and either Russia, the United Kingdom, France, Israel, India or Pakistan are crisis actors. Therefore, these nuclear powers are coded as allies of neither North Korea nor its adversaries. The latest crisis in which North Korea and at least one of the adversaries (in this case, both adversaries) are crisis actors and China is a crisis actor is ICB crisis 140, Korea War III (1953). In this crisis, China was on the same side as North Korea. Therefore we code China as an ally of North Korea. In 2006, China possesses a formal defensive alliance with North Korea (ATOP treaty 3445 [Sino-North Korean Mutual Aid and Cooperation Friendship Treaty]). Therefore we code China as a formal ally of North Korea.

Selected bibliography for coding of adversaries:
Bennett, D. Scott. 1998. "Integrating and Testing Models of Rivalry Duration." *American Journal of Political Science*. Vol. 42, No. 4, pp. 1200-1232.
Park, Kyung-Ae. 2001. "North Korea's Defensive Power and U.S.-North Korea Relations," in *Korean Security Dynamics in Transition*, edited by Kyung-Ae Park and Dalchoong Kim, pp. 83-104. New York: Palgrave.
Norris, Robert S. 2003. "North Korea's Nuclear Program, 2003." *The Bulletin of the Atomic Scientists*. Vol. 59, No. 2, pp. 74-7.
Pollack, Jonathan D. and Mitchell B. Reiss. 2004. "South Korea: The Tyranny of Geography and the Vexations of History." in *The Nuclear Tipping Point: Why States Reconsider Their Nuclear Choices*, edited by Kurt M. Campbell, Robert J. Einhorn and Mitchell B. Reiss, pp. 254-92. Washington, D.C.: Brookings Institution Press.

Romania (1985-93;—,—)

Coding of adversaries: Romania purchased a nuclear reactor from Canada in 1977. The following year, the Ceausescu regime started a nuclear program, violating its commitment to the NPT, which it had ratified in 1970. Romanian dictator Nicolae Ceausescu appointed his wife Elena to supervise the effort, leading to

widespread mismanagement of the nuclear effort. According to Mihai Balanescu, the former director of the Romanian nuclear research institute, the country's nuclear program had a military component aimed at the production of nuclear weapons. Starting in December 1985, Romania began to conduct illegal research aimed toward the production of weapons-grade plutonium. (This led the program to be coded as starting in 1985.) The regime failed to report this activity to the IAEA and, furthermore, it refused international inspectors. Despite access to Western technology, Romania's nuclear program "did not get very far down the road toward nuclear weapons. By the time Ceausescu was executed on Christmas Day 1989, thanks to his incompetent administration, his decade-plus quest for the bomb had hardly left the starting gate" (Hymans 2008, pp. 275-276). The only program "achievement" had been the reprocessing of 100mg of plutonium from its U.S. supplied nuclear reactor. During the regime's last year, Ceausescu announced to his leadership in May 1989 that the country possessed the technical capability to manufacture nuclear weapons. That same year, Hungarian Foreign Minister Gyula Horn accused Romania of threatening the security of his country by claiming that Romania "was now capable of producing nuclear weapons and would soon make medium-range missiles" (Kamm 1989, p. 1). A U.S. official at the time immediately denied that Romania possessed any of these capabilities. Had the regime continued, Balanescu estimates that around the year 2000 it would have acquired the eight kilograms of fissile material necessary for a crude bomb. The new Romanian authorities in the post-1989 era collaborated with the IAEA in shutting down the program, leading President U.S. President Bill Clinton to praise their effort in September 1993. (This led the program to be coded as ending on this date.)

Despite common knowledge that Romania had loosened its ties with the Soviet Union during the 1950s and, particularly, 1960s, and had since enjoyed cool relations with Moscow we find no evidence of Romanian strategic thinking in terms of whether the goal of acquiring nuclear weapons was driven by a Soviet threat. At the same time, Romania entertained warm relations with the West after distancing itself from the Warsaw Pact's policies. We therefore also find no evidence that a potential nuclear deterrent would be aimed at a threat from the United States or its NATO allies. It is possible that the Ceausescu regime saw a nuclear capability as a guarantee of regime survival during the quickly evolving Eastern European strategic setting of the late 1980s. Who exactly would be source of these threats remains unclear, leading us to code Romania as having no direct threats and, therefore, no adversaries.

Coding of nuclear powers: N/A, since we are unable to identify Romania's potential adversaries.

Selected bibliography for coding of adversaries:

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Fuhrmann, Matthew. 2012. *Atomic Assistance: How "Atoms for Peace" Programs Cause Nuclear Insecurity*. Ithaca: Cornell University Press.

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South Africa (1969-79;Angola{USSR},{US})

Coding of adversaries: South Africa feared communist and black nationalist regimes in the region and their possible support to ANC guerrillas. After Portugual's withdrawal from Angola and Mozambique, South Africa intervened for some eight months in the Angolan civil war in 1975 in an attempt to avoid the victory of the Marxist-oriented MPLA in the ongoing civil war. The MPLA was supported by Cuban troops and massive arms supplies from the Soviet Union, and seen in Pretoria largely as a tool of Soviet power. We do not code Cuba or the Soviet Union as independent and direct threats to South Africa, however, judging that they threatened South Africa through their support of the MPLA, without which they would not have a regional foothold. Soon after the South African withdrawal from Angola, the MPLA successfully consolidated power.

Coding of nuclear powers: At the time South Africa acquired nuclear weapons in 1979, the United States, Soviet Union, United Kingdom, France, China, Israel, and South Africa were nuclear powers. The last crisis in which South Africa and Angola were crisis actors on opposite sides of the crisis, and the United States (Soviet Union) is a crisis actor, is ICB crisis 260, War in Angola (1975-6). The United States is on the same side as South Africa. Furthermore, the United States does not possess a formal defensive alliance with South Africa in 1979. We therefore code the United States as an informal nuclear ally of South Africa. In this same crisis, the Soviet Union is on the side of Angola. Furthermore, the Soviet Union does not possess a formal defensive alliance with Angola in 1979. We therefore code the Soviet Union as an informal ally of Angola. There is no crisis in which South Africa and Angola are crisis actors on opposite sides of the crisis and any other nuclear power is a crisis actor. Therefore, none of these nuclear powers is coded as an ally of either South Africa or Angola. To summarize, we code the United States as an informal ally of South Africa and the Soviet Union as Angola's informal ally.

Selected bibliography for coding of adversaries:

Daniel, John. 2009. "Racism, The Cold War, and South Africa's regional security strategies 1948-1990." In *Cold War in Southern Africa: White Power, Black Liberation*, edited by Sue Onslow, pp. 35-54. London: Routledge.

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Van Wyk, Anna-Mart. 2010. "South Africa's Nuclear Programme and the Cold War." *History Compass*. Vol. 8, No. 7, pp. 562-572.

Sweden (1954-69; USSR, {US})

Coding of adversaries: Sweden's strategic situation in the early Cold War era was insecure. Since its airspace lay in the flight path of both superpowers' nuclear bombers, Sweden could be entrapped in great-power conflict. Sweden for some time believed that nuclear weapons could act as a deterrent. While remaining officially neutral, it is clear that Sweden perceived that the threat came from the Soviet Union, as Sweden made unilateral preparations for receiving Western assistance in the event of a conflict.

Coding of nuclear powers: At the time Sweden abandoned its nuclear program in 1969, the United States, United Kingdom, France, China, and Israel were nuclear powers (plus the Soviet Union, which we coded above as Sweden's adversary). There is no crisis between the end of World War II and 1969 in which Sweden and the Soviet Union were crisis actors on opposite sides of the crisis. Therefore, the United Kingdom, France, and China are coded as allies of neither Sweden nor the Soviet Union. The United States did not possess a formal defensive alliance with Sweden in 1969. There is evidence that the United States and Sweden expected and prepared for the former to assist the latter in a war with the Soviet Union (Gunnarson et al. 1994). Therefore the United States is coded as an ally of Sweden.

Selected bibliography for coding of adversaries:

Agrell, Wilhelm. 1990. "The Bomb that Never Was: The Rise and Fall of the Swedish Nuclear Weapons Programme," in *Arms Races: Technological and Political Dynamics*, edited by Nils Peter Gleditsch and Olav Njølstad, pp. 154-74. London: Sage Publications.

Cole, Paul M. 1997. "Atomic Bombast: Nuclear Weapon Decision-Making in Sweden, 1946-72." *The Washington Quarterly*. Vol. 20, No. 2, pp. 233-251.

Gunnarsson, Gösta, Wilhelm Carlgren, Leif Leifland, Yngve Möller, Olof Ruin, and Göran Rystad. 1994. *Had There Been a War: Preparations for the Reception of Military Assistance 1949-1969.* Report of the Commission on Neutrality Policy. Translated by Ingrid Tersman and Hans Zettermark. Stockholm: National Defence Research Establishment.

Holloway, David. 2010. "Deciding Not to Go Nuclear: The Swedish and Swiss Cases." Stanford University mimeo

Wallin, Lars. 1991. "Sweden." in *Security with Nuclear Weapons?: Different Perspectives on National Security*, edited by Regina Cowen Karp, pp. 360-82. Oxford: Oxford University Press.

Switzerland (1946-69;USSR,—)

Coding of adversaries: A neutral country, Switzerland enjoyed friendly relations with neighboring (Western European) states and with the United States, from whom it purchased nuclear technology. Yet Switzerland feared a possible conflict between East and West. It believed that nuclear weapons – especially tactical nuclear weapons and atomic surface-to-air weapons – could improve its ability to defend itself when attacked.

Coding of nuclear powers: At the time Switzerland abandoned its nuclear program in 1969, the United States, United Kingdom, France, China, and Israel were nuclear powers (plus the Soviet Union, which we coded above as Sweden's adversary). There is no crisis between the end of World War II and 1969 in which Switzerland and the Soviet Union were crisis actors on opposite sides of the crisis. Therefore, the United Kingdom, France, and China are coded as allies of neither Sweden nor the Soviet Union. The United States did not possess a formal defensive alliance with Sweden in 1969. To the best of our knowledge, there is no evidence that the United States and Switzerland expected and prepared for the former to assist the latter if Switzerland entered a war with the Soviet Union. Therefore the United States is coded as an ally of neither Switzerland nor the Soviet Union.

Selected bibliography for coding of adversaries:

Milivojevic, Marko. 1990. "The Swiss Armed Forces," in *Swiss Neutrality and Security*, edited by Marko Milivojevic and Pierre Maurer, pp. 3-48. New York: Berg.

Paul, T.V. 2000. *Power versus Prudence. Why Nations Forgo Nuclear Weapons*, Chapter 5. Montreal, CA: McGill-Queen's University Press.

Schwab, George. 1969. "Switzerland's Tactical Nuclear Weapons Policy." *Orbis*. Vol. 13, No. 3, pp. 900-914.

Syria (2001-;Israel+US,—)

Coding of adversaries: There is little information on the nuclear program attributed to Syria starting in 2001 – and of which one facility was bombed by Israel in 2007. The Syrian program is assumed to be aimed at deterring threats posed by Syria's neighboring rival, Israel. The two countries have fought three wars: the 1948 Arab-Israeli War, the 1967 Six-Day War, the 1973 Yom Kippur War, and the 1982 Israeli invasion of Lebanon, when Syria sent forces to support the PLO. Given the post-9/11 change in U.S. foreign policy towards a more proactive stance vis-à-vis unfriendly ("rogue") regimes such as Syria and Washington's consistent animosity towards the nuclear program developed by Syria's regional sponsor, Iran, we code the United States as a direct independent threat to Syria.

Coding of nuclear powers: As of 2007, Russia, United Kingdom, France, China, India, Pakistan, and North Korea were nuclear powers (plus Israel and the United States, which we coded above as Syria's adversaries). There is no crisis in which Israel and Syria are crisis actors on opposite sides of the crisis and any other nuclear power is a crisis actor. Therefore these countries are coded as allies of neither Syria nor Israel.

Selected bibliography for coding of adversaries:

Agence France Presse. 2008. "U.S. Accuses Syria of Building Secret Reactor with North Korea's Help." April 25.
Associated Press. 2011. "IAEA: Syria Tried to Build Nuclear Reactor." April 28.
Hersh, Seymour. 2008. "A Strike in the Dar: What did Israel Bomb in Syria?" *The New Worker*, February 11.
Makowsky, David. 2012. "The Silent Strike: How Israel Bombed a Syrian Nuclear Installation and Kept it Secret." *The New Yorker*, September 17.

Taiwan (1967-77;China[USSR],[US])

Coding of adversaries: As the Communists were defeating the nationalist Kuomintang (KMT) Party in the Chinese Civil War in 1949, the government of the Republic of China moved to Taiwan. Since then, Taiwan has faced a unique situation of existential insecurity. Without being recognized by most other states, Taiwan faced Chinese political, economic, and military pressure for unification. During the 1950s and 60s, China threatened to use force against Taiwan on multiple occasions but it lacked the amphibious capability to carry out an invasion. The most serious military crisis between Taiwan and mainland China during this period was the Chinese shelling of Quemoy and Matsu in 1954, which prompted Taiwanese air strikes against the mainland and led to U.S. intervention, culminating with the U.S.-Taiwan defense pact. In the mid-1960s, Taiwan started a nuclear weapons program in reaction to China's nuclear acquisition in 1964, which produced a sense of insecurity in Taipei. Taiwan now feared Chinese nuclear intimidation, perhaps even outright attack. These concerns were so grave that Taiwanese leader Chiang Kai-shek unsuccessfully asked U.S. President Johnson to launch a preventive strike against China's nuclear program. Concerns about Chinese aims were reinforced when Beijing tested a hydrogen bomb in 1967 and Nixon announced a new doctrine in relations with Asian allies, which encouraged the latter to share more of the burden for their own security. Furthermore, Taiwan's program accelerated after 1971-72 as a result of the United Nations' recognition of China (and consequent expulsion of Taiwan) and Nixon's overtures to the mainland, resulting in the Shanghai Communiqué, which promised to normalize U.S. relations with the Communist

regime. Furthermore, Taiwan's security situation vis-à-vis China deteriorated in 1974 when Washington acceded to Beijing's demand for the withdrawal of U.S. nuclear weapons deployed on the island.

Coding of nuclear powers: At the time Taiwan abandoned its first nuclear program in 1977, the United States, Soviet Union, United Kingdom, France, Israel, and India were nuclear powers (plus China, which we coded above as Taiwan's adversary). The last crisis in which Taiwan and China are on opposite sides of the crisis and the United States is a crisis actor is ICB crisis 166, Taiwan Strait II (1958). In this crisis, the United States was on the same side as Taiwan. Furthermore, the United States possessed a formal defensive alliance with Taiwan in 1977 (ATOP treaty 3270 [U.S.-Republic of China Sino-American Mutual Defense Treaty]). Therefore, the United States is coded as a formal ally of Taiwan. There is no crisis in which Taiwan and China are on opposite sides and the Soviet Union is a crisis actor. The last crisis in which Taiwan and China are on opposite sides, the Soviet Union is actively involved, and its involvement is viewed differently by Taiwan and China is ICB crisis 166, Taiwan Strait II (1958). At the time, the Soviet Union possessed a formal defensive alliance with China (ATOP treaty 3200 [Sino-Soviet Treaty of Friendship, Alliance, and Mutual Assistance]). The same formal defensive alliance with China was still in place in 1977. We therefore code the Soviet Union as a formal ally of China. There is no crisis in which Taiwan and China are crisis actors on opposite sides and any other nuclear power is a crisis actor. Therefore, the United Kingdom, France, Israel, and India are coded as allies of neither Taiwan nor China. To summarize, we code the United States as Taiwan's formal ally and the Soviet Union as China's formal ally.

Selected bibliography for coding of adversaries:

Bullard, Monte and Jing-dong Yuan. 2010. "Taiwan and Nuclear Weaponization: Incentives versus Disincentives." In *Forecasting Nuclear Proliferation in the 21st Century*: Volume 2: A Comparative Perspective, edited by William C. Potter and Gaukhar Mukhatzhanova, pp. 182-202. Stanford, CA: Stanford University Press.

Levite, Ariel E. 2002-03. "Never Say Never Again: Nuclear Reversal Revisited." *International Security*. Vol. 27, No. 3, pp. 59-88.

Mitchell, Derek J. 2004. "Taiwan's Hsin Chu Program: Deterrence, Abandonment, and Honor." In *The Nuclear Tipping Point: Why States Reconsider Their Nuclear Choices*, edited by Kurt M. Campbell, Robert J. Einhorn, and Mitchell B. Reiss, pp. 293-313. Washington, DC: Brookings Institution Press.

Wang, Vincent Wei-cheng. 2008. "Taiwan: Conventional Deterrence, Soft Power, and the Nuclear Option." In *The Long Shadow: Nuclear Weapons and Security in 21st Century Asia*, edited by Muthiah Alagappa, pp. 404-28. Stanford, CA: Stanford University Press.

Taiwan (1987-88;China{USSR},{US})

Coding of adversaries: After abandoning its nuclear program in 1977 as a result of U.S. pressure, Taiwan reignited it briefly in 1987-88. In this second phase, Taiwan's security concerns were similar to the ones that prompted the initial program back in 1967. Specifically, Taiwan faced an existential threat from mainland China, which by the mid 1980s possessed significant conventional capabilities and a sizeable nuclear arsenal. Since the end of the earlier program, the reliability of U.S. security assurances decreased significantly. In December 1978, the United States cancelled its 1954 defensive treaty with Taiwan in order to achieve complete normalization of relations with China. The following year, the U.S. Congress enacted the Taiwan Relations Act, intended to ameliorate Taipei's security concerns. Still, the security assurances included in it were only implicit in what concerned the protection of the U.S. nuclear umbrella. Also in

1979, the United States and China achieved fully normalized diplomatic relations, a move that was seen as a betrayal by Taipei's government. Then, in 1982, Washington and Beijing issued a joint communiqué committing the United States gradually to reduce its substantial arms sales to Taiwan, without which the durability of Taiwan's conventional deterrent was highly questionable.

Coding of nuclear powers: At the time Taiwan abandoned its second nuclear program in 1988, the United States, Soviet Union, United Kingdom, France, Israel, India, and South Africa were nuclear powers (plus China, which we coded above as Taiwan's adversary). The last crisis in which Taiwan and China are on opposite sides and the United States is a crisis actor is ICB crisis 166, Taiwan Strait II (1958). In this crisis, the United States was on the same side as Taiwan. Furthermore, in 1988 the United States does not possess a formal defensive alliance with Taiwan (ATOP treaty 3270 [U.S.-Republic of China Sino-American Mutual Defense Treaty] expired in 1980). We therefore code the United States as an informal ally of Taiwan. There is no crisis in which Taiwan and China are on opposite sides of the crisis and the Soviet Union is a crisis actor. The last crisis in which Taiwan and China are on opposite sides of the crisis, the Soviet Union is actively involved, and its involvement is viewed differently by Taiwan and China is ICB crisis 166, Taiwan Strait II (1958). At the time, the Soviet Union possessed a formal defensive alliance with China (ATOP treaty 3200 [Sino-Soviet Treaty of Friendship, Alliance, and Mutual Assistance]). Furthermore, this formal defensive alliance was no longer in place in 1988 (it expired in 1980). Therefore, the Soviet Union is coded as an informal ally of China. There is no crisis in which Taiwan and China are crisis actors on opposite sides of the crisis and any other nuclear power is a crisis actor. Therefore, the United Kingdom, France, Israel, India, and South Africa are coded as allies of neither Taiwan nor China. To summarize, we code the United States as Taiwan's informal ally and the Soviet Union as China's informal ally.

Selected bibliography for coding of adversaries:

Albright, David and Corey Gay. 1998. "Taiwan: Nuclear Nightmare Averted." *Bulletin of the Atomic Scientists*. Vol. 54, No. 1, pp. 54-60.

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Mitchell, Derek J. 2004. "Taiwan's Hsin Chu Program: Deterrence, Abandonment, and Honor." In *The Nuclear Tipping Point: Why States Reconsider Their Nuclear Choices*, edited by Kurt M. Campbell, Robert J. Einhorn, and Mitchell B. Reiss, pp. 293-313. Washington, D.C.: Brookings Institution Press.

United Kingdom (1945-52;USSR,[US])

Coding of adversaries: Britain's foremost security threat from the end of World War II until British nuclear acquisition in 1952 was the Soviet Union. The drive towards a nuclear arsenal was based on the British perception that conventional forces would only be useful in the unlikely event of a Soviet invasion of the British Isles. The U.K. government therefore thought that in the far more likely scenario of Soviet coercion over secondary British security interests around the globe, an independent nuclear arsenal would be the most reliable deterrent of Soviet power.

Coding of nuclear powers: At the time the UK acquired nuclear weapons in 1952, the United States was a nuclear power (plus the Soviet Union, which we coded above as the United Kingdom's adversary). The last crisis in which the United Kingdom and the Soviet Union are crisis actors on opposite sides of the crisis and the United States is a crisis actor is ICB crisis 123, Berlin Blockade (1948-9). In this crisis, the United States is on the same side as the United Kingdom (according to the dyadic version of the dataset). Furthermore, the United States had a formal defensive alliance with the United Kingdom in 1952 (ATOP treaty 3180 [Charter of the North Atlantic Treaty Organization]). We therefore code the United States as a formal ally of the United Kingdom.

Selected bibliography for coding of adversaries:

Goldstein, Avery. 2000. *Deterrence and Security in the 21st Century: China, Britain, France, and the Enduring Legacy of the Nuclear Revolution*. Stanford: Stanford University Press.

Gowing, Margaret and Lora Arnold. 1974. *Independence and Deterrence: Britain and Atomic Energy, 1945-1952*. London: Macmillan.

Malone, Peter. 1984. *The British Nuclear Deterrent*. New York: St. Martin's.

Wheeler, Nicholas. 1990. "The Atlee Government's Nuclear Strategy, 1945-51." In *Britain and the First Cold War*, edited by Anne Deighton, pp. 130-44. New York: St. Martin's.

United States (1942-45;Germany+Japan,—)

Coding of adversaries: The United States developed its nuclear program between 1942 and 1945, when it became the first nuclear power. Throughout this period, the United States was involved in an all-out war against Axis powers, most notably Germany and Japan. These two countries were therefore the main adversaries of U.S. nuclear acquisition. We code Germany and Japan as independent threats given their independent war aims and fighting capabilities, demonstrated by Japan's continued fighting for more than three months (until August 15, 1945) after Germany's surrender on May 7 that same year.

Coding of nuclear powers: At the time the United States acquired nuclear weapons in 1945, there were no other nuclear powers.

Selected bibliography for coding of adversaries:

Beevor, Antony. 2012. *The Second World War*. New York: Little, Brown.

Rhodes, Richard. 1986. *The Making of the Atomic Bomb*. New York: Simon and Schuster.

Weinberg, Gerhard L. 1994. *World at Arms: A Global History of World War II*. Cambridge: Cambridge University Press.

Yugoslavia (1954-61;USSR,—)

Coding of adversaries: Yugoslavia started a nuclear program with military aims after having been expelled from the Soviet-led bloc. The Soviet Union's conventional superiority and, from 1949 on, nuclear arsenal, presented a serious threat to the survival and political independence of Yugoslavia's regime. This perception of Soviet threat was reinforced in Belgrade when Stalin encouraged an arms buildup in its allies neighboring Yugoslavia, especially Hungary. Furthermore, in 1949 the Soviet Union tried to eliminate Yugoslav leader Marshall Tito through an attempted assassination followed by a coup. After both attempts failed, Soviet forces were assembled on Yugoslavia's borders. Finally, the Soviets imposed an economic blockade on Yugoslavia in an attempt to coerce it back into their bloc.

Coding of nuclear powers: At the time Yugoslavia abandoned its first nuclear program in 1961, the United States, United Kingdom, and France were nuclear powers (plus the Soviet Union, which we coded above as Yugoslavia's adversary). There is no crisis between the end of World War II and 1961 in which Yugoslavia and the Soviet Union are crisis actors on opposite sides of the crisis. Therefore, the United Kingdom and France are allies of neither Yugoslavia nor the Soviet Union. The United States did not possess a formal defensive alliance with either Yugoslavia or the Soviet Union in 1961. To the best of our knowledge, there is no evidence that the United States and Yugoslavia expected and prepared for the former to assist the latter if Yugoslavia entered a war with the Soviet Union. Therefore the United States is an ally of neither Yugoslavia nor the Soviet Union.

Selected bibliography for coding of adversaries:

Mukhatzhanova, Gaukhar. 2010. "Nuclear Weapons in the Balkans: Why Yugoslavia Tried and Serbia Will Not." In *Forecasting Nuclear Proliferation in the 21st Century: A Comparative Perspective*. Volume 2: A Comparative Perspective, edited by William C. Potter and Gaukhar Mukhatzhanova, pp. 205-28. Stanford, CA: Stanford University Press.

Potter, William C., Djuro Miljanic and Ivo Slaus. 2000. "Tito's Nuclear Legacy: Should the West be worried about Yugoslavia's nuclear weapons potential?" *Bulletin of Atomic Scientists*. Vol. 56, No. 2, pp. 63-70.

Yugoslavia (1974-87;USSR,—)

Coding of adversaries: After having terminated it nuclear program in 1961, Yugoslavia restarted it in 1974. To the extent that this second Yugoslav program was prompted by security concerns, these were largely the same that were present during the earlier attempt at producing nuclear weapons, namely the threat of a powerful nuclear Soviet Union, which controlled Eastern Europe around Yugoslavia and with which the Belgrade regime maintained tense relations.

Coding of nuclear powers: By the time Yugoslavia abandoned its second nuclear program in 1987, the United States, United Kingdom, France, China, Israel, India, and South Africa were nuclear powers (plus the Soviet Union, which we coded above as Yugoslavia's adversary). There is no crisis between the end of World War II and 1987 in which Yugoslavia and the Soviet Union are crisis actors on opposite sides of the crisis. Therefore, nuclear powers other than the United States are allies of neither Yugoslavia nor the Soviet Union. The United States did not possess a formal defensive alliance with either Yugoslavia or the Soviet Union in 1987. To the best of our knowledge, there is no evidence that the United States and Yugoslavia expected and prepared for the former to assist the latter if Yugoslavia entered a war with the Soviet Union. Therefore the United States is an ally of neither Yugoslavia nor the Soviet Union.

Selected bibliography for coding of adversaries:

Mukhatzhanova, Gaukhar. 2010. "Nuclear Weapons in the Balkans: Why Yugoslavia Tried and Serbia Will Not." In *Forecasting Nuclear Proliferation in the 21st Century*. Volume 2: A Comparative Perspective, edited by William C. Potter and Gaukhar Mukhatzhanova, pp. 205-28. Stanford, CA: Stanford University Press.

Potter, William C., Djuro Miljanic and Ivo Slaus. 2000. "Tito's Nuclear Legacy: Should the West be worried about Yugoslavia's nuclear weapons potential?" *Bulletin of Atomic Scientists*. Vol. 56, No. 2, pp. 63-70.

Country	Period of Nuclear Development	Adversaries	Nuclear Allies	Relative Power
Algeria	1983-93	Libya+Morocco{US}	---	0.82
Argentina	1968-90	---	N/A	---
Australia	1956-61	Indonesia+China[USSR]	[US]	0.06
Australia	1967-72	China[USSR]	[US]	0.07
Brazil	1953-90	---	N/A	---
China	1955-64	Taiwan+US	[USSR]	0.50
Egypt	1955-67	Israel{France+UK+US}	{USSR}	4.45
France	1946-60	USSR	[UK+US]	0.19
India	1954-74	China+Pakistan[US]	{USSR}	0.44
Iran	1974-78	Iraq{USSR}	[US]	2.51
Iran	1984-	Israel+US[France+UK]	---	0.09
Iraq	1972-91	Iran+Israel+US[France+UK]	---	0.07
Israel	1949-67	Egypt+Iraq+Jordan+Syria{USSR}	{Fra+UK+US}	0.13
Italy	1957-58	USSR	[US]	0.11
Libya	1970-2003	US	---	0.01
North Korea	1965-2006	S.Korea+US	[China]	0.45
Pakistan	1972-90	India{USSR}	[US]	0.18
Romania	1985-93	---	N/A	---
South Africa	1969-79	Angola{USSR}	{US}	7.17
South Korea	1959-76	N.Korea[China+USSR]	[US]	1.65
Soviet Union	1945-49	United States	---	0.55
Sweden	1954-69	USSR	{US}	0.02
Switzerland	1946-69	USSR	---	0.01
Syria	2001-	Israel+US	---	0.03
Taiwan	1967-77	China[USSR]	[US]	0.05
Taiwan	1987-88	China{USSR}	{US}	0.07
United Kingdom	1945-52	USSR	[US]	0.34
United States	1942-45	Germany+Japan	---	2.08
West Germany	1957-58	USSR	[UK+US]	0.22
Yugoslavia	1954-61	USSR	---	0.04
Yugoslavia	1974-87	USSR	---	0.03

Table 1. Adversaries and Allies in Cases of Nuclear Exploration[4]

[4] Sources: Case list and program dates from Sagan, "The Causes of Nuclear Weapons Proliferationm" to which we have added Argentina. For start dates of nuclear powers' development phase, unavailable in Sagan, we use: Christopher Way, "Nuclear Proliferation Dates," unpublished document, 2011, available at: http://falcon.arts.cornell.edu/crw12/ (consulted Oct. 18, 2014). Way's case list incorporates two not included by Sagan: Argentina and Indonesia. We omit Indonesia from our analysis because, although it publicly announced its intention to acquire nuclear weapons between late 1964 and mid-1965, it did not appear to have considered any investments in nuclear technology. We calculate relative power based on the CINC composite score taken from the COW NMC v4.0 dataset (Singer, "Reconstructing the Correlates of War Dataset"). Specifically, we divide the CINC score of each potential proliferator by those of its adversaries for the three years leading up to nuclear acquisition or abandonment of nuclear program. (The following are exceptions due to lack of data in the COW NMC v4.0 dataset: Data for Iran and Syria based on 2005-07, the latest available years. Data for North Korea based on 2001-03, the latest available years. Data for Angola 1977-78 and Libya 1993 not available, replaced by the average of the closest preceding and succeeding years for which data is available.) Allies noted as [Ally] if there is a formal defensive alliance and {Ally} if not.