HALTING REACTOR TRANSFERS:
CAN TRADE EXPECTATIONS EXPLAIN THE WILLINGNESS OF NUCLEAR SUPPLIERS
TO EXPORT REACTORS?

A Masters Thesis
submitted to the Faculty of the
Graduate School of Arts and Sciences
of Georgetown University
in partial fulfillment of the requirements for the
Master of Arts in
Security Studies

By

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Washington, DC
April 15, 2010
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ABSTRACT
Since 1974, there have been 42 contested nuclear reactor exports in which a supplier state (“the supplier”) has considered exporting a reactor to a recipient nation (“the recipient,”) and a third country (“the objector”) has objected to the proposed transfer. The thesis’s core research question is: Does a supplier’s expectation of future trade with an objector impact the supplier’s decision on whether to proceed with a reactor transfer to a recipient despite the objector’s protest? Significance testing determined that there is no relationship between a supplier’s expectation of future trade with an objector and a supplier’s decision on whether to proceed with a reactor transfer to a recipient after an objector has protested the proposed transfer. However, the thesis’s evidence suggests that the adoption of Nuclear Supplier Group (NSG) guidelines for nuclear commerce in 1978 and 1992 contributed to the development of a robust norm against exports of nuclear reactors that do not accord with NSG regulations.
The research and writing of this thesis is dedicated to my family. I am especially grateful to Professor Rosenthal, my classmates, my Mom, and Desiree Davis for comments on earlier drafts of this thesis and moral support. Of course, all errors are my own responsibility. Alex
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Introduction

In 1988, the United States government received intelligence information suggesting that China was considering constructing a nuclear reactor in Algeria. Two years later, after satellite imagery confirmed China was clandestinely building the reactor, U.S. diplomats protested to their Chinese counterparts regarding Beijing’s involvement in the project. Despite the objections from Washington, China proceeded with the reactor’s construction.¹

In September 1992, China agreed to export a 300-Megawatt (MW) power reactor to Iran.² As with the Algerian deal, U.S. officials were concerned that Tehran could use the power reactor to produce fissile material for nuclear weapons. In contrast to the Algerian case, however, in 1997, China agreed to terminate the Iranian reactor project.³ Why were the outcomes of these two cases different?

One possible explanation is that China’s willingness to heed the U.S. objections was dependent upon whether Beijing had optimistic or pessimistic expectations of future trade with Washington. In fact, during the period in which China considered the U.S. protest against the Algerian reactor export, Beijing had reason to be pessimistic about its future trade prospects with Washington – at this time, many U.S. lawmakers engaged in annual debates over whether to grant China Most Favored Nation trade status while other American legislators worked to reduce

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quotas for specific categories of Chinese imports. By contrast, when China agreed to end the Iranian reactor deal, its expectation of future trade with the U.S. was quite optimistic. In exchange for terminating the reactor export to Iran, China secured an agreement from Washington to expand Sino-U.S. commerce and to support China’s bid to join the World Trade Organization.

Significantly, the Algerian and Iranian reactor export cases exemplify a fairly common type of interaction between states. In fact, since 1974, there have been at least 42 instances in which a supplier state (“the supplier”) has considered exporting a reactor to a recipient nation (“the recipient,”) and a third country (“the objector”) has objected to the proposed transfer. The impact of states objecting to proposed reactor transfers is mixed – sometimes suppliers have halted transfers while in other cases reactor exports have proceeded despite the protests from objecting states. This disparity leads to the question: Why does a third country’s objection cause supplier states to halt reactor transfers in some cases but not others?

Understanding how diplomacy and trade expectations impact the willingness of states to export nuclear reactors is no small matter because acquisition of a reactor can markedly speed a proliferant state’s drive to the Bomb. It is well known that states can exploit power reactors to produce fissile material for nuclear weapons – indeed, one estimate suggests that Iran’s Bushehr reactor, if it is eventually completed and brought online, will be capable of producing “60

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Nagasaki bombs’ worth” of plutonium annually.6 Less appreciated is the fact that proliferators can also use much smaller research reactors—even reactors that do not produce large quantities of fissile material—to develop weapon-relevant knowledge in fields such as nuclear physics and nuclear chemistry.7 The international security implications of reactor exports are such that on at least five occasions since 1974 (and as recently as September 2007,) one state has used military force to prevent the recipient of an exported reactor from bringing a reactor online.8

Significantly, the literature on trade and interstate cooperation does little to help analysts anticipate whether a supplier state’s trade expectations will impact its willingness to heed another state’s objection to a proposed reactor transfer. The relationship between commerce and state behavior is a vigorously debated topic, with four competing schools of thought. The first argues that trade drives state behavior, and, in particular, that commerce between nations causes interstate cooperation.9 The second suggests that the first approach has the causality backwards and thus argues that political relations between states determine trade flows.10 A third camp rejects both of these perspectives and contends that there is not a unidirectional relationship between trade and state behavior—in either direction—but that instead these are interactive

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variables. A final set of scholars dismisses each of these perspectives and posits that there is little or no relationship between trade and state behavior.

This study aims to weigh in on the debate by evaluating the impact of trade expectations on state behavior. Specifically, the study examined the 42 instances of contested reactor exports since 1974 to determine whether there was a relationship between a supplier’s expectation of future trade with an objector and a supplier’s decision on whether to proceed with a reactor transfer despite an objector’s protest. At the study’s core were two assumptions: First, that a supplier would prefer cooperative behavior with an objector and decide to terminate a reactor export if the supplier had optimistic expectations of future trade with the objector. Second, that a supplier would prefer noncooperative behavior with the objector and decide not to terminate a reactor export if the supplier had pessimistic expectations of future trade with the objector.

Surprisingly, significance testing undermined these two assumptions and determined that there was no significant relationship between a supplier’s expectation of future trade with an objector and a supplier’s decision on whether to proceed with a reactor transfer despite an objector’s protest. Although the study’s main assumptions were discredited, the study’s data did suggest support for a controversial proposition. Since the end of the Cold War, policy analysts have debated the utility of multilateral arms control initiatives, with some scholars arguing that such arrangements remain essential and others claiming that arms control is an unnecessary relic.

A review of this study’s data set, however, provides preliminary support for the argument that arms control regimes can meaningfully enhance international security generally and advance U.S. interests in particular. Specifically, the data suggests that the establishment of Nuclear Suppliers Group (NSG) guidelines in 1978 and 1992 governing commerce in nuclear reactors created an increasingly robust norm against reactor exports that do not comply with NSG policies.

This study proceeds as follows. After reviewing literature that pertains to trade and state behavior as well as nonproliferation norms, the study’s research method and hypotheses are introduced. Next, the study’s data is presented and analyzed. Subsequently, lessons are drawn from the study’s data that might inform future policy decisions. The final section concludes and suggests future areas of research. The study’s three appendices describe and organize the cases that make up the data set.

**Literature Review**

First and foremost, this study examines the relationship between trade and interstate cooperation – in particular, does a supplier state’s expectation of future trade with an objector affect a supplier’s decision on whether to proceed with a reactor export despite an objector’s protest? However, the answer to this question also has implications for the nuclear nonproliferation field. As such, this study aims to make a policy-relevant contribution to the scholarship on trade and state behavior as well as research on nuclear nonproliferation.

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Trade and Interstate Cooperation

There are four distinct schools of thought on the relationship between trade and interstate cooperation. The first camp argues that trade is at the root of cooperative and conflictual behavior in international politics. This perspective is an offspring of economic liberal arguments that suggest trade has a pacific effect on relations between states because states that trade will prefer the economic gains from trade to risky and potentially costly wars. The converse of this argument is that when levels of trade are low between two states, leaders may be more willing to go to war since they will not be sacrificing commercial gains by starting conflicts.15

More recently, scholars have extended this argument beyond cases of war and peace to argue that relative levels of trade between states causes states to prefer either cooperative or antagonistic strategies in interstate relations. For instance, Solomon Polacheck, in a quantitative study of cooperation and trade between democracies and nondemocracies, finds that “the results show that the fundamental factor in causing bilateral cooperation is trade. Countries seek to protect wealth gained through international trade, therefore trading partners are less combative than nontrading partners.” Polacheck continues by noting that countries that trade more exhibit “less conflict and more cooperation.”16

Similarly, Edward Mansfield and Jon Pevehouse argue that states that enter into preferential trade relationships reap benefits beyond just avoiding conflicts. They suggest that preferential trade groupings, “create a forum for bargaining and negotiation that reduces tensions

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among participants, helps to resolve conflicts that do occur, and promotes the establishment of focal points that shape states’ expectations…”

Dale Copeland takes a different approach to the argument that trade is responsible for a state’s preferences for conflictual or cooperative behavior. While many theories on trade and state behavior concentrate both theoretically and empirically on trade in particular moments in time, Copeland focuses on a state’s future expectations of trade.

Specifically, to explain relations between two states in a dyad, Copeland argues that a state’s expectation of future trade is a variable of considerable explanatory power. Copeland asserts that if a state within a dyad has pessimistic expectations of future trade with its opponent, then the state will prefer antagonistic behavior. Alternatively, if a state in a dyad has optimistic expectations of future trade with its opponent, then the state will pursue conciliatory policies.

Copeland’s theory is particularly intriguing because it makes sense intuitively that state expectations about future trade should have a significant impact on state behavior. Moreover, the parsimony of Copeland’s explanation is very attractive: State A will prefer cooperative behavior with State B if A anticipates growing benefits from trade with B while A will prefer noncooperative behavior with B if A expects that its benefits from trade with B will decline.

Given the promise of Copeland’s approach and the fact that his theory has been evaluated against

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only a few cases, this thesis tests hypotheses that examine the impact of a state’s expectations of trade on its preferences for cooperative and noncooperative behavior.

At the same time, it is important to acknowledge that many scholars disagree with Polacheck and Copeland’s approaches. For instance, many analysts argue that the trade impacts state behavior argument has the causality of the relationship backwards. Brian Pollins, as an example, contends that the “relative cooperativeness or hostility of bilateral political ties…[affects] trade flows between all types of nations.”\(^{21}\) Moreover, Pollins posits that states actively adjust their trade relationships to meet security and economic welfare priorities, and that thus a nation will expand or contract its trade with a state as the two states’ relations improve or deteriorate.\(^{22}\)

In support of this view, Beth Simmons\(^ {23}\) has found that states with border disputes are associated with reduced trade flows. Scott Kastner presents a complimentary argument that posits that the strong effect of interstate political relations on trade can be tempered if states have domestic constituencies with strong ties to international financial interests.\(^ {24}\) In short, this camp would argue that Copeland and Polacheck’s argument is backwards – that it is not trade that drives cooperative state behavior but state behavior that determines trade flows between states.

Notably, a third cohort of scholars contends that both of these schools are wrong. Rafael Reuveny and Heejoon Kang suggest that there is not a strict, unidirectional relationship between state behavior and trade. Instead, trade and a state’s preferences for cooperation or

conflict are dynamic, interactive variables. Moreover, Reuveny and Kang argue that trade is not a monolithic variable. Instead, what states trade contributes to the dynamic between commerce and state behavior. In particular, conflict has a significant impact on trade between states in minerals, iron, steel, fuels, and scientific equipment. By contrast, commerce in food, machines, and transport equipment tends to affect state preferences for cooperative or noncooperative strategies.25

A final perspective contends that there may be much less of a relationship between state behavior and trade than is often assumed. Katherine Barbieri and Jack Levy examine the most extreme type of state behavior—war—and conclude that, “in most cases war does not have a significant impact on trading relationships.”26 Similarly, Peter Liberman identifies instances in which nations that expected conflict with threatening rivals continued to trade freely with their adversaries even though this trade actually enhanced the adversaries’ power.27

The sharp disagreements among scholars on the relationship between trade and state behavior argue for additional research in this area. By evaluating the impact of a state’s expectation of future trade on its preferences for cooperative behavior, this study will either provide strong support for the argument that trade causes cooperation or will undermine this perspective.

**Nonproliferation Norms**

Although this study’s principal investigative focus is the relationship between trade and interstate cooperation, the study’s results suggest that international institutions—and particularly

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the NSG—have contributed to an increasingly robust norm against reactor exports that do not accord with international nuclear commerce guidelines. Importantly, there is a vigorous scholarly debate over the impact and desirability of arms control regimes that aim to bolster nonproliferation norms.

Robert Jervis notes that, “institutions [are] broadly defined as enduring patterns of shared expectations of behavior that have received some degree of formal assent.”28 Specific to nuclear nonproliferation, since the dawn of the nuclear age, diplomats have sought to create treaties and regimes that build international support for “shared expectations of behavior” (norms) that prohibit activities that contribute to the spread nuclear weapons. Scholars have argued that nonproliferation institutions can contribute to norm building by providing information about compliance activities, monitoring state behavior for non-compliance, and enhancing communication between states.29

While scholars disagree over the impact of nonproliferation institutions and norms, to the extent that nonproliferation norms exist and affect state behavior, norms may significantly shape the nuclear commerce market in unique ways. On the whole, the literature on trade and state behavior tends to be general in nature and avoids addressing the impact of commerce in specific goods on interstate relations. However, nuclear exports take place within a very unique commercial environment that appears to be shaped by broad nonproliferation norms and specific domestic and international regulations. It may be the case that these norms and regulations alter the nuclear reactor market such that existing theoretical perspectives on trade and state behavior cannot precisely model the reactor trade.

Since nonproliferation norms may shape nuclear commerce, it is important to review the scholarly debates over the impact and desirability of these norms. The conventional wisdom in these debates is that nonproliferation norms effectively enhance international security by influencing state behavior. Scholars of this view assume that nonproliferation norms create incentives that prevent most states from engaging in activities that could contribute to the spread of nuclear weapons. Accordingly, this camp focuses on identifying and remedying weaknesses in existing nonproliferation norms; expanding the scope and acceptance of these norms; and devising strategies to overcome collective action problems that plague norm-building.\(^{30}\)

A second school, influenced by realist scholars, argues that nonproliferation treaties and norms are essentially products of the structural conditions of the international system, and that the impact of norms will wax and wane as international power relations shift. Unlike the first perspective, this school does not put forward a normative judgment about the desirability of institutions and norms. Instead, for example, John Mearsheimer argues that cooperation through institutions is “sometimes difficult to achieve…and always difficult to sustain” because of concerns about cheating and fears that some states may exploit institutions to increase their power.\(^{31}\) Moreover, Mearsheimer contends that, “institutions are essentially arenas for acting out power relationships and that the rules and outcomes of institutions are products of “the distribution of power in the system.”\(^{32}\) Irrespective of whether institutions generally and nonproliferation norms in particular are good or bad, this school contends that the impact of institutions will be limited by systemic incentives that make cooperation difficult.


Similarly, Thomas Schelling and Morton Halperin present a realist perspective that is more optimistic about arms control. Schelling and Halperin contend that cooperation between states in the realm of arms control can occur when states recognize a common interest, and especially when this common interest is informed by a shared desire to reduce nuclear risks.  

Likewise, Richard Betts agrees that nonproliferation institutions have the greatest impact when undergirded by shared national interests. He argues that arms control treaties “make sense between adversaries, not friends” and that contemporary efforts to impose artificial arms control arrangements on states with harmonious relationships may unintentionally promote military instability by equalizing the power of individual states.  

In sum, while the champions of nonproliferation norms believe that these norms are always desirable and can always effectively enhance international security, the realist perspective suggests that nonproliferation norms may emerge when certain conditions in the international system are present. Moreover, this school posits that the impact and effectiveness of nonproliferation norms will be shaped by existing power relations between states and that the impact of these norms may not always enhance international security.

A final camp argues that not only is the impact of nonproliferation institutions and norms limited by the structure of the international system, but also that nonproliferation regimes have a deleterious impact on U.S. national security. Analysts of this view argue that arms control arrangements are unable to prevent proliferation because these regimes lack sufficient monitoring and enforcement provisions to catch and punish states that flout regime rules;

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constrain U.S. freedom of action in countering WMD threats; and that nonproliferation institutions can even provide cover for cheaters that are clandestinely developing nuclear weapon capabilities.\textsuperscript{35} While this thesis’s primary focus is on the relationship between trade and interstate cooperation, the study’s results may also add to the debate over the impact and desirability of nonproliferation institutions and norms.

**Methods and Hypotheses**

**The Phenomenon Under Examination and Definitions.** This thesis examines a specific phenomenon: Instances since 1974 in which one state has objected to a proposed reactor transfer between two other states. As noted in the introduction, for the purpose of this study, a state that considers supplying a reactor to another state is called the “supplier.” A state to which the supplier intends to transfer a reactor is called the “recipient.” A state that objects to a proposed transfer between a supplier and a recipient is called the “objector.”

Additionally, “reactor” is defined as a facility that “produces and controls the release of energy from splitting the atoms of certain elements.”\textsuperscript{36} Moreover, for this study, “reactor” includes both power and research reactors as well as critical reactor components such as pressure vessels or turbines without which a reactor could not function. For instance, in 1993, the Czech Republic considered selling a pressure vessel to Iran to complete a power reactor.\textsuperscript{37} Since the reactor could not function without a specially made pressure vessel—a critical reactor component—the Czech Republic is considered a potential supplier of a reactor in this case.


\textsuperscript{37} Mark Hibbs and Neal Sander. “Iran seeks Skoda help, but Prague says no deal likely.” Nucleonics Week. December 16, 1993. Vol. 34, No. 50; Pg. 9
The study does not consider transfers of materials that are consumed as a part of some nuclear reaction processes such as various isotopes of uranium or heavy water. The study also does not include potential transfers of submarines that are powered by reactors nor does it include other major types of fuel cycle facilities such as milling, UF6 conversion, and spent fuel reprocessing plants.

“Trade expectations” is defined as one state’s expectation of its trade in the future with another state. Trade includes both imports and exports, since a country’s firms may seek to export goods or services to other nations for profit and a country may seek to import goods or services that the country cannot produce cheaply or easily. A state forms its expectation of future trade with another state by examining signals from the other state about the other state’s trade preferences. As examples, a state may signal its future trade preferences by proposing a trade deal, reducing tariffs, implementing sanctions, or limiting import quotas from another state. A state analyzes signals such as these from another state to make a judgment about whether trade flows with the other state will be increasing or decreasing. For this study, a state has optimistic expectations of trade with another state if the state anticipates that trade flows with the other state will increase in the future. Conversely, a state has pessimistic expectations of trade with another state if the state anticipates that trade flows with the other state will decrease in the future.

Significantly, a state’s expectation of future trade with another state is dynamic. States continually evaluate signals from other states about their trade preferences and update trade expectations accordingly. For instance, assume that State A has optimistic expectations of trade with State B. If State B threatens to reduce imports from A to B, A will update its trade

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expectations with B. As such, A’s trade expectations with B will shift from optimistic to pessimistic.

**Core Research Question and Variables.** The thesis’s core research question is: Does a supplier’s expectation of future trade with an objector impact the supplier’s decision on whether to proceed with a reactor transfer to a recipient despite the objector’s protest? To address this question, the study’s independent variable is a supplier state’s expectation of future trade with the objector state after an objector state has protested a proposed reactor transfer between the supplier and a recipient state. The study’s dependent variable is whether a proposed reactor transfer proceeds or not.

It is also worth underscoring that while a contested reactor export involves three states—a supplier, a recipient, and an objector—the interstate relationship under examination involves only two of these three states: the supplier and the objector. The central focus of this study is to understand whether a supplier’s expectation of future trade with an objector impacts the supplier’s decision on whether to follow through with a reactor export in light of a protest from the objector.

**The Study’s Hypotheses.** The study tests two hypotheses that are derived from the independent and dependent variables.

- **NULL HYPOTHESIS:** There is no significant relationship between a supplier’s expectation of future trade with an objector and a supplier’s decision on whether to proceed with a reactor transfer to a recipient after an objector has protested the proposed transfer.

- **ALTERNATIVE HYPOTHESIS:** If a supplier state has optimistic expectations of future trade with the objector, then the supplier will heed the objector’s protest and halt the proposed
reactor transfer. If the supplier has pessimistic expectations of future trade with an objector, then the supplier will not heed the objector’s protest and will proceed with the transfer.

**The Data Set.** This study’s data set is composed of each instance since India’s 1974 nuclear weapons test in which a supplier state considered transferring a reactor to a recipient state and a third nation objected to the transfer. India’s nuclear weapon test, which took place on May 18, 1974, is a particularly important turning point in the nuclear age. India’s test stunned the international community because New Delhi had previously pledged that its nuclear facilities—acquired through the “Atoms for Peace” program—would be used strictly for civilian purposes. Significantly, to acquire fissile material for the test device, India extracted plutonium from the spent fuel of a reactor that had been supplied by Canada. India’s test prompted international calls for tighter controls on nuclear commerce and led to the development of the NSG. The mission of the NSG is to prevent nuclear transfers that can contribute to nuclear explosive activities.

To identify each case from May 18, 1974 through January 1, 1980, a search of ProQuest’s New York Times, Wall Street Journal, and Washington Post historical databases was conducted. The ProQuest search results included every article from the New York Times, the Wall Street Journal, and the Washington Post from May 18, 1974 through January 1, 1980 that contained the word “reactor” in the article’s title or text. For the search results, the title of each article was reviewed, and every article that appeared relevant to the study’s subject matter was examined in depth.

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Starting in 1960, Platts began to publish *Nuclear Fuel* and *Nucleonics Week*, which are considered the publications of record for the nuclear industry. However, Georgetown University only has access to volumes from these publications that were published after 1980. As such, to identify each case from January 1, 1980 through the present day, a Lexis-Nexis search was performed to review each article from these publications containing the word “reactor.” As necessary, other newspapers were consulted to determine whether a state objected to a proposed transfer and whether a proposed transfer proceeded in a particular case.

**Categorizing the Data.** To facilitate analysis of the cases, the cases were grouped into four categories.

1. Instances in which the supplier had an optimistic expectation of future trade with the objector and the transfer was halted.

2. Instances in which the supplier had a pessimistic expectation of future trade with the objector and the transfer was halted.

3. Instances in which the supplier had an optimistic expectation of future trade with the objector and the transfer proceeded.

4. Instances in which the supplier had a pessimistic expectation of future trade with the objector and the transfer proceeded.

To group the data into these categories, each case was evaluated against four questions.

1. *Did the supplier consider transferring the reactor to a recipient country?* To answer this question, news sources were used to document each instance in which a supplier state received a request for a reactor from a recipient state. A positive answer to this question (yes) resulted if the case’s supplier state did not immediately reject the recipient’s request.
2. *Did a third country object to this transfer?* Concluding that a third country did in fact object to a proposed transfer is an admittedly subjective exercise, especially since most diplomatic interactions take place behind closed doors. A positive answer to this question (yes) resulted if news accounts indicated that a third state objected to a proposed transfer between two other states. Examples of other types of evidence that also resulted in a positive answer included news stories indicating that a third state had protested, expressed concern about, or issued a demarche in reference to a proposed transfer.

3. *Did the transfer proceed despite the third country’s objection?* For each case, news accounts were evaluated to determine whether the supplier commenced work on the recipient’s reactor despite the objector’s protest. A positive answer (yes) resulted if the supplier initiated construction on or provided critical reactor components to the recipient’s reactor project after the objector’s protest.

4. *Did the supplier have an optimistic or pessimistic expectation of future trade with the objector?* To answer this question, news accounts were examined to identify when the supplier made its decision on whether to comply with the objector’s protest against the reactor export. After the period of decision was identified, news stories were examined to determine the supplier state’s expectation of future trade with the objector during the period of decision. Statements or actions from the supplier state’s government were used to assess the supplier’s expectations of future trade. Additionally, in some cases, statements or actions from the objector government—such as threats of sanctions—were also used to estimate the supplier’s trade expectations with the objector.
Of note, since each supplier’s government in the data set was able to veto reactor transfers and transfer requests typically are made in government-to-government forums, the supplier government’s expectations of future trade (as opposed to a private firm’s business expectations) are what is relevant for this study.

**Data Analysis.** After categorizing the data, the data was organized in a table. When analyzing data that results from two variables, a table can be used to provide a quick sense of general trends. If the data in the table unambiguously supports a clear relationship between two variables (or unambiguously disconfirms a relationship between two variables,) further analysis may be unnecessary. However, in situations in which the table of data does not point to an unambiguous conclusion, the Pearson’s Chi Square test can be used to evaluate whether a relationship exists between the variables.

What does the Chi Square test do? A Chi Square test is a significance test. That is, the Chi Square test is employed to determine whether there is a significant relationship between two categorical variables.\(^43\) Performing the Chi Square test results in one of two outcomes. One possible result of a Chi Square test is that the test will find that there is no relationship between two variables – this finding results in the rejection of the study’s alternative hypothesis and the acceptance of the study’s null hypothesis of no relationship. The other possible result is that the test will find that there is a correlation between two variables. In this situation, the Chi Square test result provides the statistical significance of the correlation while simultaneously serving as evidence that the study’s null hypothesis must be rejected.\(^44\)

How does the Chi Square test work? In essence, the Chi Square test compares the observed values from data to the expected values to determine the significance between two

variables. Presumably, for a valid hypothesis, the observed values of data would match the expected values perfectly. (To take an example from this thesis: As the alternative hypothesis predicts that a supplier with optimistic expectations of future trade with an objector will halt a reactor transfer, one would expect that in every case in which a supplier had optimistic expectations of trade with the objector, the supplier would halt the transfer in question.) Notably, in the real world, very rarely will the observed values and the expected values in an experiment match perfectly. However, the Chi Square test evaluates the extent of the disparity between expected and observed values to determine whether two variables are independent or whether there is a correlation between two variables.

For experiments with one independent and one dependent variable, the Chi Square is “the sum of the squared difference between observed…and the expected data…divided by the expected data in all possible categories.” As mentioned above, the experiment’s data was organized into the following table (called a contingency table for the Chi Square test):

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45 McLaughlin, Jacqueline and Noel, Jane. “Chi-Square Test.” http://www2.lv.psu.edu/jxm57/irp/chisquar.html. According to this website, some of the material from this site comes from “Chi-Square Test.” R.A. Fisher and F. Yates. Statistical Tables for Bioagricultural and Medical Research.”


47 McLaughlin, Jacqueline and Noel, Jane. “Chi-Square Test.” http://www2.lv.psu.edu/jxm57/irp/chisquar.html. According to this website, some of the material from this site comes from “Chi-Square Test.” R.A. Fisher and F. Yates. Statistical Tables for Bioagricultural and Medical Research.”
EXPECTATIONS OF FUTURE TRADE & DECISION ON WHETHER TO HALT A REACTOR TRANSFER

<table>
<thead>
<tr>
<th>SUPPLIER BELIEF</th>
<th>Transfer Was Halted</th>
<th>Transfer Proceeded</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Optimistic expectation of trade with the objector</td>
<td>a</td>
<td>b</td>
<td>a+b</td>
</tr>
<tr>
<td>Pessimistic expectation of trade with the objector</td>
<td>c</td>
<td>d</td>
<td>c+d</td>
</tr>
<tr>
<td>TOTAL</td>
<td>a+c</td>
<td>b+d</td>
<td>a+b+c+d</td>
</tr>
</tbody>
</table>

For this table, the Chi Square formula is:

$$X^2 = \frac{(ad-bc)^2(a+b+c+d)}{(a+d)(c+d)(b+d)(a+c)}$$

Once the Chi Square statistic is calculated, the Chi Square statistic is compared to a Chi Square distribution table that lists possible Chi Square statistic values and their corresponding levels of significance. According to accepted statistical standards, if a Chi Square statistic corresponds to a significance level of less than 5%, then the null hypothesis of no relationship must be accepted; if a Chi Square statistic corresponds to a significance level of greater than 5%, the null hypothesis is rejected.

For a 2x2 contingency table like the one above, the Chi Square statistic must exceed the critical value of 3.841, which corresponds to a 5% significance level, for the test to indicate that there is a significant correlation between the study’s two variables.

**Potential Threats to Validity.** There are two threats to the study’s validity that must be acknowledged. Answering each of the “categorizing” questions required making subjective judgments based on publicly available information. Unfortunately, this methodological approach risks introducing bias into the study’s data. This threat to the study’s validity is mitigated to an extent because the study’s large N design and employment of the Chi Square test should provide

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for a rigorous evaluation of the relationship between the independent and dependent variables. Nonetheless, it is possible that unintentional bias has impacted the study’s conclusions.

The second threat to the study’s validity is that the cases are relatively homogenous in one important respect: in most of the study’s cases (37 of 42 cases), the U.S. is the objector state. Since the U.S. throughout the period under study was one of the world’s economic and military superpowers, it is possible that the suppliers in these 37 cases behaved differently in their interactions with the U.S. than the suppliers might have behaved had the objector not been a superpower. To address this threat to the study’s validity, a Chi Square test of only the cases in which the U.S. was the objector was performed to determine if the conclusion for the study as a whole was consistent with the outcomes observed in the 37 U.S. objector cases. This second Chi Square test determined that the null hypothesis of no relationship should be accepted for both the full data set and the 37 U.S. objector cases.

**Data and Results**

As described earlier, a review of the historical record resulted in the identification of 42 contested reactor transfer cases that took place after India’s 1974 nuclear weapon test. Per the procedure described in the methods section, the cases of the data set were then evaluated and organized by category. These are the results:

1. There were 19 instances in which the supplier had an optimistic expectation of future trade with the objector and the transfer was halted.
2. There were 11 instances in which the supplier had a pessimistic expectation of future trade with the objector and the transfer was halted.
3. There were 4 instances in which the supplier had an optimistic expectation of future trade with the objector and the transfer proceeded.

4. There were 8 instances in which the supplier had a pessimistic expectation of future trade with the objector and the transfer proceeded.

Accordingly, the data can be organized into the following 2x2 contingency table:

<table>
<thead>
<tr>
<th>EXPECTATIONS OF FUTURE TRADE &amp; WHETHER A REACTOR TRANSFER PROCEEDED</th>
<th>Transfer Was Halted</th>
<th>Transfer Proceeded</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUPPLIER BELIEF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optimistic expectation of trade with the objector</td>
<td>19</td>
<td>4</td>
<td>23</td>
</tr>
<tr>
<td>Pessimistic expectation of trade with the objector</td>
<td>11</td>
<td>8</td>
<td>19</td>
</tr>
<tr>
<td>TOTAL</td>
<td>30</td>
<td>12</td>
<td>42</td>
</tr>
</tbody>
</table>

Since organizing the data into a table does not lead to an unambiguous conclusion about the relationship between the two variables under examination, application of the Pearson’s Chi Square test is appropriate. Calculation of the Chi Square statistic results in 3.11. For a 2x2 contingency table, the critical value in the Chi Square distribution table is 3.841, which corresponds with a significance level of 5%. Accordingly, as the Chi Square statistic is below 3.841 and thus does not meet or exceed a 5% significance level, the thesis’s alternative hypothesis must be rejected and the null hypothesis must be accepted. As such, it is fair to conclude that there is no significant relationship between a supplier’s expectation of future trade with an objector and a supplier’s decision on whether to proceed with a reactor transfer to a recipient after an objector has protested the proposed transfer.

Moreover, the results of the Chi Square test suggest that there is some other, more powerful factor (or factors that act in concert) that causes suppliers to halt reactor transfers in response to protests from objector states in some cases but not others. Further, it is important to
note that even small changes in the data would not radically alter this conclusion. The cases in the data set very nearly resulted in a judgment that the null hypothesis should be rejected and that the alternative hypothesis should be accepted. A shift of one case from the “Pessimistic expectation of trade with the objector and the transfer was halted” category to the “Optimistic expectation of trade with the objector and the transfer was halted” category would result in a Chi Square statistic of 3.88. A Chi Square statistic of 3.88 would have resulted in the rejection of the null hypothesis and the acceptance of the alternative hypothesis since 3.88 is greater than the critical value of 3.841.

Nonetheless, even this shift of one case—if it had been reflected in the data—would have only resulted in a significance level of 5%. This significance level would have been grounds to reject the null hypothesis; however, the 5% significance level is still a relatively small significance level (a Chi Square distribution table often includes at least three values that are more significant than the 5% level – 2%, 1%, and then .1% as the most significant level.) Thus, while the data supports rejecting the alternative hypothesis and accepting the null hypothesis, even if there had been one more confirmatory case and one less discrepant case, the test would only have established a small but statistically significant correlation between the study’s independent and dependent variables. In short, even a small change in the study’s data set would still have led to the conclusion that there is likely some other, more important factor that influences the decision-making of suppliers who consider a reactor export in the context a protest from an objecting state.

Finally, it is worth noting that whether the U.S. is the objector state does not impact the conclusion that there is no relationship between a supplier’s trade expectations with an objector and a supplier’s decision on whether to follow through with a reactor export to a recipient after
an objector has protested a proposed transfer. Importantly, in most of the cases in the data set, the U.S. was the objector state (37 out of 42 cases.) One might wonder whether it is possible that the five cases in which states other than the U.S. were objectors might have skewed the data set and resulted in the acceptance of the null hypothesis. Perhaps, given the U.S.’s commercial power, there is a significant relationship between a supplier’s trade expectations with the U.S. and a supplier’s decision on whether to proceed with a reactor transfer after the U.S. has protested a proposed reactor export.

Significantly, an analysis of the 37 cases in which the U.S. was the objector reinforced the finding that the null hypothesis should be accepted. These 37 cases result in this 2x2 contingency table:

<table>
<thead>
<tr>
<th></th>
<th>Transfer Was Halted</th>
<th>Transfer Proceeded</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>SUPPLIER BELIEF</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Optimistic expectation of trade with the objector (U.S.)</td>
<td>15</td>
<td>4</td>
<td>19</td>
</tr>
<tr>
<td>Pessimistic expectation of trade with the objector (U.S.)</td>
<td>11</td>
<td>7</td>
<td>18</td>
</tr>
<tr>
<td>TOTAL</td>
<td>26</td>
<td>11</td>
<td>37</td>
</tr>
</tbody>
</table>

Performing the Chi Square test on this contingency table results in a Chi Square statistic of 1.408. 1.408 is significantly below the critical value of 3.841. Accordingly, it is clear that there is not a relationship between a supplier’s trade expectations with the U.S. as the objector and the supplier’s decision to proceed with a reactor export.

Under What Conditions Might Trade Expectations Impact Reactor Transfers?

The results of the Chi Square test are compelling grounds for rejecting the notion that expectations of future trade significantly influence a supplier state’s decision on whether to heed
another state’s objection to a proposed reactor transfer. However, anecdotal evidence from the
data set suggests that trade expectations likely impact the decision-making of supplier states in
some circumstances. This section identifies three conditions that may pertain to whether trade
expectations can influence a supplier’s decision to halt a reactor transfer.

*Major shifts in the supplier’s expectation of future trade with the objector.* Of the 19
cases in which a supplier had an optimistic expectation of future trade with the objector and
halted the transfer, seven of these cases featured a major shift in the supplier’s trade expectations
immediately prior to the decision to terminate the transfer.51 For instance, in December 1983,
the Soviet Union52 agreed to consider a Pakistani request to construct a 937-MW nuclear power
plant. The U.S. objected to the proposed transfer.53

During much of the period in which the Soviets considered the transfer, U.S. trade
relations with the U.S.S.R. were deeply strained. In 1979, the U.S. imposed sanctions on the
U.S.S.R. that cut U.S.-Soviet trade in half, and subsequently Soviet-American trade remained
meager. However, on November 8, 1984, the Reagan administration announced a major shift in
U.S. trade policy with the Soviets. The administration proposed expanding U.S.-Soviet trade and
scheduled a high-level trade summit in Moscow for January 1985. Concurrently, the U.S. and
the U.S.S.R. began to normalize their trade in grain.54 On November 22, 1984, after Soviet

51 Cases 12, 16, 18, 24, 29, 32, and 40.
52 The Soviet Union is referred to in subsequent parts of this thesis as the “U.S.S.R.” or as “the Soviets.”
53 See: Shahid-ur-Rehman Khan. “Soviets say they will not supply Pakistan with nuclear reactor.” Nucleonics
expectations of trade with the U.S. became significantly more optimistic, the Soviet ambassador in Islamabad announced that the U.S.S.R. would not construct a power reactor for Pakistan.\textsuperscript{55}

Similarly, in the late 1980s through 1992, Argentina considered supplying a number of proliferant-states with nuclear facilities. Two of the cases included proposed reactor transfers—an agreement with Iran that was initiated in 1986\textsuperscript{56} and a 1990 deal with Syria.\textsuperscript{57} The U.S. protested each proposed reactor transfer.\textsuperscript{58} Ultimately, Argentina terminated each transfer after its trade expectations with the U.S. markedly improved.\textsuperscript{59}

1991 and 1992 were pivotal years for the U.S.-Argentine relationship. In 1991, the U.S. reached agreements with Argentina to increase U.S. development aid for Argentina’s agricultural sector; to create a free trade agreement between the U.S., Argentina, Paraguay, Uruguay, and Brazil; and to increase U.S. export subsidies for Argentine commerce. In November 1991, Argentina’s President Carlos Menem conducted bilateral meetings with U.S. President George H.W. Bush in Washington and agreed on an arrangement to increase financing for U.S. businesses that intended to invest in Argentina. Finally, following a February 1992 Argentine decision to restrict its nuclear exports—including terminating the proposed nuclear transfers—the U.S. and Argentina signed a historic civilian nuclear agreement in September 1992.\textsuperscript{60} As the

\textsuperscript{59} See cases 16 and 24.
Argentine and Soviet cases illustrate, trade expectations may be able to influence a supplier state’s decision on whether to transfer a reactor if the supplier’s expectation of future trade with the objector shifts dramatically in a positive direction.

*Linkage of Inducements to Decisions to Halt Transfers.* In addition to significantly altering a supplier’s expectation of future trade, it appears that creating an explicit linkage between improved trade and the termination of a reactor deal can also increase the chances of a supplier halting a transfer. Three cases illustrate this point. In 1999, Russia considered an Iranian request to build three additional power reactors at Iran’s Bushehr power station in addition to ongoing Russian work on a separate reactor at Bushehr. The U.S. strongly objected to the proposed export of additional reactors to Bushehr.61

Russian-Iranian negotiations on the deal continued until the mid-2000s, when U.S.-Russian ties warmed considerably. In 2006, Russia’s expectation of future trade with the U.S. became much more optimistic when the two countries signed a trade deal that would permit Moscow to join the World Trade Organization. Following the trade deal, the U.S. and Russia initiated negotiations on a civilian nuclear agreement. Prior to completing the accord, the U.S. demanded that Russia agree to limit its assistance to Iran’s nuclear program to the existing Bushehr reactor project and to terminate the proposed additional reactor transfers. In May 2008, agreement was reached on this issue, and the U.S. and Russia completed a civilian nuclear accord that would provide Russian companies with access to lucrative U.S. nuclear-related contracts.62 By linking Russia’s agreement to halting the reactor transfers with the inducement

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of a nuclear trade agreement, U.S. officials were able to reverse Russia’s approach to assisting Iran’s nuclear program.

A similar diplomatic coup occurred in 1997 when the Clinton administration tied the entry-into-force of a U.S.-China nuclear agreement to a Chinese decision to terminate two separate reactor projects with Iran. Much like the Russian case, China had two agreements to build reactors in Iran. The U.S., distrustful of Tehran’s claims that its nuclear program was solely for peaceful purposes, protested the two Chinese-Iranian deals, which were initiated in 1991 and 1992 respectively.\(^{63}\)

Beijing, like Moscow, coveted access to nuclear equipment and contracts from the U.S. However, Washington had never acted to bring a 1985 U.S.-China nuclear accord into force, and thus China could not benefit from nuclear commerce with U.S. firms. Wishing to halt the Chinese-Iranian reactor deals, in 1997 U.S. diplomats offered to work to bring the U.S.-Chinese nuclear agreement into force in exchange for a Chinese pledge to halt nuclear cooperation with Iran. With the prospect of expanded commerce from the forthcoming entry-into-force of the U.S.-China nuclear deal, in late 1997 China’s President Jiang Zemin confirmed to President Clinton that Beijing would halt all significant nuclear transfers—including the two proposed reactors—to Iran. Importantly, China already had optimistic expectations of trade with the U.S. prior to the consummation of the 1997 nuclear agreement. The Clinton administration was able to enhance China’s expectation of future trade with the U.S. by explicitly linking the commercial

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benefits of the U.S.-Chinese nuclear deal to a Chinese decision to stop the proposed transfers to Iran. 64

Moreover, the terminated Chinese and Russian nuclear agreements with Iran stand in stark contrast to two additional cases involving China and Russia that occurred during essentially the same time period. In January 1995, Russia considered an Indian proposal which entailed having Moscow construct two large power reactors in India. The U.S. vociferously objected to the Russian-Indian agreement. 65 Negotiations between Moscow and New Delhi continued for the next three years, and during this period of time Russia’s trade expectations with the U.S. were consistently optimistic and did not change dramatically. 66 In April 2002, despite the U.S.’s objections, the Russian nuclear company Atomstroyeksport started construction on the first Indian reactor. 67

Likewise, in 1996 the U.S. protested a proposed agreement between China and Nigeria in which Beijing was to provide Nigeria with its first research reactor. 68 During the period in which China considered the Nigerian reactor deal, Beijing was very pleased with what it termed “soaring trade” with the U.S. 69 Notably, there is no evidence to suggest that U.S. diplomats linked a Chinese decision to abandon the Nigerian reactor deal to either additional inducements

66 “US Vice President Gore’s visit; Chernomyrdin and Gore discuss trade and investment.” BBC Summary of World Broadcasts. July 24, 1996.
or threatened penalties. In the end, China ignored the U.S.’s protest and proceeded to construct Nigeria’s reactor, which was completed in March 1999.\footnote{Mbachu, Dulue. “Nigeria Denies Nuclear Ambitions.” The Associated Press, March 5, 2004. See also: Anonymous. “Nigeria to launch first nuclear reactor.” Xinhua General News Service, September 27, 2004.}

The contrast between the Russia-Iran, China-Iran, Russia-India, and China-Nigeria cases is striking. When the objector tied the promise of expanded trade to a specific decision to halt a reactor transfer, each reactor deal was terminated. When the supplier’s expectation of future trade remained optimistic but was relatively unchanged and when there was no effort to link the termination of a reactor deal to expanded trade between the objector and the supplier, each reactor deal proceeded.

\textit{The probability that an objector’s protest of a reactor transfer will convince a supplier to halt a transfer increases if the supplier believes that no other state will transfer a reactor to the recipient if the supplier terminates the reactor deal.} Linking an inducement to the termination of a reactor deal may be all the more powerful if the supplier also believes that no other state will transfer a reactor to a recipient. Understandably, many suppliers are reluctant to cancel proposed reactor sales if it is clear that another state will step in, export a reactor to the recipient, and take the original supplier’s profits. On the other hand, if a supplier is convinced that no other state will transfer a reactor to the recipient if the supplier also does not complete such a transfer, the supplier may come to believe that completing the reactor deal may generate opprobrium from other states.

Three cases illustrate the potential power of convincing a supplier that no other state will transfer a reactor to the recipient if the supplier terminates a proposed reactor deal. First, in 1974, Belgium signed a nuclear cooperation agreement with Libya that envisioned Belgian
supply of a reactor to Tripoli.\textsuperscript{71} The U.S. government pressured Belgium to cancel the lucrative reactor deal.\textsuperscript{72} During the period in which the Belgian government considered the U.S. objection, Belgian expectations of trade with the U.S. were decidedly pessimistic.\textsuperscript{73} Moreover, the Belgian nuclear industry exhorted its government to permit the 60 billion Belgian Franc reactor deal to proceed.\textsuperscript{74} In the end, U.S. political pressure—rather than trade expectations—convinced Belgium to halt the transfer. Additionally, it appears that an important, although not decisive, factor in Belgium’s decision-making was the fact that other nuclear suppliers such as France promised that they would not supply Libya with a reactor once Belgium canceled its export agreement with Tripoli.\textsuperscript{75}

The Belgian case is decidedly different from a British and a French case, both of which occurred in the early 1990s. In 1991, U.S. officials disclosed that China had been clandestinely building a nuclear reactor in Algeria. In response, the U.S. pressured major nuclear suppliers, including Britain and France, to terminate their assistance to China’s civilian nuclear power program.\textsuperscript{76} At the time, both British and French companies were contributing to the construction of power reactors at China’s Daya Bay power station. Unlike in the Belgian case, it was clear that if either the U.K. or France pulled out of Daya Bay, that another country would simply step in, provide the needed assistance, and reap the benefits. During this period, Britain had an


optimistic expectation of trade with the U.S.\textsuperscript{77} while France had a pessimistic expectation of
trade with Washington.\textsuperscript{78} However, both countries continued to participate in China’s Daya Bay
project, at least partly because it was obvious the transfers would proceed irrespective of whether
British or French firms were involved in Daya Bay.\textsuperscript{79} It follows that an objector’s protest of a
proposed transfer is most likely to convince the supplier to terminate a reactor export if the
objector dramatically improves the supplier’s expectation of future trade with the objector;
explicitly links an inducement to the supplier’s decision to halt the transfer; and if supplier
believes that no other countries will transfer a reactor to the recipient.

\textbf{The Impact of Nonproliferation Norms}

This study was based upon a key assumption: above all else, the willingness of states to
export reactors was likely driven by anticipated trade flows. The Chi Square test conclusively
undermined this assumption by demonstrating that there is no significant relationship between a
supplier’s expectation of future trade with an objector and a supplier’s decision on whether to
proceed with a reactor transfer to a recipient after an objector has protested a proposed transfer.

Although the data did not present an unambiguous pattern linking the study’s
independent and dependent variables, the data set did nonetheless present a clear pattern that
merits attention. Of the data set’s 42 cases, 30 of the proposed reactor deals were initiated
between 1974 and 1991 (17 years.) Only 12 cases were initiated between 1992 and the present
(18 years), and only two cases were initiated between 2000 and the present (10 years.) Since

\textsuperscript{78} Anonymous. “‘Economic War’ widens.” The Financial Post, May 27, 1991, P. 10. See also: Anonymous. “No
GATT accord unless U.S. makes concessions: France.” Agence France Presse, December 20, 1991. See also:
\textsuperscript{79} Hibbs, Mark. “Despite U.S. Alarm Over Algeria, Europeans Won’t Blacklist China.” Nucleonics Week 32:21
trade expectations cannot account for the declining rate of initiated reactor transfer agreements, what can explain this trend?

A review of the historical record suggests a surprising conclusion: the establishment of NSG regulations in 1978 and especially the adoption of enhanced NSG regulations in 1992 resulted in the creation of a robust norm against transfers of reactors that do not accord with NSG policies. A brief history is in order. After India tested a nuclear device in 1974, the U.S., the U.S.S.R., the U.K, France, the Federal Republic of Germany, Japan, and Canada formed the NSG to control technologies that could be employed in a nuclear weapons program. By 1977, the number of NSG members had doubled with the addition of Belgium, Czechoslovakia, the German Democratic Republic, Italy, the Netherlands, Poland, Sweden, and Switzerland as members.80

In 1978, the NSG published Information Circular/254 (INFCIRC/254).81 The core principle of INFCIRC/254 was that “suppliers should authorize transfer of items in the [nuclear equipment] trigger list only upon formal governmental assurances from recipients explicitly excluding uses which would result in any nuclear explosive device.”82 INFCIRC/254 permitted transfer of “trigger list” equipment—including full reactors and critical reactor components—only when these items would be covered by IAEA safeguards.

After the publication of INFCIRC/254, the NSG did not formally convene again until March 1991, just weeks after the conclusion of the Persian Gulf War. Between 1978 and March 1991, each NSG member-state was responsible for making certain that its commerce did not

82 “Communication Received from the Permanent Mission of Brazil regarding Certain Member States’ Guidelines for the Export of Nuclear Material, Equipment and Technology.” (INFCIRC/254-Part 1.) http://www.nuclearsuppliersgroup.org/Leng/PDF/infcirc254r9p1-071107.pdf
During the 1978-March 1991 timeframe, 15 potential reactor deals were initiated that involved NSG members acting as potential reactor suppliers. The 15 reactor deals involved eight potential recipients, each of which was suspected of illicit nuclear ambitions (Argentina, Iraq, South Africa, Pakistan, Israel, Iran, Libya, and North Korea.) Each of these potential reactor exports would have violated either the letter or the spirit of INFCIRC/254. Significantly, however, only one of these deals (the 1979 German-Argentina reactor deal) was pursued to fruition and resulted in the construction of a reactor. One preliminary conclusion, which appears to receive strong support from this evidence, is that a supplier’s acceptance of NSG regulations in conjunction with an objector’s protest of a proposed reactor transfer between the supplier and a recipient was often sufficient to halt a controversial reactor transfer.

When the NSG met in March 1991, hostilities in the Persian Gulf War had just concluded. In the months after the March 1991 NSG meeting, IAEA inspectors discovered that Saddam Hussein had developed an extensive clandestine nuclear weapon program. Deeply unnerved by this revelation, the U.S. led a multilateral effort to strengthen the NSG’s INFCIRC/254. The product of this process was INFCIRC/254 – Part 2, which was adopted on April 3, 1992. INFCIRC/254 – Part 2 strengthened the NSG’s regulations by prohibiting nuclear transfers to unsafeguarded nuclear fuel activity—not just transfers that could result in a nuclear explosive device—while also requiring member-states to establish enforceable domestic

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84 Cases 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 17, 19, 20, and 23. Of note, the date of initiation for cases 25 and 26 took place after the March 1991 NSG meeting.
85 Case 5.
export licensing procedures.\textsuperscript{88} Perhaps as important, after the March 1991 meeting, the NSG started to hold an annual plenary session and various NSG working groups began to work throughout the year.\textsuperscript{89}

After the adoption of INFCIRC/254 – Part 2, the data set includes only 12 cases in which a supplier considered transferring a reactor to a recipient. (See following table – Initiation of Reactor Transfer Agreements.)

\textsuperscript{88} “Communications Received from Certain Member States Regarding Guidelines for Transfers of Nuclear-related Dual-use Equipment, Materials, Software and Related Technology.” (INFCIRC/254-Part 2.) The Nuclear Suppliers Group/IAEA. http://www.nuclearsuppliersgroup.org/Leng/PDF/infcirc254r7p2-060320.pdf
Initiation of Reactor Transfer Agreements

- **Year**: 1972 - 2008
- **Number of Reactor Transfer Agreements By Country**

- **Countries**:
  - U.S.
  - W. Germany/Germany
  - U.S.S.R./Russia
  - France
  - Belgium
  - Argentina
  - China
  - U.K.
  - India
  - Czech Republic
  - S. Korea
  - Ukraine

- **Key Events**:
  - 1978: NSG Adopts INFCIRC/254-Part 1
  - 1974: Nuclear Suppliers Group is created
  - 1992: NSG Adopts INFCIRC/254-Part 2
In five of these potential deals initiated after the adoption of INFCIRC/254 – Part 2, Russia (an NSG member) was the supplier.\textsuperscript{90} Four of the five Russian deals were protested on nonproliferation grounds (the exception, Russia’s 1995 reactor deal with Cuba, drew objections from the U.S. based on safety considerations.) Although two of the five Russian deals proceeded (the 1992 Russia-Iran and the 1995 Russia-India deals,) the NSG ultimately decided that the 1995 Russia-India deal was permissible since the Soviet Union had considered supplying a reactor to India prior to the U.S.S.R.’s collapse.

In three of the deals, China was the potential supplier.\textsuperscript{91} Importantly, China became an NSG member in May 2004\textsuperscript{92}, and only one of its proposed transfers was initiated after this date (China’s May 2006 reactor agreement with Pakistan.) The May 2006 China-Pakistan agreement\textsuperscript{93} is noteworthy because China initiated this deal in response to the George W. Bush administration’s effort to remove NSG restrictions on nuclear commerce with India, a principal rival of both Beijing and Islamabad.\textsuperscript{94} It is also important to point out that the May 2006 China-Pakistan agreement is unique among the data set’s cases as this is the only case in which the result of the agreement is inconclusive. This case is coded as a case in which the reactor transfer is proceeding because the last available news report on this agreement, from March 2010, indicated that an agreement between China and Pakistan for export of the reactors had recently been finalized.\textsuperscript{95}

\textsuperscript{90} Cases 31, 34, 36, 40, and 41.
\textsuperscript{91} Cases 32, 37, and 42.
\textsuperscript{93} Case 42.
The other four cases initiated after the adoption of INFCIRC/254 – Part 2 actually lend support to the argument that this regulation contributed to the formation of a robust norm against transfers of reactors that do not accord with NSG policies. The 1993 Czech Republic-Iran, 1995 South Korea-Pakistan, and 1997 Ukraine-Iran cases are remarkably similar.\textsuperscript{96} In each case, the supplier considered providing the recipient with a critical reactor component such as a pressure vessel or a turbine. Moreover, in each case, after the objector’s protest of the transfer became public, the supplier quickly reversed course and halted the deal. Of the three cases, Ukraine considered the objector’s protest for the longest period of time, taking 17 days to terminate the sale after the objector’s protest was reported in the press.\textsuperscript{97} Five days after the U.S. objection to South Korea’s consideration of a deal to provide a pressure vessel to Pakistan was reported in the media, Seoul canceled the transfer and announced its intention to join the NSG.\textsuperscript{98} Compared to many of the pre-1992 cases\textsuperscript{99} in which suppliers and objectors wrangled for years over whether a transfer should proceed, these examples are notable for how quickly each supplier complied with the objector’s protest.

The 12th case from the 1992-present cohort was Germany’s 1998 offer of a nuclear reactor to Iran.\textsuperscript{100} This example also supports the notion that INFCIRC/254 – Part 2 reinforced nonproliferation norms since Berlin’s offer of a reactor was a part of a European Union proposal designed to elicit an Iranian agreement for increased IAEA scrutiny of Tehran’s nuclear

\textsuperscript{96} Cases 33, 35, and 38.
\textsuperscript{99} For example, cases 4, 8, 10, and 13.
\textsuperscript{100} Case 39.
program. Importantly, despite Berlin’s intentions, the U.S. objected to the proposal since the U.S. opposed any nuclear cooperation with Iran at this stage. Germany quickly abandoned the potential reactor export in the face of the U.S. protest.

To be sure, there are at least several possible explanations for why the number of contested reactor exports declined after the adoption of INFCIRC/254-Part 2. It is conceivable that the emergence of the U.S. as the world’s hegemon after the fall of the U.S.S.R. made smaller states feel more secure such that fewer states sought to acquire reactors as a part of nuclear weapons programs. Perhaps more robust nonproliferation norms convinced potential proliferators that developing nuclear weapons was wrong, and thus some states left the market for reactor exports. Likewise, it is possible that improved international monitoring of commerce in reactors raised the costs of illegitimate reactor exports such that states were deterred from participating in reactor transfer deals.

However, the most plausible explanation is that nuclear suppliers were extremely reluctant to consider reactor transfers to recipients that did not accord with INFCIRC/254 – Part 2 after this regulation’s adoption in early 1992. Of the data set’s twelve suppliers, only six even entertained proposals for potentially controversial reactor deals during this period. Moreover, as the previous discussion illustrates, of the six suppliers, only China and Russia pursued negotiations with potential recipients beyond preliminary feasibility and contractual discussions. It is worth underscoring as well that, of the two contested reactor deals since 2000,

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104 Professor Justine Rosenthal suggested many of the ideas in this paragraph.

105 Russia, China, the Czech Republic, South Korea, Ukraine, and Germany.
to date neither has resulted in the actual construction of a reactor. As many of the potential suppliers during the 1978-1991 period entered into intensive negotiations with potential recipients and were often very reluctant to terminate proposed reactor sales, the cases after 1992 suggest that the NSG norm against illegitimate reactor transfers strengthened considerably with the adoption of INFCIR/254 – Part 2. As such, this evidence bolsters the case of analysts who contend that nonproliferation norms cause states to eschew behavior that can contribute to the spread of nuclear weapons.

Policy Lessons

Since the mid-1970s, U.S. policymakers have repeatedly sought to restrict commerce in nuclear reactors. However, the results of U.S. efforts to curb reactor exports have been decidedly mixed. This section suggests three policy lessons that can be drawn from this thesis’s examination of contested reactor transfers.

Policymakers should employ economic incentives sparingly when trying to convince a supplier to halt a reactor export. A key take away from the thesis’s review of contested reactor transfers is that trade expectations have a much less powerful effect on supplier decision-making than one would assume. Despite some notable exceptions, the historical record suggests that manipulating trade expectations is unlikely to alter a supplier’s reactor transfer policies. To convince suppliers to terminate reactor sales in the future, U.S. diplomats should consider public efforts to shame the supplier, threatened political penalties, or efforts to reach a political compromise in which the supplier agrees to halt the transfer in exchange for some U.S. political concession. Each of these strategies should be attempted prior to trying to manipulate the supplier’s expectation of future trade in an effort to halt a reactor export.
Bearing in mind that manipulating a supplier’s expectation of future trade should be used sparingly as a policy tool to prevent a proliferation-related reactor transfer, if policymakers decide to pursue this approach, three findings from this thesis should inform their strategy. First, manipulating a supplier’s trade expectations to discourage a reactor transfer will be most successful if the objector can dramatically shift the supplier’s expectation of future trade. At a minimum, the objector must convince the supplier that cancelling the reactor sale will cause the supplier to reap greater benefits than if the supplier proceeded with the transfer.

Second, the objector’s influence attempt will have a greater probability of succeeding if a promise of expanded trade with the supplier is explicitly linked to the cancellation of the reactor export. Third, the chances that a supplier will decide to halt a transfer improve if the supplier is convinced that no other state will decide to provide the recipient with a reactor after the potential supplier cancels its planned reactor sale. It is worth pointing out that most potential reactor deals will not meet all of these conditions, and thus influencing trade expectations is unlikely to be an effective policy tool except in exceptional circumstances.

Expand and Reinforce Nonproliferation Norms. This study demonstrated that the NSG’s norms that pertain to reactor transfers are remarkably robust. However, many aspiring nuclear states including Belarus, the United Arab Emirates, and Indonesia are seeking to build reactors in the near future but are not NSG members.\textsuperscript{106} An important policy priority for the U.S. as well as other countries with a deep interest in nuclear nonproliferation should be to expand the NSG’s membership considerably. Further, as more states seek to construct new nuclear reactors,

http://www.boston.com/bostonglobe/editorial_opinion/oped/articles/2009/03/29/the_coming_nuclear_renaissance/
existing NSG members should make application to the NSG a condition of any agreement to supply non-NSG members with equipment, materials, or expertise.

Al-Kibar: Portents of the Proliferation Future? On September 6, 2007, Israeli Air Force fighters attacked and destroyed a nuclear reactor near Al-Kibar, Syria. The reactor was being constructed clandestinely for Syria by North Korean technicians. The Al-Kibar reactor is believed to have been modeled after North Korea’s Yongbyon reactor. This third point is less a lesson than a word of caution. By strengthening the NSG’s norm against illegitimate reactor transfers, advanced nuclear states have made it very difficult for potential proliferators to acquire reactors openly, especially since so many potential reactor suppliers now refuse to consider illegitimate reactor sales. A key question is whether Al-Kibar is a portent of the proliferation future or an anomaly. It is possible that Syria and North Korea decided to construct the Al-Kibar reactor secretly without considering NSG norms at all (perhaps because both regimes are secretive by nature, for instance.) It is also possible, however, that the Syrian-North Korean decision to conduct this transfer clandestinely was a deliberate attempt to skirt the NSG’s norms. If this latter scenario is true, then NSG member states need to be especially cognizant of this new proliferator strategy.

Conclusion

One of the leading theoretical perspectives on the relationship between trade and state behavior suggests that if one state has optimistic expectations of future trade with another nation, then that state will prefer conciliatory and cooperative behavior with the other nation. Likewise, if a state has pessimistic expectations of future trade with the other nation, then the first state will

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prefer antagonistic and noncooperative behavior with the other nation.\textsuperscript{108} However, an examination of the 42 cases in this thesis’s data set undermines this argument. In fact, significance testing demonstrated that there was no relationship between a supplier’s expectation of future trade with an objector and a supplier’s decision on whether to proceed with a reactor export to a recipient after an objector has protested the proposed transfer. Moreover, the thesis’s data set presents strong but preliminary support for the argument that the adoption of NSG guidelines for nuclear commerce in 1978 and 1992 contributed to the development of a robust norm against exports of nuclear reactors that do not accord with NSG guidelines.

The thesis’s conclusions contribute to the literature on trade and state behavior as well as nonproliferation in at least three ways. First, the evidence presented in this thesis constitutes a significant challenge to theoretical arguments that suggest trade expectations materially impact state behavior. Given this finding, policymakers seeking to curb exports of nuclear reactors should avoid employing tools of economic statecraft to achieve their aims. Instead, policymakers might find that publicly shaming potential reactor suppliers or imposing political penalties are more effective strategies.

Second, this thesis adds to the arguments of scholars\textsuperscript{109} who contend that neorealists underplay the impact of international institutions and norms on state behavior. Although causation is difficult to prove, this thesis’s data suggests that the NSG does reduce the willingness of nuclear suppliers to export reactors. Third, although champions of nonproliferation norms have long believed that their perspective was correct, this thesis provides


additional empirical backing for those who advocate policies that seek to expand and reinforce nonproliferation institutions and norms.

Finally, this thesis raises several questions that might guide future areas of research. How specifically do nonproliferation norms impact the willingness of nuclear suppliers to export nuclear reactors? This thesis has demonstrated that norms created by NSG guidelines are likely the reason that nuclear suppliers are less willing to engage in illegitimate reactor exports. However, the NSG trigger lists include many other types of equipment and facilities in addition to reactors. Do the NSG’s norms effectively dissuade states from engaging in questionable transfers of other types of nuclear exports such as reprocessing or heavy water facilities? The data set suggests that Russia and China have been less willing to accept the NSG’s norms. Why is this the case, and what policies could cause Russia and China to abide by NSG guidelines? Lastly, as noted earlier, many new states are seeking to acquire nuclear reactors. What factors might make it more likely that these states will comply with nonproliferation norms?
### Appendix 1: The Data Set’s Cases by Year of Initiation

<table>
<thead>
<tr>
<th>Case</th>
<th>Year of Initiation</th>
<th>Supplier</th>
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<tbody>
<tr>
<td>6</td>
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<td>1988-1989</td>
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<td>China</td>
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<td>U.S.</td>
<td>1997</td>
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<td>U.S.</td>
<td>1997</td>
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<td>1993</td>
<td>Pessimistic</td>
<td>Halt</td>
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<td>Country 2</td>
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<td>Start Date</td>
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<td>34</td>
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<td>India</td>
<td>U.S.</td>
<td>1995-1998</td>
<td>Optimistic</td>
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<td>1995</td>
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<td>Pakistan</td>
<td>U.S.</td>
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<td>Pessimistic</td>
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Appendix 2: The Data Set’s Cases In Depth

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<th>Case</th>
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</table>

1. **Did the supplier consider transferring the reactor to a recipient country? Yes.**
   In June 1974, U.S. President Richard Nixon and Egyptian President Anwar Sadat signed an accord on U.S.-Egyptian cooperation. The accord stated: “The two Governments will begin negotiation of an agreement for cooperation in the field of nuclear energy under agreed safeguards. Upon conclusion of such an agreement, the United States is prepared to sell nuclear reactors and fuel to Egypt.”

2. **Did a third country object to this transfer? Yes.**
   After the announcement that the U.S. was considering supplying a reactor to Egypt, Israeli Premier Itzhak Rabin promptly objected to the transfer to President Nixon.

3. **Did the transfer proceed despite the third country’s objection? No.**
   After President Nixon offered Egypt a reactor in June 1974, he also promised to conclude a similar deal with Israel. Between June 1974 and December 1974, both Egypt and Israel pressured the U.S. to complete the reactor deals on terms that would be favorable to their respective governments. In the middle of December 1974, Israel declared that it no longer would accept a U.S.-supplied reactor while simultaneously dropping its objection to the U.S.-Egyptian transfer. In practice, this diplomatic gambit killed both deals, as Sadat refused to accept a U.S.-supplied reactor under stringent safeguards while Israel’s Dimona reactor operated without

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safeguards.\textsuperscript{112} (Israel’s Dimona reactor was provided to Israel by France, and went online in early 1964.\textsuperscript{113})

4. Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Optimistic.

The period of decision for this transfer is from June 1974 through the middle of December 1974, when the transfer was halted. During this time, the U.S. had an optimistic expectation of future trade with Israel. In this period, the U.S. and Israel commenced formal bilateral discussions aimed at increasing economic cooperation between the two nations. Concurrently, the U.S. and Israel initiated several arms deals that envisioned Israel purchasing large amounts of U.S. military equipment.\textsuperscript{114}

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</table>

1. Did the supplier consider transferring the reactor to a recipient country? Yes.

In June 1975, West Germany and Brazil initiated discussions on a proposed agreement in which West Germany would provide Brazil with several nuclear reactors.\textsuperscript{115}

2. Did a third country object to this transfer? Yes.

In June 1975, U.S. President Gerald Ford’s administration objected to the proposed reactor transfer.\textsuperscript{116} Subsequently, after the inauguration of U.S. President Jimmy Carter, the Carter administration protested the proposed transfer in early 1977.\textsuperscript{117}


\textsuperscript{113} “Dimona: Negev Nuclear Research Center.” Globalsecurity.org/wmd/world/Israel/dimona.htm.


3. Did the transfer proceed despite the third country’s objection? Yes.

By 1978, construction of the West German-supplied reactors had begun in Brazil.\textsuperscript{118}

4. Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Pessimistic.

West Germany appears to have reevaluated the reactor transfer in light of the Carter administration’s early 1977 protest. Although Bonn reconsidered whether to transfer the reactors to Brazil, the West German government ultimately decided to proceed with the reactor deal. Accordingly, early 1977 is the period of decision. West Germany’s expectation of future trade with the U.S. during this period was pessimistic.

In early 1977, a significant global recession was affecting both the U.S. and West German economies. In a January 1977 meeting in Bonn, U.S. Vice President Richard Mondale strongly encouraged the West German government to follow the U.S.’s lead by increasing government spending in an effort to stimulate the global economy. However, West Germany’s economy was heavily dependent on exports, and officials in Bonn, supported by the West German central bank, believed that the U.S.’s prescribed policy would make West German exports uncompetitive on the world market. In short, West Germany believed that halting the reactor deal with Brazil, which was valued at $5 billion, would terminate a lucrative export at the same time that U.S.-led global stimulus efforts were making West German exports less competitive in the world economy. Thus, West Germany had a pessimistic expectation of trade with the U.S. during the period of decision.\textsuperscript{119}

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1. **Did the supplier consider transferring the reactor to a recipient country? Yes.**
   In June 1975, the U.S.S.R. and Libya signed an accord in which the U.S.S.R. agreed to provide Libya with a 2 Megawatt (MW) reactor.\(^{120}\)

2. **Did a third country object to this transfer? Yes.**
   At the time of the agreement, Egyptian President Anwar Sadat criticized the U.S.S.R.’s decision to provide Libya with sophisticated weaponry and a nuclear reactor.\(^{121}\)

3. **Did the transfer proceed despite the third country’s objection? Yes.**
   Libya’s Soviet-supplied reactor was operational by December 1978.\(^{122}\)

4. **Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Pessimistic.**
   The U.S.S.R.’s expectations of future trade with Egypt were deeply pessimistic from the point when the reactor deal was announced through the time when Libya’s Soviet-supplied reactor went online in December 1978. Shortly after Egypt protested the Soviet-Libyan deal, Soviet Premier Leonid Brezhnev canceled a planned trip Cairo that had been scheduled for late 1975. On March 15, 1976, Egypt terminated its Friendship Treaty with the USSR. Concurrently, in a move designed to express Soviet displeasure with Sadat’s government, Moscow delayed

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finalizing a trade pact with Egypt, though the pact was eventually signed in April 1976. Finally, on August 17, 1977, Egypt suspended its export commitments with the Soviet Union.\textsuperscript{123}

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1. Did the supplier consider transferring the reactor to a recipient country? Yes.

In September 1975, France agreed to transfer a nuclear reactor to Iraq.\textsuperscript{124}

2. Did a third country object to this transfer? Yes.

Starting in at least 1978 and continuing through 1980, U.S. officials objected to the proposed reactor transfer.\textsuperscript{125}

3. Did the transfer proceed despite the third country’s objection? Yes.

In September 1980, after completing construction of the reactor, France provided Iraq with 12 kilograms of 93% enriched reactor fuel to facilitate bringing the reactor online.\textsuperscript{126}

4. Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Pessimistic.

From the initiation of the reactor deal in September 1975 through the final supply of the highly enriched uranium for the reactor five years later, France maintained consistently pessimistic expectations of trade with the U.S. During this time, French officials feared that the U.S.’s protectionist policies were harming the French economy. In late 1976, for example, Andre Rossi, the French Foreign Trade Minister, formally complained to U.S. officials about U.S.

market barriers for French spirits. Rossi noted the, “discriminatory measure will further worsen
the French trade deficit with the U.S.” 127 Roughly a year later, the U.S. Treasury Department
initiated an investigation of French steel exports to determine whether antidumping tariffs should
be imposed against French steel firms. 128 The contentious U.S.-French trade relationship
continued in 1978, as well. For instance, in December 1978, French officials insisted that
European countries not complete a trade agreement with Washington unless the Carter
administration ended its threat to impose a $500 million penalty on European food exports to the
U.S. Likewise, in February 1980, French Premier Raymond Barre “warned President Carter’s
special international trade negotiator…against the dangers to world commercial relations that
might result from…U.S. protectionism…Mr. Barre especially emphasized what he called
protectionist tendencies in steel and aircraft production.” 129

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1. **Did the supplier consider transferring the reactor to a recipient country? Yes.**

Starting in 1979, West Germany considered exporting a nuclear power reactor to Argentina. 130

2. **Did a third country object to this transfer? Yes.**

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After Argentina contracted with Kraftwerk Union, a West Germany reactor firm, the U.S. objected to the proposed transfer.131

3. Did the transfer proceed despite the third country’s objection? Yes. Construction on the West German-supplied Argentina reactor was underway by at least August 6, 1981.132

4. Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Pessimistic.
West Germany appears to have considered the Carter administration’s objection to the proposed reactor export in the spring of 1980. At this time, West Germany had a pessimistic expectation of future trade with the U.S. because Bonn believed that President Carter’s failure to support the dollar was harming German exports. Moreover, during the spring of 1980—right as Bonn was considering Carter’s request to halt the reactor transfer to Argentina—the U.S. imposed import barriers on European steel, a move that many feared would set off a U.S-European trade war. As a quarter of West Germany’s gross national product was based on exports, West German businesses were deeply worried that rising protectionism triggered by the U.S. steel barriers would dramatically harm their businesses.133

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<td>Israel</td>
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<td>Optimistic</td>
<td>Halt</td>
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</table>

1. **Did the supplier consider transferring the reactor to a recipient country? Yes.**
   In August 1981, French President Francois Mitterrand assured Iraqi Vice Prime Minister Tarek Aziz that France was willing to rebuild Iraq’s Osirak reactor, which had been destroyed during a June 1981 Israeli bombing raid.\(^{134}\)

2. **Did a third country object to this transfer? Yes.**
   Israel objected to the proposed transfer.\(^{135}\)

3. **Did the transfer proceed despite the third country’s objection? No.**
   In March 1982, France decided not to rebuild Osirak.\(^{136}\) After France decided not to rebuild the reactor, French and Iraqi diplomats negotiated an agreement that required France to provide Baghdad with $22 million in restitution for the French work that was not completed on the reactor.\(^{137}\)

4. **Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Optimistic.**
   In March 1982, Mitterrand visited Israel for three days. At his final press conference before departing Israel, Mitterrand vowed not to supply Iraq with anything that would permit any risk of nuclear war. Privately, Mitterrand promised Israeli Prime Minister Menachem Begin that France would not supply Iraq with equipment that would allow Iraq to produce nuclear weapons. Of note, Mitterrand’s reversal on rebuilding Osirak coincided with much more optimistic French

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<td>U.S.</td>
<td>1982</td>
<td>Pessimistic</td>
<td>Halt</td>
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</table>

1. **Did the supplier consider transferring the reactor to a recipient country?** Yes.

   In May 1982, South Africa asked Framatome, France’s state-owned reactor corporation, to sell additional reactors to South Africa. (At this time, France was already in the process of exporting two reactors to South Africa.) In response to the South African request, France’s intergovernmental nuclear export council, the Counseil de Politique Nucleaire Exterieur, a French intergovernmental nuclear export council, reportedly put the proposed additional South African reactor export on the agenda for the Council’s October 1982 meeting.\footnote{Anonymous. “French Face Tough Decision if South Africa Opt for More Reactors.” Nucleonics Week 23:50 (December 16, 1982): 3.}

2. **Did a third country object to this transfer?** Yes.
There is no news report that explicitly indicates that a state objected to this proposed transfer. However, at the time of this proposed reactor export, the U.S. government was concerned that Pretoria could decide to use its nuclear program for military purposes. During this period, a controversial issue in the U.S.-French relationship was whether France would supply South Africa’s existing reactors with reactor fuel. Based on its proliferation concerns, the U.S. vigorously protested the proposed transfer of this nuclear fuel.

On December 2, 1982, Harry R. Marshall of the U.S. State Department testified before Congress on the proposed transfer of reactor fuel between France and South Africa. Marshall stated: “We told the South African officials that as a matter of policy, we were asking all supplier governments not to enter into new commitments for significant nuclear supply with any non-nuclear weapons state which engaged in unsafeguarded nuclear activities. We had such discussions with France and, as I have testified, France did not conclude any new commitment.”140 Although Marshall’s statement pertained specifically to the export of reactor fuel from France to South Africa for South Africa’s existing reactors, it is fair to assume from the statement that if the U.S. opposed France providing South Africa with reactor fuel to operate an existing reactor, that the U.S. also objected to France providing South Africa with an entirely new reactor.

3. Did the transfer proceed despite the third country’s objection? No.

Although the proposed transfer did not proceed, it is unclear exactly when France decided not to pursue this potential reactor export. As of 2009, South Africa had one operational reactor.141

4. Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Pessimistic.

Although it is unclear when France decided to not export an additional reactor to South Africa, in years 1982, 1983, and 1984, France had pessimistic expectations of future trade with the U.S. For example, on June 23, 1982, French Premier Pierre Mauroy criticized several U.S. trade policies including U.S. policies on European exports of steel to the U.S.; a U.S. decision to prohibit the use of U.S. technology by European firms constructing a Siberian pipeline, and a U.S. Senate bill that would expand the President’s powers to impose penalties on countries deemed by the U.S. to be engaging in unfair trade practices. A year later, in July 1983, France’s External Trade Minister publicly expressed “the concern and displeasure of the French government over the protectionist measures decided by the U.S. administration.” Likewise, in 1984, France’s Finance Minister decried the U.S. attempt to have France decrease its protectionist policies as “dangerous and unrealistic.”

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</table>

1. Did the supplier consider transferring the reactor to a recipient country? Yes.
Starting sometime in 1982, Framatome, France’s state-owned reactor company, considered exporting a reactor to Pakistan.  

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2. Did a third country object to this transfer? Yes.

The U.S. objected to the proposed transfer.\textsuperscript{145}

3. Did the transfer proceed despite the third country’s objection? No.

By November 1986, Pakistan had initiated work on an indigenous reactor design because its efforts to acquire a reactor from France had failed.\textsuperscript{146}

4. Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Pessimistic.

France appears to have considered transferring a reactor to Pakistan between 1982 and November 1986. During this period, France’s expectations of trade with the U.S. were decidedly pessimistic. For example, on June 23, 1982, French Premier Pierre Mauroy criticized several U.S. trade policies including U.S. policies on European exports of steel to the U.S.; a U.S. decision to prohibit the use of U.S. technology by European firms constructing a Siberian pipeline, and a U.S. Senate bill that would expand the President’s powers to impose penalties on countries deemed by the U.S. to be engaging in unfair trade practices.\textsuperscript{147} A year later, in July 1983, France’s External Trade Minister publicly expressed “the concern and displeasure of the French government over the protectionist measures decided by the U.S. administration.”

Similarly, in 1983, French President Francois Mitterrand publicly decried U.S. economic policies as the primary cause of international instability.\textsuperscript{148} Likewise, in 1984, France’s Finance Minister decried the U.S. attempt to have France reduce its market barriers as “dangerous and unrealistic”

and another French Minister described the Reagan administration’s trade proposals as “suicidal.”

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1. **Did the supplier consider transferring the reactor to a recipient country? Yes.**

In March 1982, French President Francois Mitterrand indicated to Israeli officials that he would favorably consider an Israeli request that France export a reactor to Israel.

2. **Did a third country object to this transfer? Yes.**

The U.S. objected to the proposed transfer.

3. **Did the transfer proceed despite the third country’s objection? No.**

Around June 1986, France decided to halt negotiations with Israel on the proposed reactor sale.

4. **Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Pessimistic.**

Between 1982 and 1986, France had pessimistic expectations of future trade with the U.S.

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For example, on June 23, 1982, French Premier Pierre Mauroy criticized several U.S. trade policies including U.S. policies on European exports of steel to the U.S.; a U.S. decision to prohibit the use of U.S. technology by European firms constructing a Siberian pipeline, and a U.S. Senate bill that would expand the President’s powers to impose penalties on countries deemed by the U.S. to be engaging in unfair trade practices. A year later, in July 1983, France’s External Trade Minister publicly expressed “the concern and displeasure of the French government over the protectionist measures decided by the U.S. administration.” Similarly, in 1983, French President Francois Mitterrand publicly decried U.S. economic policies as the primary cause of international instability. Likewise, in 1984, France’s Finance Minister decried the U.S.’s attempt to have France reduce its market barriers as “dangerous and unrealistic” and another French Minister described the Reagan administration’s trade proposals as “suicidal.”

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1. **Did the supplier consider transferring the reactor to a recipient country? Yes.**

In 1982, West Germany considered supplying a reactor to Pakistan.

2. **Did a third country object to this transfer? Yes.**

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The U.S. objected to the proposed transfer.\textsuperscript{157}

3. **Did the transfer proceed despite the third country’s objection? No.**
   By November 1986, Pakistan had initiated work on an indigenous reactor design as its efforts to acquire a reactor from Germany had failed.\textsuperscript{158}

4. **Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Pessimistic.**
   It appears that West Germany’s decision on whether to transfer the reactor to Pakistan took place sometime between 1984 and 1986.\textsuperscript{159} During this period, Bonn had pessimistic expectations of future trade with the U.S. During this timeframe, U.S. officials repeatedly threatened West Germany with economic penalties because Washington perceived that Bonn was unwilling to help reduce the U.S. trade deficit. The Reagan administration also limited West German steel exports to the U.S. In addition to these two issues, West German officials also complained about U.S. restrictions on high technology transfers.\textsuperscript{160}

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<td>1982</td>
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<td>U.S.</td>
<td>1986</td>
<td>Pessimistic</td>
<td>Halt</td>
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1. **Did the supplier consider transferring the reactor to a recipient country? Yes.**

Starting in early 1982, Iran requested that the West German reactor company, Kraftwerk Union (KWU,) resume construction on Iran’s nuclear reactor at Iran’s Bushehr facility (construction on

the reactor stopped after the 1979 Iranian revolution.) By 1984, KWU personnel had inspected
the Bushehr reactor and submitted a bid to finish construction of the plant.\textsuperscript{161}

2. Did a third country object to this transfer? Yes.

In reference to the proposed transfer, in 1984, a U.S. State Department spokesman said that the
U.S. was, “opposed to nuclear cooperation with Iran at this time...Previous actions of the
government of Iran do not provide us with great assurance that it will always abide by its
international commitments...we have asked other nuclear suppliers not to engage in nuclear
cooperation with Iran, especially while the Iran-Iraq war continues.”\textsuperscript{162}

3. Did the transfer proceed despite the third country’s objection? No.

In October 1986, West Germany announced that it would not permit KWU to export components
for the Bushehr reactor.\textsuperscript{163}

4. Did the supplier have an optimistic or pessimistic expectation of future trade with the
objector? Pessimistic.

Between 1984 and 1986, Bonn had pessimistic expectations of future trade with the U.S. During
this timeframe, U.S. officials repeatedly threatened West Germany with economic penalties
because Washington perceived that Bonn was unwilling to help reduce the U.S. trade deficit.
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\textsuperscript{161} Anonymous. “The Atomic Energy Organization of Iran has Told Kraftwerk Union.” Nucleonics Week 23:15

\textsuperscript{162} Knapik, Michael. “Jane’s Report on Iranian Nuclear Bomb is Termed ‘Balderdash,’” Nucleonics Week 25:18

\textsuperscript{163} MacLachlan, Ann. “Iran Seeking Way to Finish Bushehr Plant But Bonn Denies Export,” Nucleonics Week
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1. **Did the supplier consider transferring the reactor to a recipient country? Yes.**
In December 1983, the Soviet Union agreed to consider a Pakistani request for a nuclear power reactor.  

2. **Did a third country object to this transfer? Yes.**
The U.S.’s public position on Pakistan’s nuclear program at this time was to discourage nuclear suppliers from assisting Pakistan’s nuclear program as Pakistan did not have full-scope safeguards on all of its nuclear facilities.  

3. **Did the transfer proceed despite the third country’s objection? No.**
On November 18, 1984, Vitali Simirnov, the Soviet Ambassador to Pakistan, indicated that the U.S.S.R. would not construct a reactor for Pakistan.  

4. **Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Optimistic.**
Between 1983 and November 1984, the Soviet Union’s expectations of trade with the U.S. shifted dramatically from very pessimistic to optimistic. On November 7, 1984, the Reagan administration announced a new plan to dramatically expand trade with the Soviet Union (U.S.-

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Soviet trade decreased considerably after the U.S. imposed sanctions on the Soviet Union in 1979, and remained meager until the 1984 U.S. trade policy shift. Concurrently, the Reagan administration indicated that high-level trade talks between the U.S. and the Soviet Union would take place in January 1985 and that the two countries would attempt to normalize their trade in grain.\(^{168}\)

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1. **Did the supplier consider transferring the reactor to a recipient country? Yes.**

In May 1984, Belgium and Libya negotiated a nuclear cooperation agreement that envisioned Belgium constructing a nuclear reactor in Libya.\(^{169}\)

2. **Did a third country object to this transfer? Yes.**

The U.S. objected to the proposed transfer.\(^{170}\)

3. **Did the transfer proceed despite the third country’s objection? No.**

In January 1985, Belgian Prime Minister Wilfred Martens traveled to Washington to discuss the reactor transfer with President Reagan. U.S. officials persuaded Martens to terminate the transfer. Belgium announced that it was terminating the reactor export in February 1985.\(^{171}\)

4. **Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Pessimistic.**


Throughout 1984, U.S. economic relations with the European Common Market states—which included Belgium—were poor because the Reagan administration sought to limit European access to U.S. steel and agriculture markets.\(^{172}\) On December 13, 1984, U.S. Secretary of State George Shultz met with Belgian Prime Minister Martens. At the meeting, Shultz reiterated U.S. objections to Belgian high-technology trade with Libya and acknowledged Belgium’s desire to expand its foreign trade.\(^{173}\)

In January 1985, Martens traveled to Washington to discuss the reactor transfer with President Reagan. During the trip, Martens was persuaded to terminate the transfer.\(^{174}\) At a joint press conference at the conclusion of his meeting with President Reagan, Martens remarked, “in the economic field, the cohesion of the alliance would be strengthened by further eliminating protectionism in our trade relations and by perfecting the procedures of our common approach towards East-West trade.”\(^{175}\) It appears that Belgium had pessimistic expectations of future trade with the U.S. throughout its consideration of the proposed Libyan reactor transfer.

Of note, in late 1984, as Belgium considered whether to terminate the proposed reactor export to Libya, the Belgian government sought and received pledges from other nuclear supplier countries such as France that these nations would not construct a reactor in Libya if Belgium halted its proposed reactor transfer.\(^{176}\)


1. Did the supplier consider transferring the reactor to a recipient country? Yes.
In January 1986, North Korea and the U.S.S.R. negotiated an agreement in which the Soviet Union pledged to construct a nuclear reactor in North Korea.\(^\text{177}\)

2. Did a third country object to this transfer? Yes.
South Korea, which expressed “deep concern” about the U.S.S.R.-North Korea reactor deal, objected to the proposed transfer.\(^\text{178}\)

3. Did the transfer proceed despite the third country’s objection? No.
By October 1989, the Soviet Union had halted its negotiations with North Korea over the proposed reactor transfer, at least in part because Pyongyang delayed the implementation of an IAEA safeguards agreement.\(^\text{179}\)

4. Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Optimistic.
Although it is unclear when exactly the U.S.S.R. decided to halt its proposed reactor export to North Korea, this decision was likely made between 1988 and 1989 as in October 1989, the U.S.S.R. halted its negotiations with North Korea over the proposed reactor. During the 1988-1989 timeframe, the U.S.S.R.’s expectations of future trade with South Korea improved markedly. Prior to this period, South Korea and the Soviet Union had very limited trade contacts. However, starting in early 1988, both South Korea and the Soviet Union took steps to initiate a formal trading relationship. In 1988, the Soviet Union signaled that it wished to open a

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trade office in Seoul, and subsequently both countries sent emissaries to each other’s capitals to lay the groundwork for developing commercial ties.  

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<td>1986</td>
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<td>Iraq</td>
<td>Israel</td>
<td>1986-8/1987</td>
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1. Did the supplier consider transferring the reactor to a recipient country? Yes.

In 1986, France restarted negotiations with Iraq on rebuilding the Osirak reactor. (As described in Case 6, in 1982, France terminated a potential agreement with Iraq to rebuild the Osirak reactor, which was destroyed by a 1981 Israeli air strike.)

2. Did a third country object to this transfer? Yes.

There is not a specific news report that indicates that a country objected to the proposed French-Iraqi reactor deal. However, in early August 1987, French President Jacques Chirac telephoned Israel’s Ambassador to France, Ovadia Soffer, to deny that France had pledged to rebuild Osirak. As the news reporting supports the claim that France offered to rebuild Osirak and given Israel’s longstanding opposition to French nuclear cooperation with Iraq, it is fair to assume that Soffer objected to the proposed transfer in the August 1987 Chirac-Soffer telephone conversation.

3. Did the transfer proceed despite the third country’s objection? No.

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In August 1987, a French newspaper published a secret letter between French President Jacques Chirac and Iraqi President Saddam Hussein, which appeared to address the French-Iraqi reactor deal. After the publication of the letter, Chirac’s office and the French Foreign Ministry publicly rejected the notion that France would rebuild Iraq’s Osirak reactor.  

4. **Did the supplier have an optimistic or pessimistic expectation of future trade with the objector?** Optimistic.

France considered rebuilding Osirak during the 1986-1987 timeframe. During this period, French expectations of future trade with Israel became more optimistic. In December 1986, the Israeli Commerce and Industry Minister, Ariel Sharon, and the French Foreign Trade Minister, Michel Noir, agreed to increase French-Israeli trade.

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1. **Did the supplier consider transferring the reactor to a recipient country?** Yes. Around January 1987, Argentina considered an Iranian proposal to rebuild Iran’s only research reactor and to export a new research reactor to Tehran.

2. **Did a third country object to this transfer?** Yes. The U.S. objected to the proposed transfer. A U.S. government spokesman stated: “We do not favor cooperation between Argentina and Iran at this time.”

3. **Did the transfer proceed despite the third country’s objection?** No.

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In February 1992, Argentine President Carlos Menem issued an executive order restricting sensitive exports that effectively terminated the proposed transfer.\(^{187}\)

**4. Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Optimistic.**

During the period of decision from 1991 through early 1992, Argentina’s expectations of future trade with the U.S. became much more optimistic. In 1991, the U.S. reached agreements with Argentina to increase U.S. development aid for Argentina’s agricultural sector; to create a free trade agreement between the U.S., Argentina, Paraguay, Uruguay, and Brazil; and to increase U.S. export subsidies for Argentine commerce. In November 1991, Argentina’s President Carlos Menem conducted bilateral meetings with U.S. President George H.W. Bush in Washington and agreed on an arrangement to increase financing for U.S. businesses that intended to invest in Argentina. Finally, following a February 1992 Argentine decision to restrict its nuclear exports—including terminating the proposed reactor export—the U.S. and Argentina signed a historic civilian nuclear agreement in September 1992.\(^{188}\)

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1. **Did the supplier consider transferring the reactor to a recipient country? Yes.**
Starting in 1986, France and Pakistan initiated negotiations on the provision of a French 900-MW nuclear reactor to Pakistan.\(^{189}\)

2. **Did a third country object to this transfer? Yes.**
In early 1990, both U.S. President George H.W. Bush and Ronald Lehman, director of the U.S. Arms Control and Disarmament Agency, publicly objected to the proposed transfer.\(^{190}\)

3. **Did the transfer proceed despite the third country’s objection? No.**
In August 1990, negotiations between France and Pakistan over the proposed reactor transfer were suspended.\(^{191}\) Sometime after June 1991, Pakistani diplomats re-engaged their French counterparts about the reactor export. However, in January 1992 any hope for a deal vanished when Pakistan made a final determination that it could not accept new, more stringent safeguards requirements that France demanded for the potential reactor transfer.\(^{192}\)

4. **Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Pessimistic.**
France appears to have made a tentative decision to terminate the reactor transfer to Pakistan in 1990, although negotiations on the reactor transfer continued through early 1992. During this period, France had a pessimistic expectation of future trade with the U.S. At this time, the U.S.

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and the European Economic Community were negotiating reforms to the General Agreement on Tariffs and Trade (GATT.) In March 1990, European officials met in Brussels to discuss the proposed GATT reforms. The European officials were very concerned about the U.S. GATT proposal on reducing agricultural subsidies as well as signs that suggested the U.S. was adopting more protectionist policies. Consistent with these broader European concerns, Edith Cresson, France’s Minister for European Affairs, publicly described the U.S.’s stance as “blackmail.”

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1. **Did the supplier consider transferring the reactor to a recipient country? Yes.**

As Case 11 describes, in early 1982, Kraftwerk Union (KWU), a West German reactor company, considered an Iranian offer to have KWU complete construction of Iran’s Bushehr reactor. In October 1986, Bonn refused to grant an export license to permit KWU to complete the reactor transfer. The West German export license decision notwithstanding, KWU remained interested in completing the Bushehr reactor.

After Bonn’s export license decision, KWU initiated discussions with four Argentine firms—Enace, Argatom, Nuclar, and Technit—and a Spanish firm—Argupados—to create a consortium to complete the Bushehr reactor. This consortium, which appears to have been led by Enace (in which KWU held a 25% ownership stake) and advised by KWU, was designed, at least in part, to circumvent Bonn’s refusal to grant KWU an export license to complete Bushehr. Importantly, since it appears that the Argentine firms would have supplied the reactor components to Iran and

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KWU would have acted only in an advisory capacity, Argentina is considered the “supplier” for this case.\textsuperscript{194}

2. \textbf{Did a third country object to this transfer? Yes.}

The U.S. objected to the proposed nuclear deal between the Argentine-German consortium and Iran. A U.S. official stated that, “the U.S. government has expressed to Argentina its opposition to the cooperation [with Iran] in no uncertain terms.”\textsuperscript{195}

3. \textbf{Did the transfer proceed despite the third country’s objection? No.}

In February 1992, Argentine President Carlos Menem issued an executive order limiting “sensitive” exports that effectively terminated the reactor transfer.\textsuperscript{196}

4. \textbf{Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Optimistic.}

Argentina decided to end its nuclear cooperation with Iran in the 1991-1992 timeframe. In the 1991 – early 1992 period, Argentina’s expectations of future trade with the U.S. became much more optimistic. In 1991, the U.S. reached agreements with Argentina to increase U.S. development aid for Argentina’s agricultural sector; to create a free trade agreement between the U.S., Argentina, Paraguay, Uruguay, and Brazil; and to increase U.S. export subsidies for Argentine commerce. In November 1991, Argentina’s President Carlos Menem conducted bilateral meetings with U.S. President George H.W. Bush in Washington and agreed on an


arrangement to increase financing for U.S. businesses that intended to invest in Argentina.

Finally, following a February 1992 Argentine decision to restrict its nuclear exports—including terminating the proposed nuclear transfers—the U.S. and Argentina signed a historic civilian nuclear agreement in September 1992.\textsuperscript{197}

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1. **Did the supplier consider transferring the reactor to a recipient country?** Yes.

Starting in early 1987, West Germany considered an Israeli request for West Germany to construct a High Temperature Gas-Cooled Reactor (HTGR) in Israel.\textsuperscript{198} Subsequently, Bonn funded a feasibility study for the potential reactor sale.\textsuperscript{199}

2. **Did a third country object to this transfer?** Yes.

While Bonn was considering the potential reactor transfer to Israel, the U.S. was urging West Germany to stop transferring nuclear equipment to states that did not accede to application of full-scope IAEA safeguards. At the time, Israel did not permit application of full-scope safeguards.\textsuperscript{200}

3. **Did the transfer proceed despite the third country’s objection?** No.


In August 1990, West Germany declared that it would begin to require full-scope safeguards for all nuclear exports. However, Israel did not want the proposed reactor to be subject to safeguards. Although Israel proposed building the HTGR in an “extraterritorial enclave” to circumvent any nonproliferation requirements associated with the sale, negotiations on the reactor appear to have petered out after Bonn’s 1990 declaration that it would begin to require safeguards on all nuclear exports. In July 1991, Israel’s Energy Minister, Yuval Ne’eman, stated that Israel was exploring new options for purchasing a reactor while concurrently indicating that Tel Aviv was not going to import a reactor from Germany.  

4. Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Pessimistic.

Negotiations between Germany and Israel over the proposed HTGR transfer appear to have ended sometime between late 1990 and mid-1991. During this period, Bonn’s expectations of future trade with the U.S. went from optimistic to pessimistic. For instance, on May 6, 1990, West Germany’s Finance Minister Theo Waigel optimistically touted the economic benefits of German reunification: “Germany’s wide open borders offer foreign sellers additional possibilities in a new joint economic and currency area.” Bonn believed that increased U.S. imports would lead to more stable exchange rates and more investment in the former East Germany. However, by March 1991, Germany’s expectation of future trade with the U.S. had grown much more pessimistic. The cost of integrating the economies of East and West Germany was much greater than Bonn had anticipated and German Economics Minister Juergen

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Moellemann noted, “We overestimated the willingness of investors in Germany and Europe, perhaps also in the United States and Japan, to invest in eastern Germany.”

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1. Did the supplier consider transferring the reactor to a recipient country? Yes.

Around mid-1988, the Soviet Union began to consider a Pakistani request for the U.S.S.R. to build a nuclear reactor in Pakistan.

2. Did a third country object to this transfer? Yes.

The U.S. government objected to the proposed transfer.

3. Did the transfer proceed despite the third country’s objection? No.

In April 1993, after the fall of the Soviet Union, Russia and Pakistan issued an announcement that indicated the two countries would cooperate in the space and nuclear fields. Subsequent press reports from 1993 and 1995 indicate that Russia continued to consider the Pakistani reactor request through at least 1995. However, after 1995, there is no evidence to suggest that Russia continued to consider the Pakistani reactor transfer request.

4. Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Optimistic.

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Since the last news report indicating that Russia was considering the Pakistani reactor request is from late 1995, Russia presumably continued to consider the Pakistani reactor transfer request through at least mid-1996. Given the uncertainty about Russian decision-making on this issue, determining Russia’s expectation of future trade is difficult. However, working from the assumption that Russia continued to consider the Pakistani reactor transfer request through at least 1996, news reports indicate that Russia’s expectations of future trade with the U.S. were consistently optimistic for years 1996, 1997, and 1998. In 1996, for instance, Russian Prime Minister Viktor Chernomyrdin indicated that Russia believed the trade balance between Washington and Moscow was improving. In 1997, Russian President Boris Yeltsin hailed improved U.S.-Russian cooperation, and praised the fact that bilateral trade doubled between the U.S. and Russia between 1993 and 1997. Likewise, in 1998, U.S. President Bill Clinton and Yeltsin released a joint statement praising economic cooperation between the two nations and promising additional joint projects, cooperative efforts to eliminate market barriers, and technical exchanges to further trade relations between Moscow and Washington.208

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1. Did the supplier consider transferring the reactor to a recipient country? Yes.

In 1988, the U.S. received intelligence information suggesting that China had agreed to help Algeria construct a nuclear reactor. Construction proceeded clandestinely until news reports of the reactor’s ongoing construction were published in mid-1991.\(^{209}\)

2. Did a third country object to this transfer? Yes.

In late 1990, U.S. diplomats objected to the reactor transfer to their Chinese counterparts.\(^{210}\)

3. Did the transfer proceed despite the third country’s objection? Yes.

In February 1992, Algeria and the IAEA signed a safeguards agreement for the Chinese-supplied reactor in anticipation of bringing the new reactor online in 1992.

4. Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Pessimistic.

During the period of decision between late 1990 through early 1992, China maintained pessimistic expectations of future trade with the U.S. During this period, U.S. officials debated whether to renew China’s Most Favored Nation (MFN) trade status, and Chinese officials repeatedly warned Washington that failing to renew Beijing’s MFN status would have deleterious consequences for the U.S.-China economic relationship. Chinese officials also protested a U.S. decision to reduce China’s textile exports to the U.S. and Washington threatened


to impose trade penalties on China for Chinese shortcomings in protecting intellectual property.\textsuperscript{211}

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1. Did the supplier consider transferring the reactor to a recipient country? Yes.

In November 1989, China agreed to provide Pakistan with a 300-MW nuclear reactor.\textsuperscript{212}

2. Did a third country object to this transfer? Yes.

The U.S. objected to the proposed reactor transfer.\textsuperscript{213}

3. Did the transfer proceed despite the third country’s objection? Yes.

On August 1, 1993, the first concrete for the Chinese-supplied reactor was poured at Pakistan’s Chashma nuclear power facility.\textsuperscript{214}

4. Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Pessimistic.


Between 1990 and 1993, China maintained consistently pessimistic expectations of future trade with the U.S. During this period, U.S. officials debated whether to renew China’s Most Favored Nation (MFN) trade status, and Chinese officials repeatedly warned that failing to renew Beijing’s MFN status would have deleterious consequences for the U.S.-China economic relationship. Chinese officials also protested a U.S. decision to reduce China’s textile imports to the U.S. and Washington threatened to impose trade penalties on China for Chinese shortcomings in protecting intellectual property. Additionally, in 1993, China indicated that a U.S. decision to link trade ties to improvements in China’s human rights record would “seriously impair” Sino-U.S. ties.215

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1. **Did the supplier consider transferring the reactor to a recipient country? Yes.**

In 1990, the German reactor company KWU considered transferring a reactor to Pakistan. KWU initiated consideration of the reactor transfer after Framatome, a French reactor company, was given permission by French President Francois Mitterrand to consider exporting a reactor to Pakistan (this case is described in Case 17.) At the time, KWU and Framatome were separate...
companies but were jointly represented by a marketing venture called Nuclear Power International.

This case is listed separately from Case 17 for two reasons. First, German consideration of the reactor transfer began four years after French consideration of the potential Pakistani reactor deal (Framatome initiated negotiations on a potential reactor export to Pakistan in 1986, while KWU began to consider a potential reactor export to Pakistan in 1990.) Second, and more important, if the reactor export was to move forward, KWU—indepedent of Framatome—may have provided some, and perhaps most, of the reactor’s critical components.216

2. Did a third country object to this transfer? Yes.

The U.S. demarched Bonn regarding its potential export of a reactor to Pakistan.217

3. Did the transfer proceed despite the third country’s objection? No.
As described in Case 17, the negotiations on the proposed reactor transfer were suspended in August 1990.218 Subsequently, sometime after June 1991, Pakistani diplomats sought to revive the reactor deal, but by January 1992, Islamabad concluded that it was not willing to accept full-scope safeguards on the reactor, which was a condition of the reactor’s supply.219

4. Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Pessimistic.
Between 1990 and early 1992, Bonn’s expectations of future trade with the U.S. went from optimistic to pessimistic. For instance, on May 6, 1990, West Germany’s Finance Minister Theo Waigel optimistically touted the economic benefits of German reunification: “Germany’s wide open borders offer foreign sellers additional possibilities in a new joint economic and currency

area.” Bonn believed that increased U.S. imports would lead to more stable exchange rates and more investment in the former East Germany. However, by March 1991, Germany’s expectation of future trade with the U.S. had grown much more pessimistic. The cost of integrating the economies of East and West Germany was much greater than Bonn had anticipated and German Economics Minister Juergen Moellemann noted, “We overestimated the willingness of investors in Germany and Europe, perhaps also in the United States and Japan, to invest in eastern Germany.”

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1. **Did the supplier consider transferring the reactor to a recipient country? Yes.**

In 1990, Argentina and Syria entered into negotiations on an agreement that envisioned Argentina constructing a 10-MW research reactor in Syria.

2. **Did a third country object to this transfer? Yes.**

The U.S. sought to block the proposed transfer as a part of a broader effort to prevent Syria from acquiring nuclear equipment.

3. **Did the transfer proceed despite the third country’s objection? No.**

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It is unclear when Argentina decided to halt the proposed reactor transfer to Syria. In February 1992, Argentina’s President Carlos Menem issued an order to restrict sensitive Argentine nuclear exports, which presumably terminated the proposed reactor export to Syria. By October 1994, Syrian officials were considering bringing Argentina before the International Commerce Commission to seek damages for Argentina’s refusal to permit the reactor transfer to proceed.  

4. **Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Optimistic.**

Between 1990 and 1994, Argentina’s expectations of future trade with the U.S. became much more optimistic. In 1991, the U.S. reached agreements with Argentina to increase U.S. development aid for Argentina’s agricultural sector; to create a free trade agreement between the U.S., Argentina, Paraguay, Uruguay, and Brazil; and to increase U.S. export subsidies for Argentine commerce. In November 1991, Argentina’s President Carlos Menem conducted bilateral meetings with U.S. President George H.W. Bush in Washington and agreed on an arrangement to increase financing for U.S. businesses that intended to invest in Argentina. Additionally, following a February 1992 Argentine decision to restrict its nuclear exports, the U.S. and Argentina signed a historic civilian nuclear agreement in September 1992. In 1993 and 1994, the U.S. decided not to impose penalties on Argentina for inadequate patent protection and offered to negotiate a free trade accord between the U.S., Argentina, and Chile.

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<th>Supplier Trade Expectation During Period of Decision</th>
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</table>

1. **Did the supplier consider transferring the reactor to a recipient country? Yes.**
   In 1986, France signed an agreement with China to provide components as well as architectural and engineering support for the construction of two reactors at China’s Daya Bay facility. In 1991, after press reports revealed that China was clandestinely constructing a nuclear reactor in Algeria (Case 21,) the U.S. tried to curb international nuclear cooperation with China.\(^{228}\)

2. **Did a third country object to this transfer? Yes.**
   After the revelation of China’s transfer of a nuclear reactor to Algeria, the U.S. objected to ongoing French efforts to transfer two reactors to China as a part of the Daya Bay project.\(^{229}\)

3. **Did the transfer proceed despite the third country’s objection? Yes.**
   Despite the U.S. protest, a French official publicly stated that Paris, “sees China as a long-term partner” and that France would “reassure China that it will continue to have access” to nuclear equipment.\(^{230}\) By 1999, both French-supplied reactors were completed.\(^{231}\)

4. **Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Pessimistic.**
   France decided to continue to supply the Daya Bay reactors in 1991. In 1991, France had pessimistic expectations of future trade with the U.S. During this period, French officials protested perceived U.S. protectionism in the telecommunications market, decried “American


intransigence” in trade talks, and pronounced that a U.S. proposal on reforming GATT would be “disastrous” for France’s economy.232

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<td>26</td>
<td>1991</td>
<td>Britain</td>
<td>China</td>
<td>U.S.</td>
<td>1991</td>
<td>Optimistic</td>
<td>Proceed</td>
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</table>

1. **Did the supplier consider transferring the reactor to a recipient country?** Yes.

As a part of the Daya Bay reactor transfer described in Case 25, Britain agreed to supply critical turbine-generator equipment for two French-supplied reactors.233

2. **Did a third country object to this transfer?** Yes.

After the revelation of China’s transfer of a nuclear reactor to Algeria (Case 21,) the U.S. objected to ongoing international nuclear cooperation with China, including the Daya Bay projects.234

3. **Did the transfer proceed despite the third country’s objection?**

Despite the U.S. protest, by 1999, both French-supplied reactors were completed. British assistance to the Daya Bay projects did not stop.235

4. **Did the supplier have an optimistic or pessimistic expectation of future trade with the objector?** Optimistic.

In 1991, the U.S. objection notwithstanding, Britain decided to continue to participate in the Daya Bay projects. During this period, Britain had optimistic expectations of future trade with the U.S. In particular, Britain was pleasantly surprised by a U.S. decision to cut interest rates,

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which Britain’s Chancellor of Exchequer, Norman Lamont, indicated would help bolster the U.K.’s exports.\textsuperscript{236}

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</table>

1. **Did the supplier consider transferring the reactor to a recipient country? Yes.**

In 1991, India offered to sell a 5-MW reactor to Syria.\textsuperscript{237}

2. **Did a third country object to this transfer? Yes.**

The U.S. objected to the proposed reactor deal between India and Syria.\textsuperscript{238}

3. **Did the transfer proceed despite the third country’s objection? No.**

News reports do not indicate precisely when India decided not to transfer a reactor to Syria.

However, a 1994 article notes that the India-Syria deal was cancelled prior October 1994.

Moreover, as India canceled a similar deal with Iran in the late 1991 – early 1992 time frame, it is likely that India also terminated its planned export of a reactor to Syria at the same time.\textsuperscript{239}

4. **Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Optimistic.**

Although U.S.-Indian trade relations between 1991 and 1994 were marked by some disagreements, on the whole India’s expectations of future trade with the U.S. were optimistic during this period. From 1991 through 1994, Indian officials praised the U.S. for granting Indian


service firms increased access to U.S. markets and larger quotas for Indian exports of textiles to the U.S. Likewise, in these years, India approved new joint ventures between American and Indian corporations. Although U.S. officials raised India’s ire during this period by decrying India’s weak intellectual property laws, the U.S. declined to penalize New Delhi for its poor patent protections.240

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</table>

1. Did the supplier consider transferring the reactor to a recipient country? Yes.

In 1991, India offered to sell a research reactor to Iran.241

2. Did a third country object to this transfer? Yes.

On November 22, 1991, U.S. Under Secretary of State for International Security Affairs Reginald Bartholomew traveled to New Delhi to object to the proposed Indian-Iranian research reactor deal.242

3. Did the transfer proceed despite the third country’s objection? No.

After Under Secretary Bartholomew’s November 1991 visit to New Delhi, India decided to halt its export of a reactor to Iran.243

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4. Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Optimistic.
Although U.S.-Indian trade relations between 1991 and 1992 were marked by some disagreements, on the whole India’s expectations of future trade with the U.S. were optimistic during this period. From 1991 through 1992, Indian officials praised the U.S. for granting Indian service firms increased access to U.S. markets and larger quotas for Indian exports of textiles to the U.S. Likewise, in these years, India approved new joint ventures between American and Indian corporations. Although U.S. officials raised India’s ire during this period by decrying India’s weak intellectual property laws, the U.S. declined to penalize New Delhi for its poor patent protections.244

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<tr>
<td>29</td>
<td>1991</td>
<td>China</td>
<td>Iran</td>
<td>U.S.</td>
<td>1997</td>
<td>Optimistic</td>
<td>Halt</td>
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</table>

1. Did the supplier consider transferring the reactor to a recipient country? Yes.
Starting around September 1991, China began to consider an Iranian request that China construct a 27-MW research reactor in Iran.245

2. Did a third country object to this transfer? Yes.
U.S. officials objected to the proposed transfer and asked China not to sell the reactor to Iran.246


3. Did the transfer proceed despite the third country’s objection? No.
In late 1992, China decided to suspend, but not terminate, the proposed research reactor deal with Iran in an effort to encourage the U.S. to grant China favorable trade conditions.\(^{247}\) More significantly, on October 29, 1997, China provided U.S. officials with a written pledge that China would not engage in new nuclear cooperation with Iran.\(^{248}\) The October 1997 agreement ended the proposed Chinese-Iranian research reactor deal.

4. Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Optimistic.
On October 29, 1997, Chinese President Jiang Zemin and U.S. President Bill Clinton met to discuss a range of issues including U.S.-Chinese trade ties and Chinese nuclear cooperation with Iran. In exchange for China agreeing not to engage in new nuclear cooperation with Iran, the U.S. pledged to aid China’s effort to join the World Trade Organization and the two countries also agreed on a number of other measures designed to improve U.S.-Chinese trade. Accordingly, China’s expectation of future trade with the U.S. during this period was optimistic.\(^{249}\)

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1. Did the supplier consider transferring the reactor to a recipient country? Yes.
In 1991, China considered a Syrian request to purchase a Chinese research reactor.\(^{250}\)

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2. **Did a third country object to this transfer? Yes.**
In December 1991, Syria asked the IAEA Board of Governors to approve the transfer of a research reactor from China, which would be placed under INFCIRC-66 safeguards. Significantly, INFCIRC-66 safeguards are ordinarily applied for facilities in countries that are not NPT signatories. However, at the time of the proposed transfer, Syria was a NPT member-state. As such, it was expected that the more restrictive INFCIRC-153 safeguards would have applied to the proposed Chinese-Syrian deal. The U.S. objected to the proposed transfer because Syria requested that the less restrictive INFCIRC-66 safeguards be applied to the proposed reactor.²⁵¹

3. **Did the transfer proceed despite the third country’s objection? No.**
After the U.S. objected to the potential transfer, the IAEA Board of Governors deferred action on the proposed sale. Subsequently, Syria agreed to conclude a comprehensive safeguards agreement with the IAEA. As the U.S.’s objection had been addressed, the IAEA Board of Governors approved the transfer in April 1992. Since the transfer proceeded only after the reason for the U.S.’s objection had been fully addressed, this case is coded as one in which the transfer did not proceed.²⁵²

4. **Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Pessimistic.**
Between November 1991 and March 1992, China had uncertain and pessimistic expectations of future trade with the U.S. This was a turbulent period in U.S.-Chinese economic relations. During this time frame, Beijing received mixed signals about U.S. trade intentions. One the one hand, U.S. President George H.W. Bush favored more open trade with China. On the other, the U.S. Congress favored more protectionist policies that would restrict trade with China. For

example, in November 1991, the U.S. threatened to impose retaliatory tariffs on products from China to punish Beijing for its lax enforcement of intellectual property protections.

Subsequently, in January 1992, China and the U.S. reached an agreement on intellectual property protections. Similarly, in March 1992, the U.S. Congress passed a bill that linked Sino-U.S. trade to a number of conditions. The bill was then vetoed by President Bush. Likewise, during these months, the U.S. had a contentious debate on whether to grant China Most Favored Nation trading status. In February 1992, China’s Minister of Economic Relations and Trade acknowledged that trade between the U.S. and China had grown substantially but noted, “The current practice of the USA in examining and approving China’s MFN status every year has caused enterprise circles in the two countries to have a sense of psychological instability and insecurity.”

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</table>

1. **Did the supplier consider transferring the reactor to a recipient country? Yes.**

In September 1992, Russia and Iran entered into negotiations to have Russia complete two power reactors at Iran’s Bushehr facility. (West Germany’s KWU started construction on the two reactors in the 1970s, but halted work on the projects after the 1979 Iranian revolution.\(^{254}\))

2. **Did a third country object to this transfer? Yes.**

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The U.S. strenuously objected to the proposed reactor transfer.\textsuperscript{255}

3. Did the transfer proceed despite the third country’s objection? Yes.
By October 1995, Russia’s Atomic Ministry (MINATOM) had 200 personnel working at the Bushehr site, and by 1998, 1,100 MINATOM technicians were working on the Bushehr project.\textsuperscript{256}

4. Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Optimistic.
Russia’s expectations of future trade with the U.S. between 1992 and 1995 were very optimistic. During this period, the U.S. permitted Russia to engage in commerce with the U.S. space and nuclear industries; created a framework to encourage U.S. investment in Russia’s energy sector; granted Russia Most Favored Nation (MFN) trade status; supported Russia’s entry into GATT; and waived a Cold War-era law conditioning trade with Russia on its emigration policies.\textsuperscript{257}


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<tr>
<td>32</td>
<td>1992</td>
<td>China</td>
<td>Iran</td>
<td>U.S.</td>
<td>1997</td>
<td>Optimistic</td>
<td>Halt</td>
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</table>

1. Did the supplier consider transferring the reactor to a recipient country? Yes.

   In September 1992, China agreed to supply a 300-MW power reactor to Iran.\(^{258}\)

2. Did a third country object to this transfer? Yes.

   The U.S. objected to the proposed Chinese-Iranian power reactor deal.\(^{259}\)

3. Did the transfer proceed despite the third country’s objection? No.

   On October 29, 1997, China provided U.S officials with a written pledge that China would not engage in new nuclear cooperation with Iran.\(^{260}\) The October 1997 agreement ended the proposed Chinese-Iranian power reactor deal.

4. Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Optimistic.

   During the period of decision China had optimistic expectations of future trade with the U.S. On October 29, 1997, Chinese President Jiang Zemin and U.S. President Bill Clinton met to discuss a range of issues including U.S.-Chinese trade ties and Chinese nuclear cooperation with Iran. In exchange for China agreeing not to engage in new nuclear cooperation with Iran, the U.S. pledged to aid China’s effort to join the World Trade Organization and the two countries also agreed on a number of other measures designed to improve U.S.-Chinese trade.\(^{261}\)

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<tr>
<td>33</td>
<td>1993</td>
<td>Czech Republic</td>
<td>Iran</td>
<td>U.S.</td>
<td>1993</td>
<td>Pessimistic</td>
<td>Halt</td>
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</table>

1. **Did the supplier consider transferring the reactor to a recipient country? Yes.**
Sometime in 1993, the Czech company Skoda Plzen agreed to provide pressure vessels for power reactors that Russia and China were planning on supplying to Iran.\[262\]

2. **Did a third country object to this transfer? Yes.**
The U.S. objected to the proposed transfer.\[263\]

3. **Did the transfer proceed despite the third country’s objection? No.**
In response to pressure from U.S. diplomats as well as from Israeli officials, in December 1993, Josef Zieleniec, the Czech Republic’s Foreign Minister, promised that the Czech Republic would not export nuclear equipment to Iran.\[264\]

4. **Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Pessimistic.**
During the period in which the Czech Republic considered the reactor transfer, Prague had pessimistic expectations of future trade with the U.S. In October 1993, for instance, Czech Prime Minister Vaclav Klaus visited Washington. During his visit, Klaus encouraged the U.S. to reduce restrictions on goods entering the U.S. from Eastern Europe. Klaus explained, “We feel that we have troubles [SIC] to penetrate the markets in Western Europe and the United States. We really need this after the total loss of our markets in the east.”\[265\]

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1. **Did the supplier consider transferring the reactor to a recipient country? Yes.**
Prior to the fall of the Soviet Union, India and the U.S.S.R. had discussed a possible project in which India would purchase Soviet reactors. With the demise of the U.S.S.R., the discussions on this project ended. Starting in January 1995, Russia began to consider a new Indian request for Russia to construct two power reactors in the Indian state of Tamil Nadu. In June 1998, India and Russia signed the final agreement for the purchase of the two reactors.

2. **Did a third country object to this transfer? Yes.**
The U.S. protested the proposed Russia-India reactor deal.

3. **Did the transfer proceed despite the third country’s objection? Yes.**
By 2000, probably because U.S. officials realized that they were unlikely to convince Russia to halt the transfer, the U.S. lifted its objection to the Russia-India reactor deal. By 2002, construction on the first Russian-supplied reactor was underway in India.

4. **Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Optimistic.**
Between 1996 and 1998, when Russia considered and then finalized terms for the reactor transfer to India, Russia’s expectations of future trade with the U.S. were consistently optimistic. In 1996, for instance, Russian Prime Minister Viktor Chernomyrdin indicated that Russia believed the trade balance between Washington and Moscow was improving. In 1997, Russian President

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Boris Yeltsin hailed improved U.S.-Russian cooperation, and praised the fact that U.S.-Russian trade doubled between 1993 and 1997. Likewise, in 1998, U.S. President Bill Clinton and Yeltsin released a joint statement praising economic cooperation between the two nations and promising additional joint projects, cooperative efforts to eliminate market barriers, and technical exchanges to further trade relations between Moscow and Washington.271

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<tr>
<td>35</td>
<td>1995</td>
<td>South Korea</td>
<td>Pakistan</td>
<td>U.S.</td>
<td>1995</td>
<td>Optimistic</td>
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1. **Did the supplier consider transferring the reactor to a recipient country?** Yes. In September 1995, South Korea considered providing a pressure vessel for a Chinese-supplied 300-MW power reactor that was being constructed in Pakistan.272

2. **Did a third country object to this transfer?** Yes. The U.S. objected to the transfer and demarched South Korea not to export the pressure vessel to Pakistan.273

3. **Did the transfer proceed despite the third country’s objection?** No. On September 22, 1995, in response to U.S. pressure urging South Korea not to export the pressure vessel to Pakistan, Jong-Moo Choi, Deputy Director General of South Korea’s Ministry of Foreign Affairs, publicly stated that South Korea would formally seek membership in the Nuclear Suppliers Group and not transfer the pressure vessel to Pakistan.274

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4. **Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Optimistic.**

As the period in which South Korea considered whether to transfer the pressure vessel to Pakistan is very short (roughly September 1995), it was not possible to find articles that specifically addressed South Korea’s expectation of future trade with the U.S. during this period. However, on July 27, 1995, at a joint press conference with U.S. President Bill Clinton, South Korean President Kim Young Sam stated: “President Clinton and I expressed satisfaction over the fact that economic and trade relations between our two countries have entered a mature phase, in terms of the size of our bilateral trade, the trade balance, and bilateral investments, and should continue to develop further on a well-balanced basis.” Accordingly, it is fair to assume that South Korea’s expectations of future trade with the U.S. in September 1995 were optimistic.

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1. **Did the supplier consider transferring the reactor to a recipient country? Yes.**

In 1976 and 1987, Cuba purchased two power reactors from the Soviet Union. Construction on the two plants at Cuba’s Juragua facility began in the mid-1980s, and work on both facilities stopped when the Soviet Union collapsed. In late 1995, Cuba and Russia initiated negotiations to complete one of the two reactors.

2. **Did a third country object to this transfer? Yes.**

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The U.S. had significant concerns about the safety of the Juragua reactor. As such, President Bill Clinton objected to the proposed reactor transfer, and asked Russian leaders to halt the project.\(^{277}\)

3. **Did the transfer proceed despite the third country’s objection? No.**

In December 2000, Russia and Cuba agreed to terminate the Juragua reactor transfer.\(^{278}\)

4. **Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Optimistic.**

Between 1996 and 2000, when Russia considered the reactor transfer to Cuba, Russia’s expectations of future trade with the U.S. were consistently optimistic. In 1996, for instance, Russian Prime Minister Viktor Chernomyrdin indicated that Russia believed the trade balance between Washington and Moscow was improving. In 1997, Russian President Boris Yeltsin hailed improved U.S.-Russian cooperation, and praised the fact that U.S.-Russian trade doubled between 1993 and 1997. Likewise, in 1998, U.S. President Bill Clinton and Yeltsin released a joint statement praising economic cooperation between the two nations and promising additional joint projects, cooperative efforts to eliminate market barriers, and technical exchanges to further trade relations between Moscow and Washington.\(^{279}\) In 1999, Russia’s Trade Minister Mikhail Fradkov told the American Chamber of Commerce in Russia that bilateral U.S.-Russian trade ties were trending upward.\(^{280}\) Finally, in 2000, U.S. President Bill Clinton announced in a speech to the Russian Duma that the U.S. would support a Russian bid to join the World Trade Organization (WTO,) if the Russian Federation chose to apply for membership in the WTO.\(^{281}\)

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\(^{281}\) Anonymous. “Clinton touches on Russia’s accession to WTO in Duma speech.” TASS, June 5, 2000.
1. **Did the supplier consider transferring the reactor to a recipient country? Yes.**

Around December 1996, China decided to export a highly enriched uranium-fueled Miniature Neutron Source Reactor (MNSR) to Nigeria.\(^{282}\)

2. **Did a third country object to this transfer? Yes.**

The U.S. objected to China’s decision to export the MNSR to Nigeria.\(^{283}\)

3. **Did the transfer proceed despite the third country’s objection? Yes.**

China completed construction of the MNSR in March 1999; however, for reasons that are not entirely clear, the reactor was not brought online until five years later, in September 2004.\(^{284}\)

4. **Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Optimistic.**

It is unclear when China decided to proceed with the transfer of the MNSR to Nigeria despite the U.S.’s objection. For the period between December 1996 and March 1999, China had generally optimistic expectations of future trade with the U.S., although there was a consistent tension between Washington and Beijing during this time over how quickly China could join the WTO.\(^{285}\) Despite this disagreement, in February 1997, the U.S. and China finalized a trade

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accord on textiles that a Chinese diplomat said would contribute to “the long-term development of bilateral economic and trade ties.” In March 1997, Xinhua, China’s state news agency, published a report that described a Chinese government white paper on the Sino-U.S. trade relationship that discussed “soaring trade between China and the United States” as well as “Sino-US economic and trade co-operation’s vast vistas.” In November 1997, following a meeting between U.S. President Bill Clinton and Chinese President Jiang Zemin, Zemin and Clinton released a statement on expanding Chinese-US trade ties. Finally, in December 1998, Xinhua released a statement on efforts between China and the U.S. to strengthen trade ties.

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1. **Did the supplier consider transferring the reactor to a recipient country?** Yes.

In February 1997, Ukraine and Iran signed a $50 million contract that committed Ukraine to provide Iran with turbines for Iran’s Bushehr reactors.

2. **Did a third country object to this transfer?** Yes.

The U.S. objected to the proposed transfer.

3. **Did the transfer proceed despite the third country’s objection?** No.

In April 1997, Ukraine terminated the proposed reactor transfer.

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4. Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Optimistic.

Although there were not news reports during the February 1997 – April 1997 period that discussed Ukraine’s expectations of future trade with the U.S., news reporting before and after this period indicates that Ukraine’s expectation of future trade with the U.S. was optimistic. In September 1996, the U.S and Ukraine established the U.S.-Ukraine Binational Commission. In a joint statement released by the U.S. and Ukraine about the commission, the two nations indicated that the Commission would focus on trade, investment, and sustainable economic cooperation in addition to foreign policy and security topics. Subsequently, at a May 16, 1997 press conference with U.S. Vice President Al Gore and Ukrainian President Leonid Kuchma, Kuchma stated that his visit to the U.S. for the first meeting of the Binational Commission was “useful for us…for the development of our trade and economic relations specifically…[as a result of] the meetings with the presidents of the influential American corporations and companies.”

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1. Did the supplier consider transferring the reactor to a recipient country? Yes.

In early October 1998, Germany led a number of European Union nations in proposing a “grand bargain” with Iran in which Iran would agree to implement the IAEA Additional Protocol in

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exchange for Europe restarting nuclear cooperation with Iran. In particular, Germany was interested in exporting a reactor to Iran—most likely by completing Iran’s Bushehr reactor—as a part of the deal.  

2. **Did a third country object to this transfer? Yes.**

The U.S. as well as the Netherlands objected to Germany’s proposed reactor export to Iran.

3. **Did the transfer proceed despite the third country’s objection? No.**

The proposed German-Iranian “reactor-for-safeguards” deal, which was first mentioned in the press in early October 1998, was floated after major German parliamentary elections and amidst a transition between German Chancellors. By the middle of October 1998, Germany’s Chancellor-elect, Gerhard Schroeder, was forming his government and preparing to assume the Chancellorship. At the end of October 1998, despite indications by the German government earlier in the month that Bonn was interested in exporting a reactor to Iran, the incoming Schroeder government’s Foreign Ministry team made clear that it would not permit a reactor transfer to Iran.

4. **Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Optimistic.**

In October 1998, Chancellor-Elect Schroeder indicated that Germany had an optimistic expectation of future trade with the U.S. At an October 9, 1998 press conference in Washington,

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Schroeder told the press that he and U.S. President Bill Clinton “talked about the importance of having stronger and more economic cooperation.”

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<tr>
<td>40</td>
<td>1998</td>
<td>Russia</td>
<td>Iran</td>
<td>U.S.</td>
<td>2006-2008</td>
<td>Optimistic</td>
<td>Halt</td>
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1. **Did the supplier consider transferring the reactor to a recipient country? Yes.**

Starting in 1998, Russia considered an Iranian request for Russia to construct three additional reactors at Iran’s Bushehr facility. (Of note, the three reactors discussed in this case were in addition to the two reactors that Iran requested from Russia in September 1992.)

2. **Did a third country object to this transfer? Yes.**

The U.S. repeatedly objected to the proposed export of three additional Russian reactors to Iran.

3. **Did the transfer proceed despite the third country’s objection? No.**

On May 6, 2008, the U.S. and Russia signed a civilian nuclear cooperation agreement. As a part of the agreement, Russia pledged to limit its future nuclear cooperation with Iran to construction on the first Bushehr reactor – and to terminate further nuclear cooperation projects with Iran including the additional Bushehr reactors. In testimony before the U.S. House of Representatives’ Committee on Foreign Affairs regarding the U.S.-Russia nuclear cooperation agreement, John Rood, U.S. Under Secretary of State for Arms Control and International

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Security, explained precisely that as a result of the agreement, “Russia’s trade is limited…to the Bushehr nuclear reactor.”

4. Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Optimistic.

Around mid-2006, U.S. and Russian diplomats were focused on negotiations regarding two noteworthy issues in the U.S.-Russian relationship. The first, U.S. support for Russia’s accession to the WTO, had been discussed by previous administrations. Notably, in November 2006, the U.S. and Russia completed an agreement in which the U.S. pledged to aid Russia in its bid to join the WTO. The second issue, a U.S.-Russian nuclear cooperation agreement, took two more years to negotiations before it was finalized. On May 6, 2008, the U.S. and Russia signed the nuclear cooperation agreement, which provided Russia with access to lucrative U.S. civilian nuclear contracts. As a result of the two major agreements, Russia’s expectations of future trade with the U.S. during this period were optimistic.

<table>
<thead>
<tr>
<th>Case</th>
<th>Year of Initiation</th>
<th>Supplier</th>
<th>Recipient</th>
<th>Objector</th>
<th>Period of Decision</th>
<th>Supplier Trade Expectation During Period of Decision</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>41</td>
<td>2000</td>
<td>Russia</td>
<td>India</td>
<td>U.S.</td>
<td>2000-2005</td>
<td>Optimistic</td>
<td>Halt</td>
</tr>
</tbody>
</table>

1. Did the supplier consider transferring the reactor to a recipient country? Yes.

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In April 2000, Russia began to consider an Indian request for Russia to export five reactors to India. At the time, Russia was already under contract to supply two reactors to India. (Case 34.)

2. Did a third country object to this transfer? Yes.

The U.S. objected to the proposed reactor transfer.

3. Did the transfer proceed despite the third country’s objection? No.

After several reports were published in April 2000 indicating Russia was considering exporting five additional reactors to India, there was no additional reporting on this proposed deal – presumably Russia stopped considering the Indian request at some point. In 2005, U.S. President George W. Bush’s administration initiated a diplomatic effort to exempt India from the NSG’s restrictions on nuclear commerce such that India would be treated as if it was a nuclear weapon state. After the start of this initiative, Russian President Vladimir Putin and Indian Prime Minister Manmohan Singh reopened the issue of possible Russian supply of additional reactors to India. In December 2008, after the NSG had agreed to create an exception to its restrictions on nuclear commerce for India, India and Russia completed an agreement that envisioned Russia constructing four new reactors in India. The U.S. did not object to this December 2008 Russia-India reactor transfer agreement.

4. Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Optimistic.

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308 Anonymous. “India, Russia to ink Nuclear deal on December 5.” The Press Trust of India, December 3, 2008.
Although it is unclear when Russia stopped considering India’s request for five reactors, from 2000 through 2005 (after the start of the U.S. effort to ease NSG restrictions on nuclear commerce with India,) Russia in general had optimistic expectations of future trade with the U.S. In 2000, the U.S. pledged to support a future Russian bid to join the WTO while lifting restrictions on U.S. Export-Import Bank financing of the Russian energy industry. In 2003, after U.S.-Russian trade relations became contentious over agricultural issues, representatives from Washington and Moscow signed an agreement to resolve issues of disagreement and to lift restrictions on agricultural trade between the countries. In 2005, the U.S. and Russia developed an action plan to increase trade between the two countries. With respect to the agreement, Russian Economic Development and Trade Minister German Gref stated, “The Russian side thinks cooperation in the sphere of energy, high technology and machine-building are promising directions.”

<table>
<thead>
<tr>
<th>Case</th>
<th>Year of Initiation</th>
<th>Supplier</th>
<th>Recipient</th>
<th>Objector</th>
<th>Period of Decision</th>
<th>Supplier Trade Expectation During Period of Decision</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>42</td>
<td>2006</td>
<td>China</td>
<td>Pakistan</td>
<td>U.S.</td>
<td>3/06-3/10</td>
<td>Pessimistic</td>
<td>Proceed</td>
</tr>
</tbody>
</table>

1. **Did the supplier consider transferring the reactor to a recipient country?** Yes.

In response to a 2005 U.S. initiative to end restrictions on nuclear commerce with India, in March 2006 China and Pakistan began discussions on a plan to export two reactors from China to Pakistan.

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2. Did a third country object to this transfer? Yes.

The U.S. objected to the proposed transfer between China and Pakistan.\(^{311}\)

3. Did the transfer proceed despite the third country’s objection? Yes.

This case is unique among those in the data set because this case is still ongoing, and therefore it is not entirely clear whether this transfer will proceed despite the U.S.’s objection. However, news reports from August 2009 and April 2009 suggested that China had formally committed to provide two additional power reactors to Pakistan.\(^{312}\) An additional report from March 2010 indicated that an agreement between China and Pakistan for export of the reactors had been finalized.\(^{313}\) As such, this case is coded as a case in which the transfer proceeded despite the third country’s objection – though it is important to note that this outcome could change in the future.

4. Did the supplier have an optimistic or pessimistic expectation of future trade with the objector? Pessimistic.

Between March 2006 and early 2010, China’s expectations of future trade with the U.S. became much more pessimistic. In 2006, *Xinhua*, China’s state news agency indicated that U.S.-Chinese economic ties maintained a “fast growth momentum.”\(^{314}\) However, in 2007, Chinese officials indicated that China believed that increasing U.S. protectionism was harming Chinese trade and that efforts by the U.S. Congress to link political actions to trade were “not conducive to the

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development of Sino-US trade.” This theme continued in 2009 when China’s Commerce Minister Chen Deming stated, “regrettably, however, trade measures by the US against China are on the rise.” Likewise, in early 2010, China’s Primer, Wen Jiabao, acknowledged the conflictual state of U.S.-Chinese trade ties while noting that he did not want 2010 to be “an unpeaceful year” for the U.S.-China commercial relationship.

Appendix 3: Categorized Data Set for Chi Square Test

1. Instances in which the supplier had an optimistic expectation of future trade with the objector and the transfer was halted. **19 Cases.**

<table>
<thead>
<tr>
<th>Case</th>
<th>Year of Initiation</th>
<th>Supplier</th>
<th>Recipient</th>
<th>Objector</th>
<th>Period of Decision</th>
<th>Supplier Trade Expectation During Period of Decision</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>1981</td>
<td>France</td>
<td>Iraq</td>
<td>Israel</td>
<td>3/1982-</td>
<td>Optimistic</td>
<td>Halt</td>
</tr>
<tr>
<td>14</td>
<td>1986</td>
<td>USSR</td>
<td>N. Korea</td>
<td>S. Korea</td>
<td>1988-1989</td>
<td>Optimistic</td>
<td>Halt</td>
</tr>
<tr>
<td>15</td>
<td>1986</td>
<td>France</td>
<td>Iraq</td>
<td>Israel</td>
<td>1986-8/1987</td>
<td>Optimistic</td>
<td>Halt</td>
</tr>
<tr>
<td>29</td>
<td>1991</td>
<td>China</td>
<td>Iran</td>
<td>U.S.</td>
<td>1997</td>
<td>Optimistic</td>
<td>Halt</td>
</tr>
<tr>
<td>32</td>
<td>1992</td>
<td>China</td>
<td>Iran</td>
<td>U.S.</td>
<td>1997</td>
<td>Optimistic</td>
<td>Halt</td>
</tr>
<tr>
<td>35</td>
<td>1995</td>
<td>South Korea</td>
<td>Pakistan</td>
<td>U.S.</td>
<td>1995</td>
<td>Optimistic</td>
<td>Halt</td>
</tr>
<tr>
<td>40</td>
<td>1998</td>
<td>Russia</td>
<td>Iran</td>
<td>U.S.</td>
<td>2006-2008</td>
<td>Optimistic</td>
<td>Halt</td>
</tr>
<tr>
<td>41</td>
<td>2000</td>
<td>Russia</td>
<td>India</td>
<td>U.S.</td>
<td>2000-2005</td>
<td>Optimistic</td>
<td>Halt</td>
</tr>
</tbody>
</table>

2. Instances in which the supplier had a pessimistic expectation of future trade with the objector and the transfer was halted. **11 Cases.**

<table>
<thead>
<tr>
<th>Case</th>
<th>Year of Initiation</th>
<th>Supplier</th>
<th>Recipient</th>
<th>Objector</th>
<th>Period of Decision</th>
<th>Supplier Trade Expectation During Period of Decision</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>1982</td>
<td>France</td>
<td>S. Africa</td>
<td>U.S.</td>
<td>1982</td>
<td>Pessimistic</td>
<td>Halt</td>
</tr>
<tr>
<td>11</td>
<td>1982</td>
<td>Germany</td>
<td>Iran</td>
<td>U.S.</td>
<td>1986</td>
<td>Pessimistic</td>
<td>Halt</td>
</tr>
<tr>
<td>Case</td>
<td>Year of Initiation</td>
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<td>Recipient</td>
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<td>Outcome</td>
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<tr>
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<td>--------------------</td>
<td>-----------------------------------------------------</td>
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</tr>
<tr>
<td>26</td>
<td>1991</td>
<td>Britain</td>
<td>China</td>
<td>U.S.</td>
<td>1991</td>
<td>Optimistic</td>
<td>Proceed</td>
</tr>
<tr>
<td>34</td>
<td>1995</td>
<td>Russia</td>
<td>India</td>
<td>U.S.</td>
<td>1995-1998</td>
<td>Optimistic</td>
<td>Proceed</td>
</tr>
</tbody>
</table>

4. Instances in which the supplier had a pessimistic expectation of future trade with the objector and the transfer proceeded. 8 Cases.

<table>
<thead>
<tr>
<th>Case</th>
<th>Year of Initiation</th>
<th>Supplier</th>
<th>Recipient</th>
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<td>U.S.</td>
<td>3/06-8/09</td>
<td>Pessimistic</td>
<td>Proceed</td>
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Bibliography


“Asian News-South Korea, Soviet Union; South Korea Stepping Up Direct Trade with Soviet Union,” Japan Economic Newswire, February 23, 1988.


“China doesn’t want 2010 to be ‘unpeaceful year’ with U.S.” Xinhua General News Service, February 27, 2010.


“China retains French models in 1,000 megawatt reactors.” Agence France Presse, December 16, 1999.


“China to export nuclear reactors to Syria, Ghana.” Agence France Presse, April 10, 1992.


“Clinton offers free trade talks with Argentina, Chile.” Agence France Presse, June 29, 1993.

“Clinton touches on Russia’s accession to WTO in Duma speech.” TASS, June 5, 2000.


“Communication Received from the Permanent Mission of Brazil regarding Certain Member States’ Guidelines for the Export of Nuclear Material, Equipment and Technology.” (INFCIRC/254-Part 1.) http://www.nuclearsuppliersgroup.org/Leng/PDF/infcirc254r9p1-071107.pdf


“French socialists tailor their arms sales to ideology.” The Telegraph (AP), March 30, 1982.


“India backs off on reactor sale to Iran,” Middle East Defense News 5:7 (January 6, 1992).

October 8, 1991.


“India, Russia to ink Nuclear deal on December 5.” The Press Trust of India, December 3, 2008.


“Israel; Discussion of Expansion of Trade with France.” BBC, December 9, 1986.


www.fas.org/nuke/guide/india/nuke


“Pakistan starts construction of second nuclear power plant,” Agence France Presse, August 1, 1993.


“Russian company begins work on Indian N-plant.” BBC. April 27, 2002.


“Six foreign companies are drawing up a bid for completion of Iran’s 1,300-MW Bushehr one nuclear power plant,” Middle East Economic Digest, March 21, 1987.

“South Korea and the USSR; Soviet trade officials in South Korea,” BBC Summary of World Broadcasts, January 24, 1989.


“Syria Agrees to IAEA Safeguards.” Middle East Defense News 5:10 (February 17, 1992.)


“Syria People’s Assembly endorses agreement on nuclear reactor and safeguards.” BBC, March 26, 1992.

http://www.fas.org/nuke/control/nsg/index.html


“U.S., China avert trade war.” St. Petersburg Times, January 17, 1992, P. 13A.


“US to dangle nuclear deal in exchange for Russia’s help on Iran.” Agence France Presse, July 9, 2006.


“US Vice President Gore’s visit; Chernomyrdin and Gore discuss trade and investment.” BBC Summary of World Broadcasts. July 24, 1996.

“US, Russia Sign Trade Deal to Allow Moscow to Join WTO.” Voice of America News, November 16, 2006.


http://www.dailytimes.com.pk/default.asp?page=2010\03\30\story_30-3-2010_pg7_2


Eck, David and Ryan, Jim. “The Chi Square Statistic.”

http://math.hws.edu/javamath/ryan/ChiSquare.html


Hibbs, Mark and Sander, Neal. “Iran seeks Skoda help, but Prague says no deal likely.” Nucleonics Week. December 16, 1993. Vol. 34, No. 50; Pg. 9


---. “Iran Still Angling for Europeans to finish Bushehr PWR Station.”


---. “Pakistan, China planning two 1000-MW PWRs.” Nucleonics Week 47:40 (October 5, 2006): 1.


http://www.boston.com/bostonglobe/editorial_opinion/oped/articles/2009/03/29/the_coming_nuclear_renaissance/


Larsen, Jeffrey. “National Security and Neo-Arms Control in the Bush Administration.” Disarmament Diplomacy 80 (Autumn 2005.)


McLaughlin, Jacqueline and Noel, Jane. “Chi-Square Test.”
http://www2.lv.psu.edu/jxm57/irp/chisquar.html. According to this website, some of the material from this site comes from “Chi-Square Test.” R.A. Fisher and F. Yates. Statistical Tables for Bioagricultural and Medical Research.”


