

Unstable Regimes? Nuclear Weapons Acquisitions in the Context of Enduring Rivalries

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Abstract

Studies of nuclear proliferation and of its impact in the international system find that once countries acquire nuclear weapons, they start behaving differently: they are involved in more low level disputes ([Rauchhaus, 2009](#)), they prevail in crises ([Beardsley and Asal, 2009](#)) and their diplomatic status increases ([Gartzke and Jo, 2009](#)). While a lot of these studies focus on the effects of horizontal proliferation, that is, the increase in the number of states that acquire the weapon, most of the strategic action happens before states conduct their first nuclear weapon test. At which stage of their nuclear weapon acquisition do states become more aggressive? I analyze event data on the weekly interactions between rivals when at least one member is in the process of acquiring nuclear weapons. I test for the presence of structural breaks that determine different levels of instability within a specific relation. My preliminary findings show that, while relations with a proliferating state might get bumpy at times, they do so mostly at earlier stages of the weapon acquisition process.

1 Introduction

In a recent Joint Press Conference with the British Prime Minister Cameron, President Obama reaffirmed the US commitment to prevent Iran from acquiring a nuclear weapon.

On this we are fully united. We are determined to prevent Iran from acquiring a nuclear weapon. We believe there is still time and space to pursue a diplomatic solution, and we are going to keep coordinating closely with our P5-plus-1 partners. At the same time, we are going to keep up the pressure, with the strongest U.S. sanctions to date and the European Union preparing to impose an embargo on Iranian oil. Tehran must understand that it cannot escape or evade the choice before it – meet your international obligations or face the consequences. ¹

In February of 2012, the State Department announced that the North Korean government had agreed to stop its uranium-enrichment program and nuclear tests in exchange for food. The situation of Iran and North Korea is different to some extent: unlike Iran, North Korea announced its withdrawal from the Non Proliferation Treaty in 2003 and has already launched two nuclear tests in 2006 and 2009. Both countries face a comparably stern opposition on the part of the US and of the international community to their nuclear program and have been the target of numerous sanctions.

These recent developments underscore two fundamental characteristics of nuclear proliferation: first, the acquisition of nuclear weapons on the part of a state often occupies a central role in international politics. Because of its intrinsic dual nature as both a highly destructive military asset and a dependable source of energy in the civilian sector, the nuclear question calls attention to the defining tensions between the right of sovereign states to pursue the policies they want and the need to factor in the implications of those policies on other countries in the international system. Perhaps nothing signifies this tension better than the inspections carried out by the United Nations Monitoring, Verification, and Inspection Commission (UNMOVIC) and the International Atomic Energy

¹[Conference \(2012\)](#)

Agency (IAEA) in various countries, and, most recently, in Iraq. Second, nuclear acquisition is a long term process, one that undergoes different phases and that presents international actors with different challenges through time. Not all the countries that explore the possibility of acquiring nuclear weapons get to acquire one— as was the case for Argentina— and some countries end up even giving up their nuclear weapons—as in the case of South Africa.

For all these reasons, it is fundamental to analyze the whole *process* of nuclear weapon acquisition, in all the different phases. So far, the literature has focused on two main moments in the process of nuclear weapon acquisition, either investigating the determinants of the establishment of a nuclear weapon program or assessing the consequences of horizontal nuclear proliferation. Yet, the most dangerous aspect of nuclear weapon acquisition is *vertical* proliferation, that is, the process of exploration, pursue and acquisition of the nuclear arsenal on the part of states. It is in the process of vertical proliferation that most of the political action happens, with some states trying to import and develop nuclear technology and others trying to prevent them from acquiring the weapon. At which stage of their nuclear weapon acquisition do states become more aggressive?

To answer this question, I use Event Data on the weekly activities of states throughout the different phases of nuclear power acquisitions, from 1945 to 2000. I focus on a subset of states, those pairs of countries —such as the US and USSR or India and Pakistan— that engage in long term, conflictual rivalries and that account for the bulk of the conflict in the international system. For each of these pairs of states I build a time series with their foreign policy activities (military attacks, diplomatic visits, treaty signing, etc.). I then analyze these time series using nonlinear statistical techniques. Specifically, I test for the presence of structural breaks: are there specific moments during the various phases of weapon acquisition that represent a turning point for the way in which states interact with each other?

The paper is organized as follows. The next session presents a survey of current studies of nuclear proliferation and points to the importance of having a clear understanding of the entire process of nuclear proliferation, going from the time before states establish a nuclear program up to the time when states have already acquired a nuclear weapon. I then present a test for structural breaks in the time series of the relation between rivals and discuss the results. Conclusions follow.

2 Literature Review

While many scholars recognize its centrality in the modern security discourse, few underestimate the challenges that the study of the causes and effects of nuclear proliferation poses (Sagan, 2011). First, the secrecy that surrounds the process of nuclear weapon acquisition makes it hard for scholars to reach stable conclusions. As in the case of Israel, in some instances the nuclear status of a country might be hard to know. Montgomery and Sagan (2011) show how relying on different information on nuclear proliferation might lead to the inclusion of other states amongst the nuclearized ones, which in turn might change the conclusion reached by present studies.

Second, even in the case of those states whose nuclear status is largely known, it is hard to determine precisely the point in time when the pursuit of nuclear weapons started or when the weapons were finally acquired. Singh and Way (2004) and Jo and Gartzke (2007) generate new data sets where they identify the years during which states explore or acquire nuclear weapons: building on many diverse sources, they often reach different conclusions on these dates. Finally, the line that divides civilian and military uses of nuclear powers is often blurry (Sagan, 2011, 270), and even peaceful nuclear cooperation, that is, the export of nuclear material for civilian purposes, often leads to the production of nuclear weapons (Fuhrmann, 2009).

Notwithstanding these challenges to inference, nuclear weapons play a crucial role in the study of international politics. This is because, as military instruments of unprecedented disruptiveness, nuclear weapons significantly alter the strategic environment in which states operate. Does horizontal proliferation –that is, the acquisition of nuclear weapons by an increasing number of states– translate into a more bellicose international system? Pessimists and optimists disagree (Jo and Gartzke, 2007) . Pessimists point to the fact that accidents would be more consequential in a world with more nuclear weapons, but also that domestic audiences might become more inflammable, and thus the presence of nuclear weapons might make the international arena a more dangerous place (Sagan, 1996). By contrast, optimists claim that nuclear weapons are likely to have a deterrent effect on states: in other words, given that amount of damage that a nuclear attack might cause, states will be more reluctant about getting involved in conflict (Waltz, 1981; Hopf, 1991). Nuclear proliferation is thus likely to translate in less international conflict. While the eventuality of a nuclear war is deemed improbable, many scholars have delved into the effects of the presence of nuclear weapons on conventional conflict, such as international crises or militarized international disputes (MIDs). Investigating the coercive advantage that nuclear power status grant to states, Beardsley and Asal (2009) show that, when involved in international crises, nuclear powers are more likely to prevail when facing a non nuclear state and that the crisis itself tends to be shorter. Gartzke and Jo (2009) don't find a significant impact of nuclear weapons on the incidence of conflict. They explain this non finding by highlighting how "for nuclear weapons to increase conventional dispute behavior, states with nuclear weapons must become more aggressive without their opponents responding by becoming more circumspect" (Gartzke and Jo, 2009, 226). They do however find that nuclear weapon acquisition confers greater diplomatic status. Conversely, Rauchhaus (2009) finds that nuclear weapon possession on the part of one or both parts of a dyad significantly increases

the likelihood of less violent disputes—such as crises or MIDs— while decreasing the probability of war between two nuclear powers.

While a significant part of the literature has focused on the consequences of nuclear weapon acquisition, other studies investigated yet another politically important stage of this process, the decision of states to establish a nuclear program. This phase of the process of nuclear weapon acquisition highlight nuclear weapons' function as an instrument of influence. States that pursue nuclear weapons might have different agendas (Narang, 2010), as states might seek weapons not just to deter attacks (Singh and Way, 2004; Jo and Gartzke, 2007) but also to compel third parties military assistance. The presence of an external threat is found to be highly correlated with nuclear proliferation: the involvement of a state in an enduring rivalry is a consistent predictor of its decision to acquire these weapons, by making such decision more likely (Singh and Way, 2004; Jo and Gartzke, 2007). The counterparts to the nuclearizing states also react strongly to the decision of establishing a nuclear program. In some cases, states can help others to establish such program. International cooperation among states plays a significant role in increasing the likelihood that a state acquires a nuclear weapon (Fuhrmann, 2009), with states transferring sensitive technology for either peaceful or military nuclear uses. In other cases, states might also feel particularly threatened by the eventuality that another state acquires nuclear weapons, and decide to target its nuclear infrastructure (Fuhrmann and Kreps, 2010), especially if it is a long term enemy or there aren't any shared foreign policy objectives.

In sum, current studies of both the causes and consequences of nuclear proliferation have highlighted how nuclear weapon acquisition is a long term process, fraught with high political stakes and correlated with conflictual behavior both on the part of the nuclearizing state and of its counterparts. But if nuclear weapons acquisition present states with an advantage in conventional conflict,

and if others are often willing to cooperate so that states become able to acquire the weapon, why is it not the case that we witness more nuclear proliferation?

Part of the answer, I argue, is likely to come from a more in-depth analysis of the process of nuclear acquisition itself. More recently, scholars have shifted to a conceptualization of nuclear weapon acquisition as a continuum, rather than a dichotomous variable (Singh and Way, 2004, 866). For instance, Singh and Way (2004) identify three phases: exploration, pursue and acquisition. This is an important innovation in the study of processes of nuclear proliferation.

By emphasizing the important role that time plays in nuclear acquisition, this approach to the study of nuclear proliferation helps theories to capture more accurately the complicated empirical dynamics at hand. First, not all states that explore the possibility of establishing nuclear programs decide to go ahead and seek them. Out of the twenty-five countries that explored, only seventeen decide to pursue the weapon (Singh and Way, 2004). Second, the very decision of states to undergo the next phase in the process of nuclear weapon acquisition is deeply linked to extemporaneous developments on the international arena. For instance, two famous cases of nuclear reversal, South Korea and Taiwan, were a function of the decision of an ally, the United States, to guarantee nuclear protection. In other words, by characterizing nuclear proliferation as a continuum, it becomes possible to focus attention on how each phase in the process becomes a forming part of the development and how what goes wrong in one phase might determine the fate of the whole process.

3 Towards a new conceptualization of the nuclear continuum

Current studies adopt mainly two procedures to model the impact of time on the process. Some treat time as a nuisance and correct for the possible autocorrelation in the observations with robust

standard errors (268 Rauchhaus, 2009; Horowitz, 2009, 242). Others model the effect of time by adding a counter measures of years since a country has entered a specific phase of the process—such as exploration or acquisition (Sobek, Foster and Robison, 2011). Both approaches build on statistical techniques that are largely used in the discipline and that serve an important function in making the results of the analysis robust (Beck, Katz and Tucker, 1998; Carter and Signorino, 2010). In particular, adding a counter variable for years since a state has acquired a nuclear weapon, for instance, serves two purposes: first, it measures the effect of time since acquisition, or learning, on the likelihood of conflict occurrence. Second, it allows scholars to control for the effects of time when assessing the impact of the other predictors of conflict.²

What this procedure does not do, however, is testing how the behavior of a state entering a new phase changes. Do relations between states become dramatically different? Are states more likely to become the initiators or the targets of attack? Are they instead more likely to see an increase in cooperation? How does the behavior change *during* each of the phases in the process?

Since nuclear weapon acquisition is best understood as a process rather than a continuum, I argue that modeling time correctly becomes instead a central concern in studying nuclear proliferation. A dynamic analysis of the process of nuclear proliferation is warranted by the fact that this is a highly political process that often involves many states actively trying to prevent—or help—others from completing it.

I focus here on the process of nuclear weapon acquisitions and test for its consequences on both the pattern of conflict and cooperation between countries. To do so, I build the time series of the relations between countries and I test for the presence of structural breaks, that is, moments in the

²As Carter and Signorino (2010) explain, adding an interaction term between time and the variable of interest would allow to model how the impact of that variable changes through time.

series that mark an abrupt change in the relation between the states.

4 Data

In this paper, I focus on a subset of the states in the international systems, those that form enduring rivalries. These are dyads that engage often in conflict, and are responsible for the bulk of the conflict present in the system.

Various definitions of what counts as an enduring rivalry have been provided in the literature (Colaresi, Rasler and Thompson, 2007) In this project, I choose to use the definition of enduring rivalries provided by Diehl and Goertz (2001) as those dyads that engage in more than six violent conflicts over a period of twenty years, over related issues . There are two reasons why I select those dyads that conform to this definition. First, unlike Colaresi, Rasler and Thompson (2007), the definition that these authors provide singles out states have been involved in a number of related disputes over a period of twenty years: in an international system where the great majority of wars and militarized disputes have been fought among a minority of states (87 Colaresi, Rasler and Thompson, 2007) these states represent the most bellicose dyads in the international system.³ As discussed in the previous section, the propensity for states to engage in disputes once they acquire nuclear weapons has been one of the main focus of current research on nuclear proliferation.

Second, precisely because of their history, relations between enduring rivalries are characterized more than any others by the fact that their past conditions the way the future is predicted, and the future. The decision to pursue a nuclear weapon becomes highly embedded in a long past between the two countries and shadow of the future.

³ Klein, Goertz and Diehl (2006) relax both the temporal requirement and the dispute intensity one (but not the issue consistency one) and look instead at dyads having had at least three Militarized Interstate Disputes (MIDs) in the period from 1816 to 2001, a change that makes the number of these rivalries balloon from 64 to 200.

Table 1 reports the complete list of dyads that qualify as enduring rivalries for [Diehl and Goertz \(2001\)](#). The use of this definition however imposes some constraints on the kind of dyads that are considered as enduring rivalries. As ([Colaresi, Rasler and Thompson, 2007](#)) notes, if rivalries start when the first violent dispute erupts, then all the process leading up to that dispute is missed. Second, since violence is one of the criteria used to identify a relationship, only dyads where the parts score high in terms of military capabilities will be likely to be included. Thus, in the second column, I also indicate whether they qualify as an enduring rivalry according to the approach adopted by ([Colaresi, Rasler and Thompson, 2007](#)), and if so, during which period.

Similarly, the third column shows the time period during which the dyad is considered as a rivalry also in the new definition provided by [Klein, Goertz and Diehl \(2006\)](#).

In this paper, I focus on a 11 of these dyads, as I am in the process of collecting data and extending my analysis to all the others. As mentioned in the previous section, the secrecy that characterizes the process of nuclear weapon acquisition makes it hard for scholars to identify the exact dates for each phase of the nuclear weapon acquisition process. Here, I report the two main periodizations present in the literature, the one proposed respectively by [Singh and Way \(2004\)](#) and [Jo and Gartzke \(2007\)](#). For each dyad, I report the starting dates for each phases in the process of nuclear proliferation. As it is evident from Table 2, the "pursue" phase identified by [Singh and Way \(2004\)](#) roughly corresponds to the program establishment one in the [Jo and Gartzke \(2007\)](#) specification.⁴

⁴ For instance, in the case of Egypt and Israel, since Egypt has never started a nuclear program, the entries are left blank. Conversely, the uncertainty that surrounds the Israeli nuclear program—as evidenced in the multiple date entries— might in part explain why dates for [Singh and Way \(2004\)](#) and [Jo and Gartzke \(2007\)](#) diverge so much.

Table 1: Enduring Rivalries, 1945-2000

Dyad	Enduring Rivalry	Strategic Rivalry	Enduring Other
Afghanistan-Pakistan	1949-89	1947-79	1949-01
Algeria-Morocco	1962-84	1962-	1962-84
Argentina-Chile	1952-84	N	1952-84
Cambodia-Thailand	1953-87	N	1953-98
China-India	1950-87	1948-	1950-87
China-S. Korea	1950-87	N	1950-94
China-US	1949-72	1949-72	1926-72
Congo-Zaire	1963-87	N	1976-94
Cuba-US	1959-90	1959-	1959-96
Cyprus-Turkey	1965-88	N	1965-01
Ecuador-US	1952-81	N	1951-81
Egypt-Israel	1948-89	1948-	1948-89
Ethiopia-Somalia	1960-85	1960-88	1960-85
Ethiopia-Sudan	1967-88	1965-	1967-98
Greece-Turkey	1958-89	1955-	1958-01
India-Pakistan	1947-91	1948-	1947-02
Iraq-Israel	1967-91	1948-	1948-98
Iraq-Kwait	1961-	Y	1961-00
Israel-Jordan	1948-73	1948-94	1948-73
Israel-Saudi Arabia	1957-81	N	1957-81
Israel-Syria	1948-86	1948-	1948-01
Japan-S.Korea	1953-82	N	1994-99
Jordan-Syria	1949-91	1946-	1949-91
Kenya-Uganda	1965-89	1986-95	1965-97
N.Korea-S.Korea	1949-	1948-	1949-01
N.Korea-US	1950-85	N	1950-00
Laos-Thailand	1960-88	N	1960-88
Morocco-Spain	1957-80	1956-91	1957-80
Norway-Russia	1956-87	N	1956-01
Peru-US	1955-92	N	1955-92
Russia-US	1946-86	1945-89	1946-00
Saudi Arabia-Yemen	1962-84	1990-	1962-84
Thailand-Vietnam	1961-89	1954-88	1961-95

5 Model and Data

To test for the presence of structural breaks, I use the [Bai and Perron \(2003\)](#) test for structural stability. The detection of structural changes is very important aspect in the analysis of a time

Table 2: Nuclear weapons programs dates

	Singh and Way 2004			Jo and Gartzke 2007	
	Explore	Pursue	Acquire	Program	Possession
Egypt-Israel					
Israel-Egypt	1949	1958	1972	1955	1966
Israel-Iraq	1949	1958	1972	1955	1966
Iraq-Israel	1976	1982	1972	1973-78,1984	
Israel-Jordan	1949	1958	1972	1955	1966
Jordan-Israel					
Israel-Syria	1949	1958	1972	1955	1966
Syria-Israel					
China-US	1955	1955	1964	1956	1964
US-China	1945	1945	1945	1942	1945
China-South Korea	1955	1955	1964	1956	1964
South Korea- China	1959	1970		1971-75	
China-India	1955	1955	1964	1956	1964
India- China	1954	1964-80	1974-88	1964-65,72	1988
Pakistan-India conflict	1972	1972	1990	1972	1987
India- Pakistan conflict	1954	1964-80	1974-88	1964-65,72	1988
South Korea- North Korea	1959	1970		1942	1945
North Korea-South Korea	1965	1980		1982	
North Korea-US	1965	1980		1982	
US- North Korea	1945	1945	1945	1942	1945
US-USSR	1945	1945	1945	1942	1945
USSR-US	1945	1945	1949	1943	1949

series. Structural break can be defined as points in time where the characteristics of the series change dramatically.

[Bai and Perron \(2003\)](#) estimate break dates on the basis of the least-squares principle. The method "essentially proceeds via a sequential examination of optimal one-break (or two segments) partitions". After all the SSR have been computed and scored, the optimal partition is found by satisfying the following criteria ([Bai and Perron, 2003, 6](#)):

$$SSR(\{T_{m,T}\}) = \min_{mh \leq j \leq T-h} [SSR(\{T_{m-1,j}\}) + SSR(j+1, T)] \quad (1)$$

where m represents the number of breaks, T represents the breakpoints, j the number of regimes.⁵

The dates for structural breaks are treated as unknown variables to be estimated from the data, when m and h , that is, the minimum segment length, are specified.

$$y_t = x_t\beta + z_t\delta_j + u_t \quad (2)$$

[Bai and Perron \(2003\)](#) investigate both a partial and a pure structural change model, that is, they look at both instances where all the parameters are subject to shifts and to instances where some parameters β are constant throughout the sample. Here, I focus here on a pure structural change model and I regress the series on a constant to detect changes in its mean.

Data on cooperation and conflict between dyads of enduring rivals come from the COPDAB data set ([Azar, N.d.](#)), the WEIS data set ([McClelland, 2006](#)), and the *Levant Data Set* ([N.d.](#)). These data set collect information on the foreign policy action of each state: episodes include events such as trade agreements, battles, diplomatic disputes etc. Since the data sets extend for different years, I merged them and weighted the data using [Goldstein \(1992\)](#) scale.

⁵ j is thus bound between 1 and $m+1$

6 Results

To better illustrate the results of the test for structural stability, I report them in Figure 1. The dotted lines represent cooperation and the dashed lines represent conflict. The length of each line represents the duration of the rivalry itself. Bold dots represent structural breaks. I highlight in red those structural breaks that correspond to dates when one or more phases of the nuclear proliferation process starts.

Several conclusions emerge from the graphs. First and foremost, a state's decision to nuclearize not always translate into a major shift in the relation with an enduring rival: as emerges by the prevalence of black dots, in most cases structural breaks do not correspond with any of the nuclear program dates. Second, structural breaks are associated more often with the decision of a country to establish the nuclear program, rather than with its actual acquisition of the nuclear weapon. Third, structural breaks in the foreign policy behavior of one member of the dyad tends to be mirrored by structural breaks in the foreign policy behavior of the counterpart – with the exception of Pakistan and India. Finally, in those dyads where a state's decision to establish a nuclear program actually coincides with a major structural break, only the conflict patterns are affected, and not the cooperation one. The case of Israel stands out in the data, and more detailed research is necessary to make clear why this is the case.

7 Conclusions

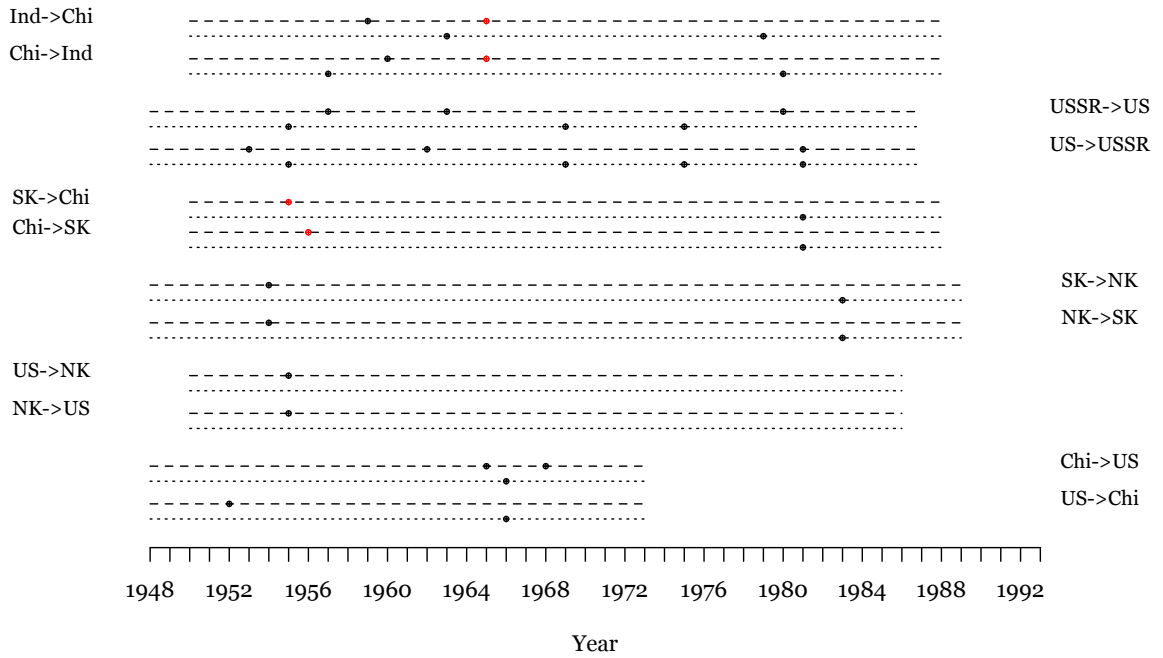
Nuclear proliferation—that is, the acquisition of nuclear weapons on the part of an increasing number of states— is one of the the most important phenomena in the international arena, and also one of the most studied in the Academic debate. Do states that acquire a nuclear weapon become more

bellicose?

Here, I have presented two innovations with respect to current studies. First, I have looked both at pattern of cooperation and conflict. Second, rather than just focusing on the establishment of a nuclear program or on the acquisition of the weapon itself, I have investigated the whole process of nuclear weapon acquisition and tested for the presence of structural breaks, that is, watershed moments. My findings show that, in those cases when structural breaks actually coincide with states entering a new phase in the process, they do so mainly when states decide to establish a nuclear program, rather than when they already have the weapon. This in turn, points to the importance for the counterparts of a state deciding to go nuclear to avoid over-reactions that might actually lead to an increase in the level of conflict registered.

Finally, these results are highly preliminary. First, the analysis does not include all nuclear states, and I am currently extending the number of enduring rivalries that I consider. Second, there might be a selection bias problem, as I am only considering dyads where at least one state has entered the process of nuclear weapon acquisition, so in future analysis I will match dyads where at least one state has entered the process of nuclear weapon acquisition with dyads where none of the actors have. Finally, to assess the robustness of my findings, I will analyze the data with different tests of structural breaks, to see whether they identify breaks in the same points where [Bai and Perron \(2003\)](#) do.

Structural Breaks



Structural Breaks, cont.

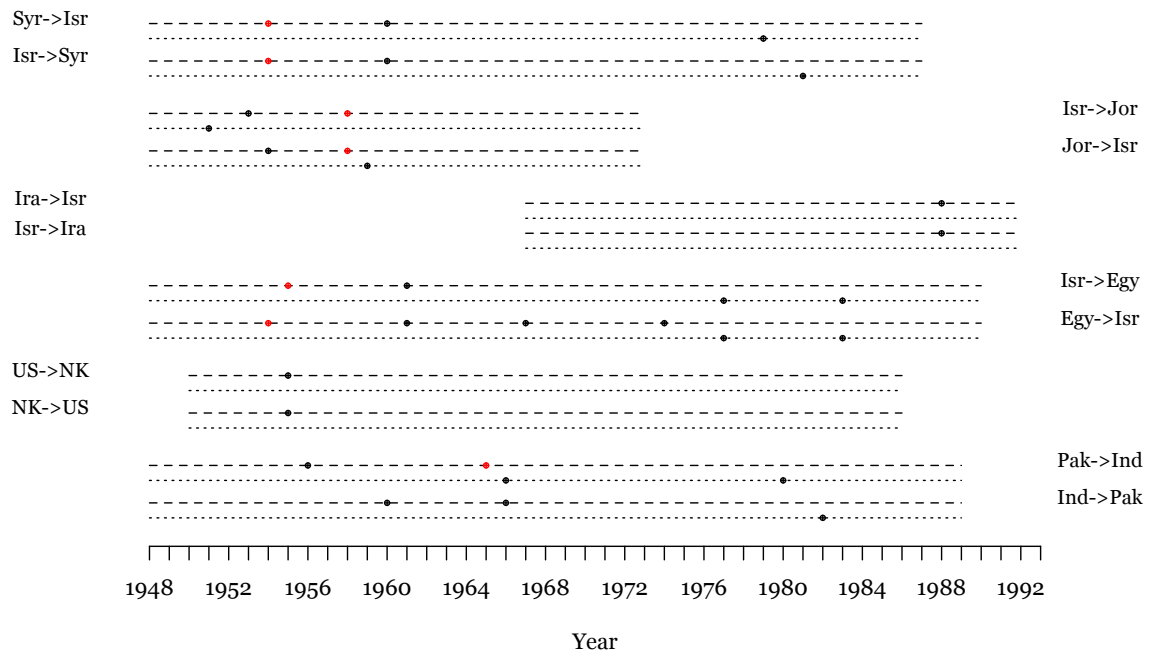


Figure 1: Structural breaks in the relations between enduring rivals. The dotted lines represent cooperation and the dashed lines represent conflict. The length of each line represents the duration of the rivalry itself. Bold dots represent structural breaks.

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