# EVOLUTIONARY EXPLANATIONS OF SYRIAN–TURKISH WATER CONFLICT*

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**Abstract:** The issues of water and territory dominate relations between Syria and Turkey, upstream and downstream riparians in the Euphrates and Tigris basin. This chapter proposes an evolutionary game to explore eventual trajectories of riparian relations. Turkish hawks are defined as those Turkish foreign policies that support no water concessions. Turkish doves can instead support the flow of an increased amount of water to Syria on the basis of an international agreement. Syrian hawks are those Syrian foreign policies that do not recognize Turkish sovereignty over Hatay—also known as the Sandjak of Alexandretta. Syrian doves can in turn accept that the territory belongs now to Turkey. It is found that evolutionary stability does not depend upon the values territory and water represent for the fitness of Syrian and Turkish foreign policies. No evolutionary stability is possible unless doves are cooperative towards hawks. If doves are cooperative towards hawks, the unique evolutionarily stable outcome implies their extinction. Riparian relations will ultimately evolve into mutual intransigence.

**Keywords:** upstream-downstream water conflicts, game theory, Turkey-Syria water conflicts

## 1. INTRODUCTION

Two contentious issues underlie Syrian–Turkish relations: water and territory. Syria has requested Turkey, the upper-riparian in the Euphrates river basin, to allow a flow of more than 500 $m^3/s$ (cubic meters per second) of water, making Turkey uncomfortable with Syria's nonrecognition of its sovereignty over Hatay province (the Sandjak of Alexandretta). Given

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these dimensions of conflict, how will Syrian–Turkish relations evolve? We generate an answer through an evolutionary game where we find that the current status quo characterized by no concessions on both issues is the unique evolutionarily stable outcome. The stability of the status quo is insensitive to different assumptions about behavior traits and to values of water and territory for the riparian countries.

The next section broadly describes water and territory issues in Syrian–Turkish relations. The subsequent section presents the basic assumptions of the evolutionary framework. The implications and interpretations of results follow the presentation of the model. The final section concludes the analysis.

## 2. CONFLICT DIMENSIONS IN SYRIAN–TURKISH RELATIONS

Turkey and Syria, the upstream and the midstream riparian states in the Euphrates–Tigris basin, have a long history of antagonistic relations around water, territory, and terrorism. Together these contributed to adverse relations and ensuing tension between the two riparian countries until the capture of Abdullah Öcalan, the leader of the PKK (acronym for Kurdish Workers Party), by Turkey in 1999. Now known as KADEK (acronym for the Congress for Freedom and Democracy in Kurdistan), the PKK aims at forming an independent Kurdish state in Turkey. During the 1980s and 1990s, the party received Syria's support with the twin objectives of extracting Turkish concessions on water and territory issues Beschorner (1992), Cohen (1993), Frey (1993), Olson (1992), Robins (1991), Starr (1991).

The issue of territory centers on Hatay which became a part of the French Mandate of Syria after the First World War. In 1936, France signed an agreement with Syria thereby ending its mandate. Turkey requested France to grant Hatay the same status as Syria and Lebanon, as Hatay was not cited in the agreement. Following the French refusal, Turkey and France brought the issue before the League of Nations, which conferred the status of special enclave (entité distincte) on Hatay in 1937. Although the territory was put under joint Turco-French guarantee, Hatay became independent in governing its interior affairs and adopted Turkish as its official language. Following general elections, Hatay proclaimed itself an independent republic in 1938 and became a part of Turkey through a plebiscite in 1939. To this date Syria considers this decision as invalid.

The water issue between Turkey and Syria concerns the Euphrates. Syria has opposed the building of dams and other projects that harness waters of the Euphrates River in upstream Turkey. Joined by Iraq, it also insists that Turkey fix a water quota between 700 $m^3/s$ and 1,000 $m^3/s$ for downstream flow. This exceeds the agreed annual average water flow of 500 $m^3/s$ that was fixed in 1987 by Turkey in return for Syrian cooperation in security matters. According to Bağış (1997), a Turkish water flow lying between 700 $m^3/s$ and 1,000 $m^3/s$ would preclude optimal performance of the GAP (Turkish acronym for the Southeastern Anatolia Project), including several dams and hydroelectric power plants. Syria and Iraq also fear that both the quantity and quality of water will diminish once the GAP fully becomes operational. While there exists a tripartite commission composed of technical personnel from the riparian countries that irregularly meets to discuss these issues, none of the commission's activities or other proposals (such as the Turkish three-stage plan) have thus far resolved conflicting demands in the basin (Lowi 1993; Kolars and Mitchell 1991; Bağış 1991; Naff and Matson 1984).

The Turkish government is uncertain whether Syria has given up its claim over Hatay. In fact, a Turkish diplomat indicated that Turkey would not like Syria to bring the Hatay issue up following an agreement over water (Sarıibrahimoğlu 1995, p. 8). Such linkages seemingly constitute a political norm in all river basins (LeMarquand 1977). For example, Syria reduced the water flow to Iraq in 1974 and 1975 as Iraq favored the closure of all negotiation possibilities with Israel after the Yom Kippur War (Walt 1987, p. 133; Lowi 1993, p. 59).

There are three game-theoretic analyses of the terrorism-water issue-linkage. These studies assume, in general, rationality of players and that the Syrian support to terrorism constitutes a major foreign-policy tool. Güner (1997) models the conflict as a war of attrition, Güner (1998) searches for the implications of Syrian uncertainty about Turkish preferences with respect to the mutual conflict outcome, and Güner (1999) investigates the conditions of various alliance combinations in the basin among Turkey, Syria, and Iraq. The first study reveals that unilateral concessions depend on whether the associated costs and benefits are equal for the riparian states, i.e., costs of continuing the conflict and the benefits from water. Otherwise, if riparian states evaluate future costs and benefits asymmetrically, the propensity to unilaterally concede depends not only on costs of conflict and water benefits but also on discounted future benefits and costs. The second piece of work indicates that Syrian misperceptions about Turkish costs of conflict have no impact upon Turkish water policy. Different Syrian beliefs about how the issue-linkage harms Turkey do not result in a Turkish concession. The third study points towards the possibility of Turkish–Iraqi and Syrian–Iraqi alliances with Iraq acting as a balance to threats in the basin.

A Turkish–Iraqi alliance is likely if Iraq perceives that Turkey would concede provided that Syria ceases its support to the Kurdish separatists. An Iraqi–Syrian alliance is by no means automatic as Turkey is the upstream riparian state in the basin and can give significant advantages to Iraq at the expense of Syria. With terrorism off the agenda in Syrian–Turkish relations, the situation could lead to an alliance between Turkey and Iraq.

## 3. EVOLUTIONARY FRAMEWORK

There are two major advantages of using an evolutionary game: first, it does not require the restrictive assumption of purely rational players, and, second, it offers the possibility of dynamic interpretations of interactions (Boulding 1991; Kandori, Mailath, and Rob 1993; Maynard Smith 1982; Maynard Smith and Price 1973; Selten 1991; Young 1993). In this game, Syria and Turkey are not assumed to be unitary or rational players; they can make mistakes. They are not assumed to make conscious choices or to be able to compute and anticipate every respective move. The relaxation of the rationality assumption does not imply that strategies bringing low benefits are selected. Success is imitated. Thus, learning still occurs under limited capacities of information processing and of computation of best moves. Simply actions bringing higher rewards are more frequently chosen.

Evolutionary games model interactions within or between large populations. Syrian and Turkish foreign policies with respect to the issue-linkage are assumed to make up the respective populations. Interaction is not between unitary rational players, Syria and Turkey, but between masses of Syrian and Turkish foreign policies. These large populations contain different foreign-policy types or templates. Some Syrian templates may adopt a hostile stand with respect to Turkey but some others can be more cooperative recognizing (directly or indirectly) Hatay as a Turkish territory. Similarly, some Turkish foreign policies may favor a water concession but some others would raise objections against such a move. Either Syrian or Turkish decision makers such as political leaders, diplomats, or experts can adopt a specific template. If a template proves to be successful, more decision makers use it.

An evolutionary framework has two major implications in this case. First, matched foreign policies do not necessarily constitute best replies. Syrian and Turkish foreign policies are randomly matched in pairs resulting in an aggregate behavior rather than conscious and calculated moves. Only successful foreign policies survive and unsuccessful policies ultimately become extinct. Second, foreign policies do not suddenly change directions. Even if a foreign policy is not optimal, its fitness excess is sufficient for it being chosen in the next period (Fudenberg and Levine 1998, p. 71). The evolution of foreign policies thus takes time.

In theoretical terms, hawks and doves respectively depict aggressive and nonaggressive behavioral traits in a population. The recent Syrian signals about a possible acceptance of Hatay as belonging to Turkey and the Syrian–Turkish agreement of 1987 indicate that doves and hawks in fact exist in both populations. We assume that hawks and doves fully describe existing behavioral traits of large populations of Syrian and Turkish foreign policy possibilities. Those hostile and noncooperative foreign policies are labeled hawks and doves those that are in general cooperative. The fitness of each foreign policy is defined as its aggregate or average payoff in its repeated encounters with opposing hawks and doves. Foreign policies that bring greater expected payoffs than average become dominant, otherwise they slowly disappear.

## 4. EVOLUTIONARY GAME

Territory and water are assumed to be paramount issues representing intrinsic values for Syria and Turkey. To assert that water is a valuable resource around that corner of the world is a truism. As for Hatay, it constitutes an undeniable burden in Syrian–Turkish relations and a substantial value for both countries. Huth (2001, p. 241) cites Hatay as a potential dispute between Syria and Turkey indicating that Syria can still claim it. Syrian–Turkish relations contain a genuine likelihood of war with territory being a central issue (Vasquez 1996, p. 534). Both issues are associated with significant gain and loss prospects. A water concession implies a diminution of Turkish welfare but an increase in Syrian welfare. Similarly, a Syrian recognition of Hatay as a Turkish territory means a loss for Syria but positively affects Turkish welfare. Consequently, water and territory issues shape the fitness of any foreign policy.

We assume that Syrian hawks, denoted by Y, $0 \leq Y \leq 1$, are those foreign policies that consider Hatay as a Syrian territory. In contrast, Syrian doves, denoted by $1 - Y$, are those Syrian foreign policies that regard Hatay as belonging to Turkey when paired with Turkish doves. Similarly, Turkish hawks, denoted by X, $0 \leq X \leq 1$, are defined as those Turkish foreign policies that reject water concessions. Turkish doves, denoted by $1 - X$, instead support an increased amount of water flow to

Syria on the basis of an international agreement. Pairs of foreign policies from respective populations are repeatedly selected to interact.

Syrian doves are cooperative and recognize Turkish sovereignty over Hatay when they are paired with Turkish doves. However, if they are paired with Turkish hawks, they can be either cooperative or not. Let q denote the likelihood that Syrian doves recognize Hatay as a Turkish territory in their encounters with Turkish hawks. Similarly, Turkish doves give a water concession when matched with a Syrian dove. They can become less cooperative facing Syrian hawks. Let p denote Turkish doves' propensity to give a water concession in their encounters with Syrian hawks. Hawks are perpetually noncooperative. Turkish hawks never give a water concession and Syrian hawks never recognize Hatay as a Turkish territory. Hence, unlike hawks of both populations, doves, either Syrian or Turkish, are assumed to behave differently towards hawks and doves of the opposing population. Doves are cooperative towards doves but not so cooperative toward hawks of the opposing population. When two doves from respective populations are matched, the result is mutual cooperation: Syrian dove accepts Hatay as belonging to Turkey and Turkish dove signs an agreement increasing the water quota flown downstream.

No water concession or a territorial recognition is obtained in Syrian hawk–Turkish hawk interactions. This is the current status quo. For convenience, the fitness of Turkish and Syrian hawks is normalized to 0 in this case. A Syrian hawk can obtain a water concession encountering a Turkish dove. The only difference between this outcome and the normalized status quo is the likelihood of a water concession by Turkish doves denoted by p. Therefore, when matched, Syrian hawks and Turkish doves respectively obtain pwS and – pwT, where wT and wS are positive parameters measuring respectively the importance of water for Turkish and Syrian populations. The fitness of Syrian hawks increases and that of Turkish doves decreases.

When matched with a Syrian dove, Turkish hawk's fitness increases if Hatay is recognized as a Turkish territory. The difference between the status quo and this outcome is the likelihood of territorial recognition by Syrian doves. The fitness of Turkish hawks therefore becomes $qh$ and that of Syrian doves $-qh$ where the positive parameter $h$ measures Turkish hawks' fitness increment deriving from Syrian territorial recognition. Syrian doves are assumed to lose what Turkish hawks gain in terms of territorial recognition.

Finally, in interactions among doves, there are concessions over both issues. Hatay is recognized as a Turkish territory and Syria obtains a water concession. The recognition of Hatay lowers the fitness of Syrian doves but boosts that of Turkish doves. Similarly, the water concession boosts the fitness of Syrian doves but lowers the fitness of Turkish doves. The fitness of Turkish and Syrian dove respectively becomes h − wT and wS – h. These assumptions imply the game below:

| | | **Syria** | |
|---|---|---|---|
| | | **Hawk (Y)** | **Dove (1 − Y)** |
| **Turkey** | **Hawk (X)** | $0, 0$ | $qh, -qh$ |
| | **Dove (1 − X)** | $-pw_T, pw_S$ | $h - w_T, w_S - h$ |

*Figure 1: Syrian–Turkish Water/Territory Conflict as an Evolutionary Game.*

## 5. EVOLUTIONARY STABILITY

Assuming that doves, either Syrian or Turkish, concede or do not and that the fitness parameters of water and territory can or cannot be equal, the general game in Figure 1 implies four evolutionary variants. In addition, there are two parameters related to water and territory for each population. For each population these parameters can be equal or unequal with either territory or water weighing more than the other. Hence, nine possible cases exist in each variant with two parameters taking three distinct values each. These nine cases are:

1) wS = h; wT = h,
2) wS = h; wT < h,
3) wS = h; wT > h,
4) wS < h; wT = h,
5) wS < h; wT < h,
6) wS < h; wT > h,
7) wS > h; wT = h,
8) wS > h; wT < h,
9) wS > h; wT > h.

With four variants and nine cases, there are thirty-six evolutionary games in total. The equilibrium analysis is simple. The concept of evolutionary equilibrium, also known as evolutionary stable strategy (ESS), corresponds to strict Nash equilibrium in games where there are two different populations (Syrian and Turkish populations in our case) each possessing two distinct behavioral traits (hawks and doves). ESS and strict

Nash equilibrium concepts are equivalent in these games (Gardner 2003, p. 226). Strict Nash equilibrium implies that all unilateral deviations from equilibrium strategies induce a payoff reduction. The deviator may lose nothing when others stick to their equilibrium strategies in non-strict Nash equilibria. As to the ESS, it indicates the ultimate state that interacting populations will evolve into: both populations will consist of one behavioral trait only. If an ESS implies, for example, dove–dove interactions, this means that respective populations will ultimately contain doves and no hawks.

## Variant 1: p = q = 0

Either Syrian or Turkish doves do not concede when matched with hawks of the opposing population. The stage game matrix becomes, as seen in Figure 2, below:

| | | *Syria* | |
|---|---|---|---|
| | | ***Hawk (Y)*** | ***Dove (1 − Y)*** |
| ***Turkey*** | ***Hawk (X)*** | $0, 0$ | $0,0$ |
| | ***Dove (1 − X)*** | $0, 0$ | $h - w_T, w_S - h$ |

*Figure 2: Variant 1.*

In none of the nine cases a strict Nash equilibrium and therefore an ESS exists. There is no evolutionary stability under these conditions. No predictions can therefore be made about the evolution of Syrian and Turkish foreign policies. For example, if wS = wT = h, all entries are zero in the game matrix, all outcomes constitute Nash equilibrium and none is strict.

## Variant 2: p = q = 1

Either Syrian or Turkish, doves concede when matched with hawks of the opposing population. The stage game reduces to (Figure 3):

| | | *Syria* | |
|---|---|---|---|
| | | ***Hawk (Y)*** | ***Dove (1 − Y)*** |
| ***Turkey*** | ***Hawk (X)*** | $0, 0$ | $h, -h$ |
| | ***Dove (1 − X)*** | $-w_T, w_S$ | $h - w_T, w_S - h$ |

*Figure 3: Variant 2.*

There exists a unique strict Nash equilibrium, and therefore an ESS, in all nine cases: hawk–hawk. Hence, populations will finally contain only hawkish foreign policies.

## Variant 3: p = 0, q = 1

Syrian doves concede when matched with Turkish hawks (unlike Turkish doves matched with Syrian hawks). The stage game reduces to (Figure 4):

| | | ***Syria*** | |
|---|---|---|---|
| | | ***Hawk (Y)*** | ***Dove (1 − Y)*** |
| ***Turkey*** | ***Hawk (X)*** | *0 , 0* | *h, −h* |
| | ***Dove (1 − X)*** | *0 , 0* | $h - w_T , w_S - h$ |

*Figure 4: Variant 3.*

There is no strict Nash equilibrium, and therefore no ESS in any of the nine cases under these conditions. No predictions can be made.

## Variant 4: p = 1, q = 0

Turkish doves concede when matched with Syrian hawks (unlike Syrian doves matched with Turkish hawks). The stage game becomes, as seen in Figure 5:

| | | ***Syria*** | |
|---|---|---|---|
| | | ***Hawk (Y)*** | ***Dove (1 − Y)*** |
| ***Turkey*** | ***Hawk (X)*** | *0 , 0* | *0,0* |
| | ***Dove (1 − X)*** | $-w_T , w_S$ | $h - w_T , w_S - h$ |

*Figure 5: Variant 4.*

Again, no strict Nash equilibrium and therefore an ESS exists in any of the nine cases. Hence, similar to the previous variant, no prediction can be made regarding the evolution of Syrian–Turkish relations.

## 6. EVOLUTIONARY IMPLICATIONS AND INTERPRETATIONS

If cooperative Syrian and Turkish foreign policies act like hawks encountering hawkish foreign policies of the opposing population, no stability is reached in Syrian–Turkish relations. Hence, even if populations fully contain hawks, doves would find a fertile environment to proliferate, and, similarly, if they contain only doves and no hawks, hawks could by mistake enter the population and proliferate. Accordingly, there will be a constant change in the relative frequencies of Syrian and Turkish foreign policy traits over time. It is impossible for one foreign-policy type to totally out-compete the other. No state of bilateral relations will be immune to invasion.

Doves and hawks will continually replace each other in respective populations if Turkish doves do not support water concessions matched with Syrian hawks, yet Syrian doves recognize Hatay as a Turkish territory in their encounters with Turkish hawks. In this case, Turkish doves are cooperative only with respect to Syrian doves. Syrian doves are however cooperative, even matched, with hawkish Turkish foreign policies. The indeterminacy in Syrian–Turkish relations still rules when this situation is reversed: Turkish doves give a water concession encountering obstinate Syrian foreign policies in the territory issue and Syrian doves act like hawks matched with intransigent Turkish foreign policies in the water issue.

If doves, either Syrian or Turkish, are cooperative even when they encounter conflictual types of opposing populations, then an evolutionary stability is reached. This is the only instance where both foreign policy populations ever reach stasis: the state of the equilibrium will ultimately consist fully of hawkish foreign policies. Those foreign policies that never concede in either water or territory issues will finally dominate respective populations. Those dovish foreign policies that enter populations by mistake (mutants) will become extinct, i.e., not survive at all. Unconditional cooperation leads to stable conflict. Thus, those doves that behave differently depending upon the type they encounter do not become extinct. Instead of producing mutual cooperation in riparian relations, unconditional cooperation in dovish foreign policies stimulates noncooperative foreign policies in both populations. This type of doves can be sporadically observed in riparian relations, yet they can never dominate foreign-policy populations. Syrian–Turkish relations cannot evolve into a stable peaceful outcome.

Allan (1996) indicates that wheat imports in the region make up "virtual water" as wheat is a water-intensive commodity. Thus, as long as these countries can import food in international markets, imported wheat can be substituted for the scarce water resources at home. Under the condition that Syria can easily make up for water shortages through wheat importations, or, if the Turkish Southeast Anatolian Project (comprising more than twenty dams upstream over the Euphrates and the Tigris rivers) ultimately facilitates cheap agricultural trade in the region by its completion, water may become a lesser concern than territory.

The model implies that none of the above possibilities carry any weight in Syrian–Turkish relations, however. The evolution of foreign policies will not change direction irrespective of whether water-intensive commodities are cheaply produced and play a central role in riparian countries' trade or Hatay suddenly loses its importance for Turkey. What counts is the concessional behavior of dovish foreign policies.

## 7. CONCLUSIONS

These results do not follow game rules assuming rational, omniscient players who can predict each move but rules of thumb, boundedly rational and aggregate behavior of large populations. Yet, they provide support for earlier game-theoretic analyses and permit alternative explanations as well. Reformulations of fitness functions for hawks and doves in both countries and alternative criteria of evolutionary dynamics can be considered as extensions of the present research. In general, the model indicates that an inherent instability underlies Syrian–Turkish relations. If foreign policies in both countries ever evolve into a stable state, they will only be conflictual.