

Israel and the PLO: A Game with Differential Information

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I. PREFACE

This article seeks to identify and analyze the respective considerations taken by Israel and the PLO in formulating policies on the Israeli–Palestinian conflict. Because of the diversity of views represented in Israel, the PLO cannot establish Israel's true position and is thus unable to make use of information on Israel in planning its own move. Similarly, Israel is unable to determine whether the PLO has adopted a *minimalistic* position or continues to adhere to its *maximalistic* goals. Each side must take into account the fact that the other side has only incomplete knowledge regarding its adversary. In our model, each side also takes into account the various possible beliefs that the other side may hold about it.

A consistent analysis of the situation described above calls for application of *noncooperative games in strategic form with incomplete information*. The “incomplete information” refers to the fact that each player (side) is unable to determine the other side's genuine interest. For an analysis within this framework, we must also assume that each player is aware of the (incomplete) information held by the other(s) about him.

The conflict between Israel and the Palestinians is over territories west of the Jordan River and over the level of self government by the Palestinians in some

of these territories. We assume that no political settlement is possible without PLO agreement and explicit or implicit participation. (It is possible to construct a parallel model rejecting this assumption.)

In this analysis we shall present the PLO as Player I (rows player) with three policies (rows) and two possible types. Israel is presented as Player II (columns player) with four policies (columns) and two possible types.

We describe the situation in the medium term planning horizon, that is, three to five years. Second, the other conceivable players in the arena—for example, the U.S. and Jordan—are not ignored; their strategic behavior is incorporated in the considerations leading to the construction of the outcomes. Further discussion on the scope of our analysis is included in Section 7.

Section 2 presents a short review of the main concept of strategic games with differential and incomplete information. It can be skipped at first reading. The game is constructed in three steps in Sections 3, 4, and 5, and solved in Section 6. Interpretation of the solution is presented in Section 7.

In Sections 3 and 4 the relatively objective parameters of the situation (i.e., part of the data) are described.

Each of the two players faces a whole spectrum of policies, which we rank from the most conciliatory to the most aggressive. Our first task is to limit the range of policies of each player. Israel's dependence on the U.S. restrains it from adopting the most aggressive policies, while the popular consensus within Israel determines the bound on its most conciliatory policies. Similarly, Palestinian popular support and the survival of the PLO determine its most conciliatory policy. (The most aggressive policy for the PLO is that of the rejectionist factions.)

The shape of the function relating pairs of policies to outcomes is quite simple. If both players choose aggressive policies, the probability of war increases, whereas if both players select conciliatory policies, the chances of a settlement increase up to certainty. If an aggressive policy of one side is pitted against a conciliatory policy of the other side, the *status quo* may prevail (Figure 1).

To make this functional relation more precise, we group the policies of each side into three to four classes and describe representative policy for each group; we then present the outcome corresponding to each pair of these policies. Even when each side follows a preselected policy there may be uncertainty attached to the resulting outcome. So once again, out of all possible outcomes, we specify four elementary (representative) outcomes, and assign to each pair of policies either one of these elementary outcomes or a lottery over the elementary outcomes.

The next step (Section 5) is to select possible rankings over the (elementary) outcomes that each side in the conflict may have. Here we need not represent every view held by some Israeli or some Palestinian. Rather, we need only represent those preferences that might be adopted by Israeli and PLO decision makers, respectively. We suggest two representative (von Neumann–Morgenstern)

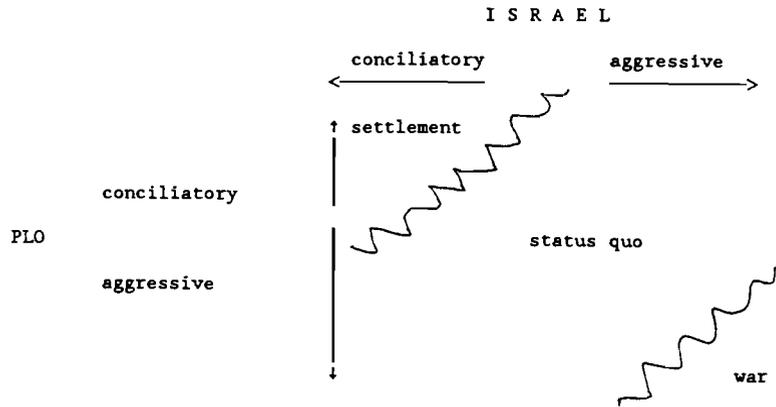


FIG. 1. The policy spectra for Israel and the PLO.

rankings over the (elementary) outcomes for each of the two sides. The inherent uncertainty of a game with differential information is that each side's ranking of outcomes is not known to the other side before the game is played, and may not be revealed even after the game has been played.

A test of our selection of policies, outcomes, and rankings lies in the properties of the (Harsanyi)–Nash equilibria of the game (Harsanyi, 1967–1968). If the equilibria are robust and not inconsistent with our perception of reality, then our choices are not unreasonably arbitrary. Another desired property of an equilibrium is its being a pure strategy and not a mixed strategy equilibrium. We elaborate on these topics in Section 7.

However, we should like to make it clear that this is a pilot study on the subject. The game theoretic construction is the simplest possible. A next step would be to increase the number of players, types and policies, and to model it as a dynamic game with a larger time horizon.

2. GAMES WITH DIFFERENTIAL INFORMATION

An n -player game in strategic form is constructed in two steps. First, an *outcome function* is defined: Each of the n players has a (finite) set of *policies* (or *strategies*). A *combination* of policies is an n -list of policies, one for each player. An *outcome* is interpreted as the result of the game arrived at when each player follows a policy available to him. An *outcome function* assigns an outcome to each combination of policies.

Secondly, evaluations of the outcomes by players are introduced. It is assumed that each player has a (complete and transitive) *ranking* of the outcomes (indifference is allowed).

A combination of policies is an *equilibrium* if no player can do better, i.e., obtain an outcome ranked above the equilibrium outcome by switching to another policy available to him. A game may have no equilibrium. To resolve this problem von Neumann introduced the concept of *mixed policy*. A player's mixed policy is a probability distribution over his (pure) policies. A combination of mixed policies results in a probability distribution over the outcomes. To enable the player to compare different probability distributions over outcomes, *ordinal* ranking of outcomes does not suffice, and *cardinal* (von Neumann–Morgenstern) utilities must be attached to outcomes. A *payoff function* assigns his von Neumann–Morgenstern utility of the corresponding outcome to each combination of policies and to each player. Nash (1951) proved that each such game described by its payoff function has at least one equilibrium (in mixed strategies).

Several difficulties may be encountered in modelling a conflict situation by a game as described above. It may, for example, be difficult to establish who the participants to the conflict are, which policies are available to the player, and what the resulting outcomes are and how they are ranked, ordinally or cardinally, by the different players. In other words, players may not know with certainty the characteristics of other players or the rules of the game in which they are engaged. Furthermore, they may recognize this uncertainty as well as the uncertainty about themselves held by other players.

To analyze such situations in a game-theoretical framework, Harsanyi (1967–1968) suggested the concept of a *type* of a player. A player's type is a conceivable resolution of uncertainties by other players relating to his characteristics, i.e., his cardinal ranking of outcomes and his probability distribution over combinations of types of other players. Harsanyi showed that all uncertainty can be reduced to uncertainties about types of players. Thus, a *game with incomplete information* consists of an outcome function and of sets of types, one set for each player. A *strategy* of a player is a mapping that assigns a policy of this player to each of his types.

One can think of such a game as played in the following sequence. First, nature selects a combination of types, one for each player, according to a given *prior* probability. Next, each player is informed of his type, i.e., his cardinal ranking over outcomes and his probability distribution over the types combinations of other players. Each type's distribution is the posterior or the conditional with respect to the prior probability. Next, the selected types choose (simultaneously) their policies, and an outcome results. The players chose their strategies before being informed of their respective types. However, it is assumed that every player knows the outcome function and the characteristics of all possible types. Every player also knows that all players possess this knowledge, and knows that each player knows, etc. An *equilibrium* is a combination of strategies such that for each player, the policy assigned to each of his types is a best response to policies played by combinations of types of other players, weighted according to his (the type's) distribution.

Harsanyi explicitly assumed the existence of a prior probability distribution, from which the types' distributions are derived (Bayesian consistency assumption). In our application, as well as in many other applications this assumption is too restrictive. The types in our application are conceivable parties or factions in Israel and the PLO, respectively. The assumption that each type of each player knows and studies the characteristics and beliefs of the possible types of the other player(s) is not unreasonable. However, there is no basis for assuming that the probabilistic beliefs of players' types are consistent. An incomplete information game without the consistency assumption is referred to as a *game with differential information*.

The rest of the paper is devoted to a detailed construction of such a game, and to the analysis and interpretation of its equilibria.

3. POLICIES

Severe restrictions must be imposed on the process of enumerating available policies, lest the process becomes an infinite one. In trying to present the most likely policies Israel and the PLO could adopt, we use the following procedure: We start by identifying several premises that seem acceptable to almost all decision makers in both camps. We then, by a procedure of elimination and inference, try to infer from these premises the policies that should be taken into account in a formalization of a strategic game.

3.1 ISRAEL

3.1.1 Premises

- (I) The strategic and military balance of power in the Middle East will remain at its present state, that is Israel will remain dominant.
- (II) Israeli decision makers will maintain, or adopt, policies that have a good chance of satisfying a large popular *consensus*.
- (III) Israeli decision makers will not adopt policies that can lead to an open confrontation with the U.S. (Yariv, 1982, pp. 19–20).

3.1.2 The Consensus

- (I) Israel's security is its most vital concern. (Avineri, 1986, p. 4; Horowitz, 1975, p. 14).
- (II) The city of Jerusalem should remain unified (Gazit, 1983, p. 116; Yariv, 1982, p. 23).
- (III) Israel should remain Jewish and democratic in character (Allon, 1980, p. 112).

3.1.3 Implications

The above discussion rules out three policies:

- (I) Full withdrawal to 1967's lines (rejected on the basis of lack of national consensus) (Peleg, 1984, p. 252).
- (II) Full annexation (rejected on the basis of lack of national consensus and U.S. opposition) (Peleg, 1984, p. 252).
- (III) Acceptance of a Palestinian state in the West Bank (rejected on the basis of lack of national consensus). (Perlmutter, 1985, p. 152)

This leaves us with four possible policies from which the Israeli decision makers might choose:

(A) *Active status quo*: An intensive settlement policy of Jewish settlements in the occupied territories, expropriation of lands, active opposition to any cooperation between Palestinians on the West Bank and the Gaza Strip and the PLO, and "heavy-handed" steps, such as collective sanctions and expulsion of local leaders (Ma'oz, 1984, pp. 161–203).

(B) *Liberal status quo*: Economic liberalization with some political concessions, enlarging of public service facilities, investments in infrastructure, facilitating of Arab investments and money transfers to the West Bank and the Gaza Strip, etc. (Ma'oz, 1984, pp. 151–159).

(C) *Transfer of authorities*: The transfer of political and administrative functions from the Israeli military and civil government to city councils and other local civil bodies on the West Bank and in Gaza, thus significantly reducing Israel's military presence and day-to-day involvement in the populated areas of the occupied territories (Shalev, 1982, p. 98).

(D) *Territorial compromise*: Willingness to enter into negotiations with Jordan and some sort of Palestinian delegation towards complete withdrawal of Israel from most of the territories occupied in 1967 (Allon, 1973, pp. 8–9).

3.2 THE PLO

3.2.1 Premises

- (I) The strategic and military balance in the Middle East is in Israel's favor.
- (II) Engagement in the political process is necessary; refusal to do so would increase the risk of a political settlement without participation of the PLO (al-Hasan, 1982; Abu Iyad, 1984; Abu Jihad, 1984).
- (III) The armed struggle against Israel must continue to prevent political arrangements unfavorable to the PLO (al-Hasan, 1982; Abu Iyad, 1984; Abu Jihad, 1984).
- (IV) The PLO leadership must adopt policies that rely on a minimum consensus shared by most PLO factions and the Palestinian people, in order to

maintain the PLO's effectiveness and its status as the sole representative of the Palestinian people.

- (V) Organizational unity or at least effective collaboration must be maintained among all Palestinian factions; inner division risks the PLO's long term survival (Mishal, 1986, pp. 21, 48, 151).

3.2.2 *The PLO Minimal Consensus*

- (I) The Palestinian people have a right to self-determination. ("Resolutions," 1977, p. 189).
- (II) The Palestinian people have a right to territorial sovereignty ("Resolutions," 1977, p. 189).
- (III) Prior and unilateral recognition of Israel are unacceptable as preconditions for political negotiations ("Political Program," 1974, p. 224; "Arafat," 1985).
- (IV) The ultimate political goal of the PLO should remain the establishment of a secular-democratic state in all of Palestine, that is, in Israel, the West Bank, and the Gaza Strip (Abu Iyad with Rouleau, 1981, p. 225; al-Hasan, 1985).

The above premises rule out a policy of unilateral and unequivocal recognition of Israel and public renouncement of the armed struggle prior to the establishment of a Palestinian State in the West Bank, or at least prior to the achievement of some tangible political and territorial gains. This leaves us with three possible policies.

(I) *Yes/No policy* emphasizes the political process with a possible compromise on armed struggle and unity (Mishal, 1986, p. 150). The PLO might be willing temporarily to cease, or to minimize, the armed resistance at the price of friction and dispute within the organization. At the same time, the PLO would be reluctant to participate in direct negotiations unless clear cut territorial gains were guaranteed a priori.

(II) *No/Yes policy* emphasizes the armed struggle while allowing, to some extent, diplomatic activity (Agha, 1976, p. 20). Since diplomatic activity, according to this policy is regarded as a tactical means of achieving the ultimate goal rather than a strategy to achieve an agreement, the PLO would be very reluctant to lower the intensity of its armed struggle.

(III) *No policy* emphasize the willingness to sacrifice possible political gains in favor of intensive reliance on armed struggle. Attributing little, if any, benefit in the short run to the political process, such a policy will tend to amplify the armed resistance, regarding it as the sole means of achieving PLO political goals (Garfinkle, 1983, pp. 631-638).

4. OUTCOMES AND OUTCOME FUNCTION

Once each side has chosen its preferred policy the outcome is a function of the strategic balance of power between the parties to the conflict, and of the external dominant factors. Regarding the balance of power, we have already mentioned Israel's military dominance in the area. As for the external factors, we believe it is necessary and sufficient to focus on the U.S. and Jordanian roles as determinant factors concerning the possible outcomes.

Both Israel and the PLO perceive the U.S. role as critical. This fact manifested itself in the mediation role played by the U.S. between Israel and the PLO before, during, and after the 1982 Lebanon War (Schiff and Ya'ari, 1984, p. 37; Mishal, 1986, pp. 158, 165).

Jordan's role is decisive because Jordan sees itself as the sovereign of the West Bank, and therefore a prominent and direct partner to any negotiations (Carter, 1982, p. 404; Susser, 1979, p. 241) and because Israel has insisted since 1967 that negotiations on the future of the West Bank will be conducted by Israel and Jordan with the possible inclusion of West Bank and Gazan Palestinians as part of a joint Jordanian-Palestinian delegation (Mishal, 1986, pp. xii-xiii). At the same time, Israel refuses to negotiate with the PLO or to accept representation of the PLO in the above mentioned delegation (Rabin, 1986).

4.1. POSITIONS

We now turn to a brief description of the U.S. and Jordanian positions and their effect on the outcomes of the Israeli and the PLO policies.

4.1.1 *Premises*

- (I) The U.S. will be willing to consider PLO participation in the negotiation process if the PLO recognizes Israel and unequivocally accepts UN Security Council Resolution 242 as a basis for peace talks ("Memorandum," 1975).
- (II) The U.S. will be ready to admit the PLO into the negotiation process if the PLO publicly renounces its armed struggle against Israel.
- (III) A negotiated settlement of the Israeli-Arab conflict and the Palestinian problem is perceived by the U.S. as important and beneficial to its interests in the area (Sicherman, 1978, Chap. 2).
- (IV) The U.S. sees in Israel and in Jordan important allies, contributing to the political stability in the Middle East, and therefore will always consider seriously their respective interests (Garfinkle, 1984, p. 24).
- (V) Jordan's position, especially since the 1982 PLO withdrawal from Beirut, has become closer to that of the U.S. administration. Jordan rejects the PLO position that the U.S. should recognize the Palestinian right for self-determination as a precondition to its acceptance of UN Security

Council Resolution 242 and the renouncement of its armed struggle against Israel ("King Hussein's speech," 1986).

- (VI) Jordan's national interest is to maintain its political influence over the West Bank in any future political settlement (Avishai, 1983).
- (VII) Because of its demographic composition and its political status in the Arab world, Jordan cannot pursue a negotiation process for long without the explicit or implicit consent of the PLO (Saunders, 1985-1986, p. 320).

4.1.2 Inferences

- (I) The U.S. will refuse to support direct participation of the PLO in peace negotiations under the PLO's conditions.
- (II) The U.S. will not tolerate Israeli steps towards annexation and/or prolonged reprisal measures against the local population in the West Bank and the Gaza Strip, since in the U.S. view, such measures might drastically minimize future prospects for a peaceful settlement of the Israeli-Arab conflict (Saunders, 1975, pp. 178-180).
- (III) Jordan will not be able to publicly enter bilateral negotiations with Israel over the West Bank in the face of strong PLO opposition, unless Jordan can secure a full Israeli withdrawal.

4.2 THE OUTCOMES

Before presenting the outcome function, we shall describe the outcomes themselves. We have grouped all relevant outcomes into four elementary categories: comprehensive settlement, narrow settlement, *status quo*, and armed conflict. Their main characteristics being presented in Table I.

By armed conflict, we mean a large scale military operation that involves, in addition to the Israeli army and possibly some PLO units, a regular army of one or more Arab states.

4.3 NOTATION

A notation will now be introduced to simplify the consecutive tables.

Israel's policies

- TC Territorial compromise (comprehensive)
- TA Transfer of authorities (narrow settlement)
- LSQ Liberal *status quo*
- ASQ Active *status quo*

TABLE I
Characteristics of the Outcomes

	Comprehensive settlement	Narrow settlement	Status quo
Military	Full Israeli withdrawal from populated West Bank areas. Demilitarization or deployment of Jordanian military forces.	Reduction of Israel military presence in highly populated areas. Establishment of local police forces. Some tacit or overt cooperation with Jordan.	Maintenance of full military presence in the West Bank.
Political	Establishment of joint Jordanian-Palestinian rule over the West Bank within the framework of confederation/federation with Jordan.	Transfer of day-to-day civil administrative functions to local bodies. Close cooperation with Jordan. Some freedom of expression for Palestinian national aspirations, allowing some political activities beyond the municipal level.	Situation may vary between adoption of heavy handed policy towards leaders and local bodies suspected of engagement in mass civil disobedience, and adoption of flexible policies, such as appointment of local Palestinian figures as mayors in all West Bank cities, or willingness to allow municipal elections. Simultaneously, Israel might shift to the freezing of Jewish settlements.
Economic	Open border and economic relations between Israel and the West Bank, Gaza Strip, and Jordan.	Open-bridges policy and some economic relations with Jordan.	Policies may fluctuate between increasing or reducing control over investment and other economic activities.

PLO's policies

- Yes/No Emphasis on political process with possible compromise on armed struggle
- No/Yes Emphasis on armed struggle with possible diplomatic activity
- No Rejectionist approach

Elementary outcomes

- CS Comprehensive settlement (withdrawal from at least 70 percent of the occupied territories)
- NS Narrow settlement

TABLE II
The Outcome Function

PLO	Israel			
	TC	TA	LSQ	ASQ
Yes/No	CS	0.5 NS 0.5 SQ	0.8 SQ 0.2 NS	SQ
No/Yes	0.8 SQ 0.2 NS	0.8 SQ 0.2 NS	SQ	0.8 SQ 0.2 AC
No	SQ	SQ	0.8 SQ 0.2 AC	0.6 SQ 0.4 AC

SQ Status quo

AC Armed conflict

In the construction of the outcome function (Table II) we use probabilistic combinations of elementary outcomes as well as some of the elementary outcomes themselves.

The suggested outcomes are a direct result of the premises and inferences mentioned above. For methodological convenience, we shall explain the matrix in two steps. We begin by considering the case in which Israel chooses one of the two versions of settlement as preferred policies. We then explain the case in which Israel adopts one of the two versions of *status quo* as its preferred policy. One should keep in mind that a comprehensive and/or a narrow settlement requires a partner.

4.4 ISRAEL ADOPTS POLICIES LEADING TO SETTLEMENT

Suppose Israel were to adopt a territorial compromise or a transfer of authorities policy. Jordan and the U.S., led by their respective interests, would tend to follow suit. The outcome would then be determined by the PLO position. A Yes/No policy of the PLO would enable Jordan to continue its political dialogue with Israel towards the achievement of a comprehensive settlement. However, Israeli transfer of authorities policy would meet with only partial success because of lower incentives for Jordan and the PLO.

A No/Yes position by the PLO would decrease Jordan's ability to maintain the dialogue and remain a potentially valid partner for a negotiated settlement. Yet there is still a low probability that exceptional diplomatic skills might lead to some sort of narrow settlement. A comprehensive settlement would not be a viable option since No/Yes policy regards diplomatic activities as tactical means of serving the armed struggle and not as a strategy to achieve an agreement. A

PLO transient position (rejectionist line) would block the possibility of Jordan participating in negotiations. With no partner, the most probable outcome would be a maintenance of some sort of a *status quo*.

4.5 ISRAEL ADOPTS STATUS QUO POLICIES

If Israel were to adopt one of the two versions of *status quo* as a preferred policy, it would be highly unlikely that the U.S. would put heavy pressure on Israel to negotiate any settlement against its will. Yet, if Israel were to adopt the liberal version of the *status quo*, while the PLO maintained its Yes/No policy, there would be some probability that the outcome would be a narrow settlement. That is so because of U.S. and Jordanian tendencies, combined with the PLO's adoption of the Yes/No policy, leaves some room (i.e., positive probability) for a negotiated settlement. PLO adoption of a No/Yes policy would reduce U.S. and Jordanian pressure on Israel. The outcomes would then most probably be close to Israel's preferred policy.

However, an active *status quo* policy by Israel, or alternatively, a No policy (rejectionist position) by the PLO might increase resistance and noncooperative behavior on the part of the West Bank and Gaza Strip Palestinian population. A rejectionist strategy by the PLO might also radicalize Israel's position towards the West Bank, encouraging the "no retreat" camp, as well as other elements, to take tough measures against the Palestinian population and further steps leading to a *de facto* annexation. Such radicalization might lead to a large scale military operation between Israel and some of its Arab neighbors. Under these circumstances, an active rather than liberal *status quo* policy on behalf of Israel might increase the probability of war.

5. PLAYERS' TYPES AND THE PAYOFF FUNCTION

5.1 DEFINITION OF TYPES

From the spectrum of opinions in each of the two camps we restrict our attention to two representative types for each player. Rather than adopt the misleading nomenclature of "doves" and "hawks," we use the terms "minimalists" and "maximalists." Note, however, that according to our methodological approach, a player's type is completely characterized by his NM utilities over outcomes and his probabilistic beliefs over the other players' types.

The minimalist type of each player is ready to consider the possibility of a settlement that accords certain territorial and/or political gains to the other player. The Israeli minimalist is motivated by his concern over the Jewish and democratic character of Israel, and his belief that Israel's security is not compromised by these territorial concessions. The PLO minimalist is motivated by his

realization that under the prevailing circumstances, no level of sovereignty and self-determination for the Palestinians is likely to be achieved without compromise.

The maximalist type of each player prefers the *status quo* to any sort of compromise conceivably acceptable even to the other side's minimalists. Maximalists on both sides believe that time is on their side. Both also believe that NS is a significant step toward CS, which both oppose.

5.2 RANKING OF TYPES (TABLE III)

Putting ourselves in the place of each type and keeping in mind all that was said up to here, we suggest the von Neumann–Morgenstern utilities each type attributes to any of the possible outcomes.

It is useful, in this context, to clarify further the costs and benefits associated with each possible outcome. Benefits refer to the extent to which each of the four outcomes advances the political interest of each type; costs refer to the political price that each type will have to pay for the concessions required by each outcome.

We consider two major types of costs. First, a political settlement of the conflict requires both sides to agree to some territorial and political compromise. As substantive territorial and/or political concessions are opposed by the majority on both sides, any settlement will be associated with a cost for each type of each side. Second, we assume that an armed conflict is considered as a cost to each type of each side.

The evaluation of benefits depends on each types set of priorities. They are, thus, discussed separately.

5.3 THE ISRAELI MINIMALIST TYPE

Narrow settlement is the preferred outcome because it maintains Israel as a democratic and Jewish state, while involving only minor territorial concessions.

Status quo provides the Israeli minimalist with no substantive benefits but it saves him possible costs on the territorial and political issues.

Comprehensive settlement provides an adequate answer to the issue of the Jewish and democratic character of Israel. On the other hand, it entails high costs in terms of territorial and political concessions. We rank CS (maximum benefit–maximum cost) lower than SQ (no benefit–no cost) for two reasons: (a) because of uncertainty, an existing no cost–no benefit outcome is likely to be preferred over a maximum benefit–maximum cost outcome; (b) given the Israeli political context, CS (or even striving for it) might endanger the political effectiveness of this type.

AC (Armed conflict): Because an armed conflict involves a heavy cost and no apparent benefits, it is ranked as the least desirable outcome.

TABLE III
Types (Ranking and NM Utilities)

Israel		PLO	
Minimalist	Maximalist	Minimalist	Maximalist
NS 1.0	SQ 1.0	CS 1.0	SQ 1.0
SQ 0.5	NS 0.3	NS 0.3	AC 0.7
CS 0.3	AC 0.1	SQ 0.1	NS 0.3
AC 0.0	CS 0.0	AC 0.0	CS 0.0

5.4 THE ISRAELI MAXIMALIST TYPE

Giving a high priority to the idea of annexation of most of the territory under dispute, a *status quo* enables the Israeli maximalist to stay with what is most dear to him without having to face any apparent cost. In his opinion, time is on his side, allowing for *de facto* annexation.

Narrow and comprehensive settlements impair the highly valued interest of the maximalist type. This is why both outcomes are ranked so low. Since the CS requires more concessions than the NS, the CS is ranked below the NS.

Armed conflict and comprehensive settlement are both regarded as being very costly by the maximalist type. It is thus difficult to specify clearly their respective ranks. In ranking the AC a little higher we rely on what seems to be a good instance of revealed preference. Many Israeli and non-Israeli observers of the 1982 Lebanese War argue that one of Israel's motives for engaging itself in this war was a growing concern on the part of the Israeli government that the PLO might be ready to enter negotiations and thus might generate some sort of a comprehensive settlement.

5.5 THE PLO MINIMALIST TYPE

Comprehensive settlement provides tangible political and territorial rewards and reduces the risk of Israeli annexation of the West Bank. Combined, they seem to endow a remarkable benefit to the PLO's present leadership. Compared to these material benefits, the costs attached to such a political compromise are admissible.

What is true for the CS outcome might not be true for the narrow settlement outcome. To achieve an NS, the PLO leadership must commit itself to the political process just as much as in the CS case, thus it is likely to pay a similar political cost. On the other hand, the benefits it may draw from such an outcome are much lower.

It is evident that a *status quo* represents a costly outcome for the PLO mini-

malist type. It includes a risk of annexation and of a gradual decline of PLO control over the Palestinian population in the West Bank.

Armed conflict is ranked slightly lower than SQ because the 1982 Lebanese war showed that Israel might exploit a future AC to eliminate the PLO leadership and destroy the organization militarily.

5.6 THE PLO MAXIMALIST TYPE

Narrow and comprehensive settlement are much less favorable than SQ and AC because they entail a different degree of compromise, which is regarded by the maximalists as of no use to the achievement of the PLO goals. CS is considered least favorable, as it entails a risk of a permanent compromise. The same argument holds to a lesser degree for the NS.

The high position of *status quo* on this scale could be explained by the following: Aware of the internal disagreement in Israel and the fragile demographic balance between Jews and Arabs incorporated in the existing territorial *status quo*, the PLO maximalist believe that time is on the Palestinian side.

Armed conflict is not the preferred outcome of the PLO maximalists because of the high chances of an Israeli victory which, in turn, would delay the achievement of the ultimate PLO goal.

5.7 EACH TYPE'S PROBABILITY DISTRIBUTION ON THE TYPES OF THE OTHER SIDE (TABLE IV)

In the next section it will be shown that we need not impose restrictions on α and γ . Restrictions on β and δ are used in the computation of the equilibria.

5.8 CONSTRUCTION OF THE PAYOFF FUNCTION

In order to construct the payoff function of our differential information game we need simply insert the NM utilities of each type of each player from Section 5.2 into the outcome function of Section 4.3 (see Table V).

TABLE IV
Each Type's Probability Distribution on the Types of the Other Side

PLO	Israel			
	Minimalist		Maximalist	
Minimalist	α	γ	$1 - \alpha$	δ
Maximalist	β	$1 - \gamma$	$1 - \beta$	$1 - \delta$

TABLE V
Payoff Function

PLO	Israel							
	Minimalist				Maximalist			
	TC	TA	LSQ	ASQ	TC	TA	LSQ	ASQ
Minimalist								
Yes/No	0.3 1.0	0.2 0.75	0.14 0.6	0.1 0.5	1.0 0.0	0.2 0.65	0.14 0.86	0.1 1.0
No/Yes	0.6 0.14	0.6 0.14	0.5 0.1	0.4 0.08	0.86 0.14	0.86 0.14	1.0 0.1	0.82 0.08
No	0.5 0.1	0.5 0.1	0.4 0.08	0.3 0.06	1.0 0.1	1.0 0.1	0.82 0.08	0.64 0.06
Maximalist								
Yes/No	0.3 0.0	0.65 0.75	0.86 0.6	1.0 0.5	0.0 0.0	0.65 0.65	0.86 0.86	1.0 1.0
No/Yes	0.6 0.86	0.6 0.86	1.0 1.0	0.4 0.94	0.86 0.86	0.86 0.86	1.0 1.0	0.82 0.94
No	0.5 1.0	0.5 1.0	0.4 0.94	0.3 0.88	1.0 1.0	1.0 1.0	0.82 0.94	0.64 0.88

In each entry the lower lefthand number is the payoff in NM utility to the (rows player) PLO according to his type and the policies played by PLO and Israel (corresponding to this entry). The upper righthand number is the corresponding payoff to Israel (the columns player).

6. COMPUTATION OF THE EQUILIBRIA

In this section the computation of Nash equilibria of the game constructed in Section 5.8 is presented in detail. An equilibrium strategy assigns, by definition, a policy to each type of each player that is a best response against policies of other players. First, note that the PLO minimalist has a dominant policy, Yes/No; i.e., it is a best response to every policy of the other player. Similarly, transfer of authorities is a dominant policy for the Israeli minimalist.

Indeed, Yes/No guarantees the largest payoff, 1, to the PLO minimalist against Israel's territorial compromise. Similarly, $0.2 > 0.14$ and $0.2 > 0.1$, $0.14 > 0.1$ and $0.14 > 0.08$; and $0.1 > 0.08$ and $0.1 > 0.06$.

For the Israeli minimalist 0.75 is larger than 0.6, 0.5 or 0.3; 0.6 is the largest among 0.6, 0.5, and 0.4, and 0.5, is the largest among 0.5, 0.4, and 0.3. The fact that the minimalist of both sides have a dominant policy does not depend on the numerical utilities of the outcomes but only on the ordinal ranking of the outcomes by the minimalists and the outcome function. (See the two tables in Sections 4.3 and 5.2.)

We now turn to the computation of the equilibrium policies of the maximalists of each side. The Israeli maximalist gets the same outcome playing TA or TC against No/Yes and No, but he strictly prefers playing TA to TC against Yes/No. As we assume that the Israeli maximalist assigns positive probability to the PLO being minimalist, ($\delta > 0$), TC is dominated by TA for the Israeli maximalist, and will not be used by him in any equilibrium.

For computational convenience, suppose now that Israeli maximalist plays against the PLO maximalist. Taking into account the above considerations, we have a three by three game that has three (pure strategy or pure policy) equilibria: (Yes/No, ASQ), (No/Yes, LSQ) and (No, TA). Each of these equilibria yields the SQ outcome, i.e. NM utility of 1 to each side. It is easy to see that if each of the maximalists assigns a positive but small probability that his opponent is a minimalist, the three policy pairs above are still components of equilibria (see Table VI).

Equilibrium 1 is an equilibrium for any belief of the Israeli maximalist ($0 \leq \delta \leq 1$), but the PLO maximalist must assume that the chances of an Israeli minimalist are 0.22 at most. If $\beta > 0.22$, then the PLO maximalist will prefer to switch to No/Yes.

Equilibrium 2 holds only if $\beta \leq 0.3$ and $\delta \leq 0.54$. Equilibrium 3 requires no assumption on β but $\delta \leq 0.46$ is required.

TABLE VI
The Equilibria

	PLO		Israel	
	Minimalist	Maximalist	Minimalist	Maximalist
EQ1	Yes/No	Yes/No	TA	ASQ
EQ2	Yes/No	No/Yes	TA	LSQ
EQ3	Yes/No	No	TA	TA

TABLE VII
The Equilibria Outcomes

PLO Israel	Minimalist Minimalist	Minimalist Maximalist	Maximalist Minimalist	Maximalist Maximalist
Eq.Out.1	0.5NS 0.5SQ	SQ	0.5NS 0.5SQ	SQ
Eq.Out.2	0.5NS 0.5SQ	0.2NS 0.8SQ	0.2NS 0.8SQ	SQ
Eq.Out.3	0.5NS 0.5SQ	0.5NS 0.5SQ	SQ	SQ

The equilibrium outcome (Eq.Out.) corresponding to the equilibrium depends on the actual realization of types. So the types' dependent equilibria outcomes are as shown in Table VII.

We have found that our game has three (pure strategy) equilibria, EQ1, EQ2, and EQ3, if the following beliefs are common knowledge: $0 \leq \alpha \leq 1$, $0 \leq \beta \leq 0.22$, $0 < \gamma \leq 1$, and $0 \leq \delta \leq 0.3$. There is no other pure strategy equilibrium for these values of the beliefs' parameters. Furthermore, if the inequalities above are strict, i.e., $\beta < 0.22$ and $\delta < 0.3$, then the above equilibria exist even if other parameters of the game, i.e., the NM utilities, are slightly changed.

For the sake of demonstration let us consider the special case in which $\alpha = \gamma' = 0.8$ and $\beta = \delta = 0.2$. These beliefs are consistent in the sense of Harsanyi, i.e., there exists a (prior) probability distribution over the types' combinations that induces (as conditional or posterior probability distribution) the values of α , β , γ , and δ above. Specifically, the probability of both sides being minimalists or both being maximalists is 0.4. The probability that the PLO is minimalist and Israel is maximalist or vice versa is 0.1 each. Assuming that this probability distribution is common knowledge we can compute the equilibrium outcomes (types independent): Eq.Out.1 is then 0.25NS, 0.75SQ; Eq.Out.2 is 0.24NS, 0.76SQ and Eq.Out.3 is 0.25NS, 0.75SQ.

Note, however, that in reality we assume only the range of the beliefs, parameters to be common knowledge. Also, since there are three equilibria, game theory does not predict which equilibrium will arise. Moreover, without some additional assumptions, the theory does not claim that an equilibrium will be achieved. Our heuristic is that if a combination of strategies is played for some time, it is an equilibrium. However, in the short run, different players may play equilibrium strategies of different equilibria.

No mixed strategy equilibria has been discussed. In deciding on a policy it seems inconceivable that in a one-shot situation a player will randomize, i.e., being indifferent between several policies, he will choose one of them according to a prespecified lottery dictated by the equilibrium, and (stochastically) independent of any parameter of the game. A claim may be made that from an observer's point of view a player may seem to be randomizing. However, such opponent randomizing does not imply that a mixed strategy is played. In the spirit of this paper, the randomization results in the selection of the player's type, who, in turn, plays a pure strategy.

7. INTERPRETATION

7.1 THE ACTUAL SITUATION

We shall now relate the equilibria computations of Section 6 to the actual situation. Our ability to predict the player's behavior depends on his type. If the player is a minimalist we can safely predict the policy he will follow. This is true for the Israeli as well as the PLO minimalist. The former will follow the transfer of authorities (TA) policy, whereas the latter will play the Yes/No policy. The maximalists types of both players, on the other hand, are unpredictable. Each of the maximalists may choose any of three available policies: the PLO maximalist may play Yes/No, No/Yes, or No while the Israeli maximalist may play TA or a version of the *status quo* policy, either LSQ or ASQ. The Israeli maximalist will not consider territorial compromise as a viable option.

Hence, considering the outcome function (Section 4.3), we rule out the possibility of comprehensive settlement in the intermediate range future, regardless of which types prevail on either side. If at least one of the two players is a minimalist, we rule out the possibility of an armed conflict.

Our conclusions are based on the assumptions that players employ only equilibrium policies. However, if there is more than one equilibrium policy available, the players might find themselves out of an equilibrium outcome. This may happen when there is insufficient communication between the players and each of them chooses an equilibrium policy of a different equilibrium. In our case, it may occur when both players are maximalists. Note also that maximalists are

less communicative with each other than the minimalists. Some of the outcomes out of equilibrium that may occur when two maximalists employ policies of different equilibria include positive probability of AC. Thus, our prediction for the intermediate range future includes the possibility of an armed conflict if maximalists prevail on both sides.

7.2 A HISTORICAL PERSPECTIVE

A way of gaining insight into the validity of our analysis, as well as to test our model, is to look back at past experience. Let us make a bold assumption that the basic situation and the basic options in the conflict between Israel and the PLO has essentially remained the same since the beginning of the 1970s. (During this period, until now the observed outcome was SQ with an exception of AC during the Lebanese War of 1982). The war of October 1973 is not viewed as part of the Israel-PLO conflict according to our analysis.

The persistency of the SQ outcome lends credibility to the assumption that the simultaneous occurrence of minimalists on both sides must have been extremely rare.

It appears that one can find independent confirmation that since the early 1970s the Israeli type has been largely maximalist (Harkabi, 1986, pp. 105–109). Indeed, the Israeli governments under every prime minister from Golda Meir to Itzhak Shamir, with the possible exception of Shimon Peres, played a version of SQ (LSQ or ASQ) almost all the time, as far as we know, with Menachem Begin playing TA at least once, i.e., when he suggested the autonomy plan to the Palestinian problem at Camp David. The positions of President Carter guaranteed that it was actual TA policy and not just a public relations act.

As previously shown, TA policy is consistent with Israel being the maximalist type, whereas the AC outcome contradicts it being the minimalist at the time. On the other hand, the PLO's reaction to the autonomy plan at Camp David, as well as its subsequent acts, which contributed to the outbreak of the Lebanese War, are inconsistent with the PLO's minimalist type, as defined in Section 5.5. However, we do not adhere to the implication that the PLO was then of the maximalist type as defined in Section 5.6. We rather suggest that the PLO's type(s) before the 1982 Lebanese War were different from those described in Section 5. Specifically, it seems that (both) the PLO's types then ranked AC above SQ. Indeed our motivation for ranking SQ above AC for both types of PLO stems from its experience during that war, during which Israeli types were also influenced.

One of the main conclusions of the present analysis is that in the actual dynamic situation we try to model, several processes are simultaneously at work. In the short run, there is a groping toward equilibrium in case that there is more than one equilibrium. This also extends to a reevaluation of the probabilistic be-

iefs of each player's type about the types of the other player. There is also, in the long run, a more fundamental change in the players' types, namely, their ranking of outcomes.

In other words, it seems that in situations of prolonged conflict in which the basic options remain essentially unchanged, the parties concerned in the conflict may vary their goals. Each side's policy in such a conflict with incomplete information, is aimed not only at achieving its intermediate goals and misleading the opponent as to the player's true type (if such a misrepresentation is advantageous), but also at altering the other player's type. Whereas the analysis of repeated games with incomplete information deals with the misrepresentation aspect of strategies, an endogenous change of types has not yet been analyzed in detail. Stochastic games seem the most promising models for such analysis.

However, an empirically valid long term model of the Israeli-Palestinian conflict does not seem easily attainable at present, and the discussion here does not alter our main conclusions of Section 7.1 for the medium term future.

NOTE ADDED IN PROOF

The Intifada stretches the definition of Status Quo (as an outcome) to its limit and, to some extent, varies the rankings (Table III). Yet, the basic options and policies remain unchanged.

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