Optimal Strategies in Linguistic Games

Jonathan Pool

University of Washington
Seattle, Washington

Introduction

Why is this book in English?

An insider can offer several answers, such as these:

1. Because the Editorial Group insisted that all papers be in English.
2. Because English is the native language of the book's honoree.
3. Because all of the authors can write in English, and some can write only in English.
4. Because Mouton can sell more copies of an all-English book than of a plurilingual book.
5. Because more of the existing literature in linguistics is in English than in any other language.

These answers, in turn, lead to further questions: Why did the authors do what the Editorial Group asked? Why is English the major language of linguistics? And so on. Explaining a particular linguistic event can involve hypothetical links in an infinitely long and thus intractable causal chain.

To avoid an infinite regress, we explain events by limiting the classes of allowable causal links. We may focus entirely on historical, or attitudinal, or biological, or political variables, for example. We create, implicitly or explicitly, rigorously or impressionistically, a closed system with a finite number of kinds of components interacting according to a finite number of rules. If the system is rigorously defined the result can be thought of as the scientific analog to a computerized spread-sheet program. A given set of assumptions yields a given set of results. Change one assumption and the results get recalculated. We have what is popularly called a 'what if' model: it tells us what

Offprint from:
Joshua A. Fishman et al. (Editors)
The Fergusonian Impact
Vol. 2: Sociolinguistics and the Sociology of Language
© 1986 Mouton de Gruyter, Berlin · New York · Amsterdam. Printed in Germany

would happen if our assumptions were true. Consider the following what-ifs.

What if linguistic situations were the products of 'rational' choices made by individuals and other actors among known sets of alternatives? What if each actor preferred some situations to other situations and tried to make those choices that would bring about the situations most preferred by that actor? What if an actor could not always know what choice to make because the situation depended on several actors' choices?

These what-ifs typify one kind of closed system, called a 'game'. The term 'game' has, of course, been connected to language in other ways, notably by Wittgenstein (Pitkin 1972: 39-73) and Farb (1974: 4-6). Here the term is used as in the mathematical theory of games. This theory is a set of analytical tools for deriving predictions from models that contain assumptions like those above: assumptions sometimes summarized under the heading of 'strategic interdependence'. Would it make sense to think about language as a game? Let's try it.

Language and the theory of games

In the theory of games (see Hamburger 1979, Luce & Raiffa 1957, Zagare 1984), a game has 'players'. The players make 'choices'. Their choices yield 'outcomes'. The outcomes affect the players' 'utility'. These are the four basic ingredients of a game.

Ingredient 1: players. Who are the players in linguistic games? It would not be surprising to see the players described as 'individuals'. In the real world, individuals do appear to make linguistic choices. Game theory is not, however, intrinsically individualistic. The players could be families. They could be institutions, such as schools and governments. Could they be speech communities? Could they be languages? If we can imagine a speech community or a language making choices and having utility, then we could define a model of a linguistic game in which speech communities or languages are players.

Ingredient 2: choices. What choices do the players in linguistic games make? Certain linguistic choices are commonly recognized. Individuals make choices of whether or not to learn a second language. If they choose to learn one, they choose which one to learn. Those competent in more than one language choose which language to speak or write in. Persons not competent to understand the language in which something is spoken or written choose whether to obtain a

translation of it into a language which they can understand. Families, it might be thought, choose which language or languages to adopt for home communication. Schools choose which languages to use as media of instruction and which languages to teach as second languages. Governments choose official languages. 'Language strategists' (Weinstein 1983: 62-78) choose which languages and language varieties to promote and with which groups, ideals, and symbols to associate them. It could be argued that speech communities choose whether to maintain or abandon their languages. Perhaps it even makes sense to think of languages themselves as choosing whether to represent new exogenous concepts by borrowing or translating foreign terms.

Ingredient 3: outcomes. What are the outcomes of the players' choices in linguistic games? The theory of games does not claim the power to predict the substantive content of an outcome. Strictly speaking, an outcome is just one of the sets of player choices that the rules of the game allow. Consider a college student deciding whether to take Chinese, French, or neither. The other players, from that student's viewpoint, might be the two professors teaching these languages. The professors' alternatives might be to teach like taskmasters and to teach like entertainers. If these are the only players and their only alternatives, then there are twelve possible outcomes in this game. Each outcome is a set of choices, such as: Student chooses Chinese, Chinese professor chooses style T, French professor chooses style E. If an outcome has certain effects such as raising the student's course grade or helping the student pass the Foreign Service examination, game theory does not pretend to help discover such effects.

Ingredient 4: utility. The players in a game must be actors who care about the results of their choices. To be more precise, each outcome must add to or substract from each player's utility (otherwise known as 'happiness') by a certain amount. The amount can vary from one outcome-player combination to another, but the effects of the various outcomes on a player's utility must be consistent. Consistency requires that preferences be 'transitive'. Suppose you are playing a game in which you and another author of a competing chemistry textbook are each deciding whether to write in Arabic or French. If you prefer having your book be the only one in Arabic to having it be the only one in French, and you prefer having it be the only one in French to having both books be in French, then it would violate the transitivity requirement for you to prefer both books being in French to having yours be the only one in Arabic. If you prefer X to Y and Y to Z you must prefer X to Z. The same logic extends to 'expected' outcomes, as well, that is combinations of possible outcomes, each with a certain probability of taking place. Consistency of preferences requires that a player's preference schedule look as if the player weighted each outcome in such a combination by its probability of occurrence. The theory of games assumes that, whenever two alternatives faced by a given player can be shown to differ in such a way that under all circumstances one of them yields an expected outcome preferred by that player to the other alternative's expected outcome, the player will choose the former. Consistency does not require factual accuracy, however. If a chemist prefers to have his book be the only one in French on the basis of false beliefs about the future education policy of his government, his preference is no less real for being misguided, and it can still be consistent with his other preferences.

In general, a game can offer a given player any number of opportunities to make choices. These opportunities are called 'moves'. In any game, whether single-move or multi-move, each player can be said to exercise a 'strategy', i.e. a personal rule for making choices during the game. Suppose, for example, that a game includes as its players three parliamentary candidates for the same seat, each of whom chooses for each campaign speech one of two languages commonly spoken in the seat's constituency. Each candidate knows which languages the other candidates have used in their previous speeches. Then a candidate's strategy is a rule specifying, for all possible sequences of prior language choices by the other two candidates, which language to use for the next speech.

In principle, a strategy can be 'mixed', i.e. can specify a randomized choice among alternatives based on certain probabilities. Would anyone ever want to leave a linguistic choice up to chance? At least in the areas of language testing and cryptography, it is obvious that the answer is yes. Teachers randomize the elements of linguistic competence on which they test their students. The communicators of secrets randomize the codes used to transmit their messages. Whenever another player could, by predicting your choices, influence the outcome of a game to your detriment, you may find that a mixed strategy is preferable to a 'pure' strategy.

Beyond these universal properties of games, there are many distinctions of possible relevance to games modeling linguistic behavior. It is worth mentioning the most prominent of these distinctions.

A 'strictly competitive' game (often called a 'zero-sum game') is one which can be analyzed as if there were a fixed amount of total utility and the various outcomes merely divided that utility differently among the players. Thus there would be no possibility of a creative escape from the conflicts of interest among the players. Some interpretations of language politics in multilingual states (e.g. Rabushka & Shepsle 1972) suggest that language politics might best be modeled as a strictly competitive game among ethnic groups.

A 'cooperative' game is one in which the players can negotiate and make binding promises. Although a youth deciding which language to take in school is presumably unable to reach agreements with similarly situated youths in other countries to study the same language, governments may be profitably modeled as having such an ability with respect to the languages they teach or require in their countries' schools.

A 'coalition' game is a cooperative game in which players choose to join other players to form a group with the power to control resources. One can understand a linguistically diverse society as one in which the benefits to members of a coalition depend on whether that coalition is linguistically homogeneous. Efficient exploitation of the spoils of victory might be hindered in a linguistically divided coalition. The longevity of popular support for a governing coalition, however, might require that it include players from more than one language group.

A game can have any number of players, from one to infinity. A one-person game, often called a 'game against nature', models situations in which the utility of a player depends only on the choices made by that player and on chance events. From a player's perspective, choice situations often appear to be one-person games. When you are deciding which language to study or in which language to write a novel, you probably think of your decision as having an effect on your own utility but not on the utility of others. Even if you think your choice will benefit or hurt others, you probably think of the dicisions of others as independent of your own. For example, when you decide whether to learn Esperanto you might consider how many literary magazines are published in it, but you probably don't consider that your own decision to learn or not to learn could also influence the decision of those who want to publish these magazines. Regardless of whether other actors are objectively involved, when a player acts as if the choices of all others were independent of the player's own choices, then the player can be analyzed as playing a one-person game.

In a two-person game, two players are both aware of each other's existence, each other's choices, each other's part in determining the outcome, and the effects of the outcomes on each other's utility. Two-person games are widely used to model situations of interdependence between two main actors, such as arms races, battles, courtships, and criminal trials. There are also linguistic situations involving two main players. The governments of France and the Federal Republic of Germany, for example, appear to be playing a game in which each player chooses whether to promote vigorously the teaching of the other country's language in its own schools or allow freedom of student choice and the consequent predominance of English in each country in the foreign-language curriculum. A conversation between two individuals with different native languages can be modeled as a two-person game in which each player chooses which of two possible languages to use for the next utterance. Two firms negotiating a merger can be seen as playing a linguistic game if each has been using a different language for internal communication and they will now need to decide which language(s) to use in the merged firm.

This introduction has touched on some of the chief concepts in the theory of games and suggested ways in which these concepts might be relevant in applying this theory to the analysis of linguistic behavior. To see how this approach can produce actual results, we need to model in some detail a particular kind of linguistic behavior.

A bilingual conversation game

Image two bilinguals choosing which language(s) to use for a conversation, the term 'conversation' broadly construed to include not only oral but also written interaction. Suppose each player has a different native language, and each player prefers using its native language to using its second language. (The players are referred to by 'it' because they can be persons or institutions or one of each, e.g. a citizen corresponding with a government agency.) We can assume that each player, at each point in the game at which it is that player's turn to say something, has two alternatives. The player can use its native language or its second language. Player 1 will begin the conversation. The two players will take turns thereafter. The total number of turns ('moves' of the game) has been decided beforehand. We might call this game 'Bilingual Conversation'. A two-move game of Bilingual Conversation can be represented either as a 'tree' (Figure 1) or as a 'matrix' (Table 1).

The game starts with player 1 making a choice between N (using its native language) and S (using its second language). After this move, player 2 knows which choice player 1 made, and it is player 2's move. There are four possible outcomes: n, p, q, and s. Player 1 has two 'pure'

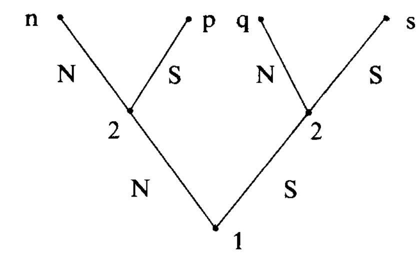

Figure 1. Tree representation of a two-move game of Bilingual Conversation.

(non-mixed) strategies: N and S. Player 2 has four pure strategies. NN and SS are noncontingent: player 2 chooses N or S, respectively, regardless of player 1's prior choice. The contingent strategies for player 2 are NS (choose your native language if player 1 chose its native language, your second language if player 1 chose its second language) and SN (choose your second language if player 1 chose its native language, your native language if player 1 chose its second language).

As a simple yet interesting case, let us assume that each player's native language is the other player's second language. Consequently, player 2's NS strategy is equivalent to reciprocation: if player 1 uses its native language, player 2 uses its native language; if player 1 uses its second language, player 2 uses its second language. Conversely, player 2's SN strategy is equivalent to imitation: whichever language player 1 starts with, player 2 continues with the same language.

Let us further assume that language choices affect players' utility only through the differential effort or discomfort in using the languages. Each player prefers to use its own native language, so player 1's favorite outcome is p and player 2's is q. Outcomes n and s, however, are harder to rank. Which is more burdensome: saying something in one's second language, or understanding something said in that language by the other player? It is like asking, 'Which would you rather be, blind or deaf?' Not all players will give the same answer. Some players, if forced to choose, will prefer to be active in the second lan-

Table 1. Matrix representation of a two-move game of Bilingual Conversation.

		2			
		NN	NS	SN	SS
1	N	n	n	p	p
	S	q	s	q	s

guage (let's call them type-A players) and some to be passive in it (type-P players). In particular, for the type-A player the fear of misunderstanding a message in a second language when there is no opportunity to study or look up or request clarification of problematic passages may be paramount. For the type-P player the discomfort of speaking or writing with inevitable errors that betray the player's nonfluency may overshadow the concern about misunderstanding, since nonfluent reception can be more easily hidden. Situational and personality differences can both contribute to whether a given player in a given game is type-A or type-P.

If there can be type-A and type-P players, then there are four variants to this game. In the AA game, both players are type-A. In the PP game, both are type-P. In the AP game, player 1 is type-A and player 2 type-P. And, in the PA game, player 1 is type-P and player 2 type-A.

With these assumptions, we can complete the description of the game by specifying how the four possible outcomes affect the players' utilities. This effect will differ from one variant of the game to another. A type-A player will prefer outcome s to n, while a type-P player prefers n to s. Table 2 lists the outcomes ranked by the players' preferences in each of the four variants of Bilingual Conversation.

Table 2. Players' outcome preferences in four variants of the two-move game of Bilingual Conversation.

Game variant	AA		PP		AP		PA	
Player	1	2	1	2	1	2	1	2
Most preferred	p	q	p	q	p	q	p	q
	s	s	n	n	s	n	n	s
	n	n	s	s	n	s	s	n
Least preferred	q	p	q	p	q	p	q	p

Having identified the four variants of Bilingual Conversation, we are ready to analyze the strategies of the players. If the game is noncooperative, i. e. offers no opportunity for negotiation, what strategies are available to player 2? At first sight, it appears that, in all four variants of the game, player 2's optimal strategy is NN: to reply in its native language regardless of what player 1 did. As we can see from Table 1, when player 1 chooses N the NN strategy by player 2 yields n rather than p, and player 2 prefers n to p in all four variants of the game. When player 1 chooses S the NN strategy by player 2 yields q rather than s, and player 2 always prefers q to s. Therefore, in each variant NN 'dominates' player 2's other strategies: it is the best strategy for player 2 reqardless of the strategy used by player 1.

What, then, is player 1's optimal strategy? In two of the games, PP and PA, player 1 also has a dominant strategy: N. Regardless of the strategy used by player 2, N yields an outcome ranked higher by player 1 than the one strategy S would produce. To see this in the PP game, note in Table 2 that player 1's preference ranking of the possible outcomes in that game is p > n > s > q. The outcomes in the first row of Table 1 (those that can take place when player 1 uses N) are always ranked higher by player 1 in the PP game than the corresponding outcomes in the second row.

In the AA and AP games, however, neither N nor S is a dominant strategy for player 1. If player 2 were to use NS, then player 1 would optimally use S. If player 2 were to use any other strategy, however, player 1 would optimally use N. In the AA and AP games, then, player 1 would like to know in advance which strategy player 2 is using. In a noncooperative game, player 1 can only guess at what player 2 will do, since they can not negotiate or even communicate. The best guess, it is usually assumed, is that the other player will use its dominant strategy whenever there is one. If so, N is player 1's optimal strategy in all four games.

We therefore expect to see all of these games end with the same outcome: n. This outcome consists of player 1's optimal strategy of starting the conversation in its native language, combined with player 2's optimal strategy of continuing in its own native language.

This result, however, seems paradoxical. Although the n outcome emerges from the use of its optimal strategy by each player, in none of the four games can n be described as the 'optimal' outcome. In the AA game, n is clearly nonoptimal, since both players would prefer s to n. In the PP game, n is superior to s, but it may not be superior to p and q, since each of the latter outcomes is preferred by one of the players. And, in the AP and PA games, by the same criterion n cannot be called superior to any of the other three outcomes.

How is it that, in at least the AA game, the use by both players of their optimal strategies produces an outcome that is definitely nonoptimal? The general answer is simple: no law of nature requires that whenever each actor pursues its own good the outcome is best for everyone - or even best for anyone. If player 2 limited itself to the noncontingent strategies NN and SS, the AA game would take the form of the widely studied Prisoner's Dilemma, in which each player has a dominant strategy but its use by each player leads to a deficient outcome.

Games of this kind can exist when the world is so constituted that an actor hurts other actors by helping itself. In our case, each player who uses its native language hurts the other player. That is the environment in which, as the dilemma is often sloganized, 'individual rationality leads to group irrationality'.

Is there anything that the players could do to change the deficient outcome, n, in the AA game to s, which both players would prefer? Neither player can do so alone. If player 1 alone changed from N to S, the outcome would change from n to q, a worse outcome from player 1's point of view. If player 2 alone changed from NN to any other strategy, the outcome would either stay the same or change to p, the latter being a change for the worse. So the strategy combination of N/NN yields an 'equilibrium' outcome, one that gives neither player alone an incentive to change its strategy. (In the AA game, it is a 'deficient equilibrium', one to which there is another outcome preferred by both players.) Although neither player alone can improve the outcome, if both players together changed their strategies they could improve the outcome from n to s. Player 1 would have to change to S, and player 2 would have to change to NS or SS.

Suppose, then, that we make the game 'cooperative', allowing the players to communicate and to make binding promises. If one player promised a strategic change to the other player before the game began, would that affect the other player's strategy? If player 1 told player 2, 'I am going to use strategy S, starting the conversation in your language', what would player 2 do? The answer: nothing. Player 2 would stay with NN, thus reaping the best possible outcome, q, which is also the worst possible outcome for player 1. Knowing this, player 1 would not make such a promise to player 2.

Players 1 and 2 are not in a symmetric situation, however. If player 2 were to promise to use the NS strategy, saying 'Whatever you do I'll reciprocate', player 1 would no longer find it optimal to start with its native language. By using S rather than N, player 1 could change the outcome from n to s, to the benefit of both players. This fact can be expressed by saying that player 2 can force player 1 to switch from N to S. The n outcome resulting from the N/NN strategy combination in the AA game is an equilibrium, but it is a 'force-vulnerable' equilibrium. One player's unilateral and irrevocable change of strategy can improve the outcome for that player by making the other player also change strategy in order to respond optimally to the first player's new strategy. The N/NN equilibria in the other three games are not, however, force-vulnerable. If either player unilaterally changes its strategy, and the other player optimizes in light of this new strategy, the new outcome will be worse for the 'forcing' player than the old outcome.

Having sketched the contours of a game-theoretic analysis of Bilingual Conversation, we can now ask the bottom-line question. What good is such an analysis? There are two conventional criteria for answering that question. First, if the analysis helps make better decisions, then it is useful. Second, if the analysis helps predict the decisions that people make, then it is useful. These two criteria – the practical and the scientific – are closely interrelated. Using the analysis of Bilingual Conversation to help make a decision about which language to use in a conversation among bilinguals requires that the analysis be predictive.

In addition to the predictions directly derivable from the assumptions of the game, we can also pursue a more speculative line of argument. The reasoning would be that behavior in real life will rarely fit the predictions of a simplified model exactly, but it will conform to those predictions more fully when the situation better fits the assumptions of the model than when it has a poorer fit to those assumptions. It will be helpful to illustrate the kinds of predictions such reasoning can generate.

One prediction is that conversations between strangers will more frequently begin in the native language of the initiating party than conversations between prior acquaintances. The only thing that would persuade player 1 to begin with player 2's native language, in these games, is knowledge that player 2 is using the NS strategy, combined with player 1's preference for active rather than passive use of a second language. Acquaintance with player 2 might give player 1 the knowledge needed to form such a belief about player 2's strategy.

A second prediction is that native-language reciprocation will be more common in formal institutional conversations than in informal personal ones. Formal institutional conversations, we can assume, tend to have high stakes and to set procedural precedents. On both grounds the replier could be expected to fear that use of a second language would be self-injurious.

A third prediction is that bilinguisme passif (the use by each actor of its own native language) will be more common in written conversations than in oral ones. The reasoning is that writing in a second language subjects the writer to expectations of correctness that are difficult to satisfy and requires precise use of the language to overcome the low redundancy of the medium. Speaking in a second language involves lower expectations of correctness and greater opportunities for interactive clarification of intended meanings. Conversely, listening in a second language renders comprehension difficult because of the pressure of time and the gap between the listener's standard knowledge and the speaker's colloquial performance. Reading in a second language imposes less time pressure and presents a code more familiar to the reader. Oral bilingual conversations are thus expected to be AA games and written conversations PP games. To the extent that these conversations take the form of cooperative games with negotiated agreements, we should expect the n outcome (bilinguisme passif) to be more frequent in the PP game, typified by the written conversation.

The evidence on these predictions has not been evaluated, but the results of an empirical evaluation would probably be mixed. DuBow (1976: 91-2), for example, reports that in the formal institutional conversations of certain courts a conversation initiated by the court in its official language (which for our purposes might be included in the notion of 'native language') is continued by litigants in their native languages, despite the fact that they are competent in the official language. This observation seems to fit the second prediction above. DuBow attributes this behavior to deliberate defiance of court authority. The defiance motive would lead to a prediction that native-language replies are equally frequent at all levels of second-language competence. The effort-avoidance motive, on the other hand, would lead to a prediction that native-language replies become less frequent as second-language competence rises. On the other side, it is common knowledge that in many formal and informal conversations between bilinguals both parties use the native language of the initiating party. Such behavior is not predictable from the assumptions above. Further, in at least some experimental two-turn conversations where negotiation is impossible, the initiator's use of the replier's native language tends to cause the replier to use the initiator's native language (Taylor 1977: 72-3). This behavior, too, conflicts with the expected behavior in any of the variants of Bilingual Conversation.

Whenever observed behavior fails to conform to the predictions generated by our assumptions, we obviously need to reconsider the assumptions. One alternative assumption is that the players prefer to use one another's languages rather than their own. This seems reasonable whenever the players are seeking practice in a second language which they are trying to learn, when they reap pride or prestige from demonstrating second-language competence, or when they incorporate one another's comfort into their own utility functions. If both players exhibit a complete preference reversal, the preference rakings in Table 2

will simply be turned upside down. 'S' and 'N', 'q' and 'p', and 's' and 'n' will be exchanged in the resulting predictions. But in many societies there are shared beliefs about the unequal topical or situational appropriateness and the differentially specialized expressive powers of languages (see Ferguson 1974, Hymes 1974). Such beliefs can cause whole societies to favor one language over the other, rather than each community favoring its own language. Such asymmetry would strengthen one player's preference for its own native language and reverse the other player's language preference. If the player's rankings of outcomes that involve use of the 'better' language rise sufficiently, all conflict of interest among the players will disappear, as p or q becomes the top-ranked outcome for both players.

Another new assumption could be that the players value linguistic homogeneity in conversations. They may find conversation in either language more satisfying than alternation between the languages. If so, the preference ranks of n and s would fall relative to the ranks of p and q. If this change is maximal, then in all four games player 1 will have p and q, and player 2 will have q and p, as the two most preferred outcomes. Player 2 will have a dominant strategy in all games: SN. Conversations will be linguistically homogeneous, and player 1 will be able to dictate the language of a conversation merely by initiating it in the desired language, which will be player 1's native language. Thus, p will always be the predicted outcome. If, however, the game is cooperative and player 2 can commit itself to a strategy known to player 1, the N/SN equilibrium is force-vulnerable. Player 2 can announce its adherence to the NN strategy, and this fait accompli forces player 1 to use S rather than N. The advantage in the game, therefore, rests with the player that can persuasively appear to have first adopted an irrevocable strategy. A reputation for linguistic inflexibility or for being unable or unwilling to learn other languages is probably an attribute that contributes to success in this game.

A third, and contrary, new assumption would be that a player's utility is increased by reciprocation, Players may have learned to enjoy the act of reciprocation itself, they may use reciprocation as an exploratory or teaching strategy in what they perceive as a continuing series of interactions, or others may reward them for reciprocation. If reciprocation is a social norm, as apparently suggested by Taylor (1977: 72-3) to explain experimentally observed reciprocation, such rewards could be expected. To take these reasons for reciprocation fully into account it might be necessary to redefine the game as one with many moves or many players. What happens, though, if we simply assume that reciprocation is valued by the players as a matter of taste? If the value of reciprocation is great enough, then s and n (in the original order) will become the highest-ranked outcomes for both players in all four variants of the game. Player 2 then always has NS as a dominant strategy. Given that, player 1's optimal strategy is N in the PP and PA games, and S in the AA and AP games. All conversations will be linguistically split, with player 1 determining who uses which language. As before, however, player 2 can force a change to a new equilibrium, more favorable to player 2, by persuading player 1 that player 2 has irrevocably adopted NN or SS. If player 2 is a type-A player, it can declare its use of SS and force player 1 to adopt S. If player 2 is type-P, it can preempt with NN and force player 1 to adopt N.

Most of the alternative assumptions described above leave intact the asymmetry between players 1 and 2 discovered in the original game. If the players cannot negotiate, player 1 can dictate the outcome. If they can negotiate, player 1's intrinsic advantage disappears, and the outcome will be determined by either player if it can successfully commit itself to an irrevocable strategy choice. It is, then, clearly in the interest of player 2 to make the game 'cooperative': to embed the conversation in a larger interaction that gives player 2 a chance to visibly commit itself to a contingent strategy.

Conclusion

The game of Bilingual Conversation illustrates the duality of assumptions on which a game-theoretic analysis of linguistic behavior is based. On the most fundamental level, there are assumptions that go with the territory of game theory. These include the assumptions of discrete actors, identifiable choices, consistent preferences, consistent principles for selection among strategies, and reciprocal knowledge of (or at least beliefs about) the identities, choice situations, and outcome preferences of the other actors. On the optional level, there are assumptions about who the actors are, what choice alternatives they have, and what their preferences among the possible outcomes are. These are the assumptions that can be freely made and revised by the observer on the basis of substantive hunches, prior empirical research, and trial and error.

If there is one main recommendation that emerges from the games described above, it is that the outcomes of cooperative linguistic games will, under certain conditions, be substantially better for all parties

than the outcomes of the same games played noncooperatively. In practical terms, this means that the 'invisible hand' of self-interested linguistic action may not be optimal from the perspective of social welfare. Linguistic decisions that are individually rational can sometimes have negative spill-over effects on the utility of others. When that is the case, concerted and enforceable collective decisions – whether in the form of governmental language policies or in the form of freely concluded but enforceable agreements – may be linguistically beneficial to all, even though they may curtail each actor's decisional autonomy.

References

DuBow, Fred. 1976. Language, law, and change: Problems in the development of a national legal system in Tanzania. *Language and politics*, ed. by William M. O'Barr & Jean F. O'Barr, 85-99. (Contributions to the sociology of language, 10.) The Hague: Mouton.

Farb, Peter. 1974. *Word play: What happens when people talk.* New York: Bantam.

Ferguson, Charles. 1974. Language problems of variation and repertoire. *Language as a human problem,* ed. by Einar Haugen and Morton Bloomfield, 23-32. New York: Norton.

Hamburger, Henry. 1979. *Games as models of social phenomena.* San Francisco: Freeman.

Hymes, Dell. 1974. Speech and language: On the origins and foundations of inequality among speakers. *Language as a human problem,* ed. by Einar Haugen and Morton Bloomfield, 45-71. New York: Norton.

Luce, R. Duncan, and Howard Raiffa. 1957. *Games and decisions.* New York: Wiley.

Pitkin, Hanna Fenichel. 1972. *Wittgenstein and justice.* Berkeley: University of California Press.

Rabushka, Alvin, and Kenneth A. Shepsle. 1972. *Politics in plural societies: A theory of democratic instability.* Columbus: Merrill.

Taylor, Donald M. 1977. Bilingualism and intergroup relations. *Bilingualism: Psychological, social, and educational implications,* ed. by Peter A. Hornby, 67-75. New York: Academic Press.

Weinstein, Brian. 1983. *The civic tongue: Political consequences of language choices.* New York: Longman.

Zagare, Frank C. 1984. Game theory: Concepts and applications. *(Sage university paper series on quantitative applications in the social sciences,* 07-041.) Beverly Hills: Sage.