Uncertainty, Bargaining, and the Strategy of Commitment

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(Received June 29, 1971)

Implicit in the prevalence of Edgeworth's view that in bilateral monopoly the outcome within the limits of the contract zone is determined by "dissimulation" and "higgling", is the corollary that an approach toward an explanation of the outcome under bargaining — a phenomenon as endemic to the political as the economic sphere — would minimally require an analysis that focusses on uncertain expectations and bargaining "moves". If "higgling" is to be effectual, clearly each participant's concession decision must be a function of uncertain expectations as to the other's. This implies that expectations modified by uncertainty are subject to shifts, as subjective probability distributions are altered under the impact of additional information gleaned from the bargaining process itself. Unfortunately, with the introduction of variables that are characterized by and reflect various degrees of deception — i. e., bargaining tactics as usually conceived — the bargaining problem becomes exceedingly complex, and the outcome effectively indeterminate, at least in the truistic sense that positive theory has not as yet been able to provide us with rigorously predictive analysis.

However, in what is essentially a normative approach to the bargaining process, T. C. Schelling has argued that, in an indeterminate situation, rationality would in fact dictate that a bargainer *impose* determinacy by deliberately taking that action consistent with minimizing his own concession alternatives[1]. That is, bargainer A should irrevocably commit himself to his announced position, and — if no-exchange following commitment implies the imposition of mutual costs in excess of the costs of agreement — B will conclude an exchange at that price. Thus, the outcome is determinate at A's demand — determined by a "strategy of commitment".

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[1] T. C. Schelling, The Strategy of Conflict (reissue; New York 1963), esp. chap. 2 — "An Essay on Bargaining".

If Schelling is correct, a natural question that follows is: why is commitment strategy so infrequently observed in actual bargaining situations? It hardly needs to be documented that in neither of the two areas wherein bargaining is most ubiquitous — international relations, and union-employer negotiations over the wage rate — unilateral commitment as deliberate policy is rarely employed to reach agreement[2]. One purpose of this paper is to analyze and explore the concept of commitment strategy within a bilateral context, so as to see if there are in fact constraints on its use imposed by the logic of the bargaining situation itself. Beyond that, we shall take note of a primary constituent of the bargaining milieu — uncertainty — and examine the manner in which the degree of uncertainty shapes the bargaining problem and the tactics that are employed in its resolution.

I. Uncertainty and the Bargaining Problem

If the necessary conditions for bargaining exist, so that participants are "tied together" by an ability to affect the terms of settlement within a range of outcomes jointly preferable to the consequences of no-agreement, then the resultant bargaining problem is concerned with the determination of which outcome will in fact emerge. For example, in union-employer negotiations over the wage rate, the explicit intent of each participant is to achieve a settlement, but at opposite extremes of a "range of practicable bargains". This is the set of wage rates bounded by each bargainer's reservation price — the price beyond which he prefers the consequences of breakdown[3].

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[2] In union-management negotiations, the only significant example of a sustained bargaining technique even remotely akin to commitment strategy has been the "hard line" taken by the General Electric Company in negotiations with its workers in North America. See H. R. Northrup: Boulwarism, Ann Arbor 1964. The company's policy — which was to make no concessions from its initial, usually generous, offer — has, however, undergone considerable modification in the last five years.

As for international negotiations, F. C. Iklé points out that "threats are usually vague and used sparingly and... commitments frequently are kept ambiguous." F. C. Iklé: How Nations Negotiate, New York 1964, p. 75. Again, "commitments in international politics... are both vague and fluid, their binding power is hard to determine by both parties, and they are subject to change or annulment." Iklé, p. 66.

[3] A. C. Pigou: The Economics of Welfare, 4th ed., reprinted; New York 1962, p. 455.

Regarding the relationship of uncertainty[4] to the bargaining problem, there are nominally three possibilities: (1) each side is certain of the other's reservation price, (2) each side is uncertain of the other's reservation price, or (3) one side is certain of the other's reservation price; the other side is uncertain.

II. Uncertainty, the Dichotomy of Motivation, and Bargaining Tactics

In bargaining, the general relationship between uncertainty and bargaining tactics may be discerned by taking note of the forces that would tend to operate on a bargainer as he considers his bargaining posture. Within the range of potential outcomes mutually preferable to the consequences of no-agreement, a duality of forces is operative, encouraging participants to adopt tactics of both conflict and cooperation. While each side is motivated to utilize the threat of imposing costs so as to obtain a more favorable agreement than that currently offered, each is simultaneously motivated to utilize con-

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[4] Uncertainty is here conceptualized in the Knightian sense — that is, it is embodied in subjective probability, which takes into account "the various factors more or less susceptible of measurement," but yields only an "estimate of the probable outcome of any proposed course of action"; nevertheless, "the individual... throws his estimate of the value of an opinion into the probability form of 'a successes in b trials' (a/b being a proper fraction) and 'feels' toward it as toward any other probability situation." F. H. Knight: Risk, Uncertainty and Profit, New York 1921, pp. 226, 234.

A thorny problem raised by Keynes — one which we shall not attempt to resolve here — is the question of how to treat the *degree of confidence* that one holds in any particular probability judgement. Regarding the relationship between information and the "weight" that one assigns to the probability estimate itself, Keynes says: "new evidence will sometimes decrease the probability of an argument, but it will always increase its 'weight'". J. M. Keynes: A Treatise on Probability, London 1921, p. 71. However, it is not altogether clear why this should be so. Suppose a bargainer, for example, were to assign a probability p to the proposition that his opponents reservation price is greater than or equal to w. He holds some degree of confidence x in this judgement. Now, if his opponent should (perhaps inadvertently) reveal that in a similar transaction he had settled for an amount $w' > w$, the impact of this additional information may well be translated into an increase in p and in x — but by how much? The point is that there is always the possibility of a *trade-off* between subjective probability and degree of confidence. Probability p may increase by relatively little, while degree of confidence x increases by a great deal, *or* a large increase in p may be accompanied by little or even *no* increase in x.

ciliatory tactics — as long as both prefer any cooperative solution to the joint damage implied by no-agreement.

At one end of the continuum, a conflict tactic, in the pure, would be manifested by the bargainer in an explicitly firm stance that would preclude the acceptance of *any* concession by the opponent short of full concession. A more diluted tactic of conflict could involve the use of the bluff: the externalization by the bargainer of a greater degree of adherence to his position than the firmness with which he is in fact prepared to stand fast. Again, moving further in the direction of compromise, an attentuated conciliation tactic could be manifested in, for example, "quid pro quo" — an attempt by the bargainer to link his current less-than-total concession to a preceding or subsequent concession by his opponent. Finally, at the other end of the range, a pure tactic of conciliation would take the form of a full concession to the opponent's demand.

If the bargainer, then, is virtually *certain* that his prospective demand is feasible (because, say, he has what he believes to be positive information as to his opponent's reservation price), he would reasonably be inclined to (in a sense) "cash in" on certainty by abjuring conciliatory tactics, and emphasizing tactics of conflict. Thus, we have a plausible generalization: *conflict* tactics — growing out of the determination to stand fast — may be expected to result from increased certainty as to the feasibility of one's demand.

However, to the extent that the bargainer is *uncertain* as to his opponent's reservation price, to that extent he would likely be less inclined to risk no-exchange by taking an adamant stand. In itself, then, uncertainty engenders bargaining tactics of *conciliation* — what may be called the "strategy of concession".

Thus, if each side is certain of the other's reservation price, as in (1) above, the immediate implication is that conflict tactics will dominate, and — except in the special case of successful commitment, as noted below — a most likely outcome is breakdown and no-exchange[5]. Here we have the anomaly that because each side

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[5] An interesting attempt to resolve the standoff implicit in mutual certainty may be found in the Cross bargaining model. J. G. Cross: A Theory of the Bargaining Process, The American Economic Review, 55 (1965), pp. 67—94, and J. G. Cross: The Economics of Bargaining (New York 1969). Although Cross explicitly disclaims any assumption of perfect knowledge (The Economics, pp. 25—26), the Cross bargainer at time *t* nonetheless *behaves as if* he is certain not only of the feasibility of his demand, but the rate at which his opposite number will subsequently concede. Thus, at time *t*, the expected return to a Cross bargainer from holding fast is in fact conceptually identical to that of a player who knows with certainty (say, through cland-

knows that his offer "in the last analysis" is acceptable to the other, neither side is inclined to make the concession that would avert breakdown and the consequent no-exchange outcome preferred by neither[6, 7].

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estine information) that his opponent prefers a settlement at q_1 to the consequences of no-exchange, and will concede at a particular rate r_2 and no other, i. e.:

$$U_1' = f(q_1) e^{-aw} + (C_1/a) e^{-aw} - (C_1/a)$$

where U_1' = the present value to player I of demanding quantity q_1; $f(q_1)$ = the utility of q_1 at agreement; a = the rate at which player I discounts future utility; $w = (q_1 + q_2 - M)/r_2$; q_2 = player II's demand; M = total amount of the good available; r_2 = player I's estimate of II's rate of concession; and C_1 = the utility cost per period to player I of bargaining. Cross: A Theory, p. 74.

According to Cross, it is the q_1 that maximizes U_1' which bargainer I will demand as an outcome. Again, the apparent standoff which one might expect from this situation is nominally resolved via the introduction of a "learning function". Thus, in the Cross model, player I initially behaves as if he is certain of the outcome should he stand firm (otherwise, the expected return function would be modified by some degree of subjective probability less than unity), and demands outcome q_1 so as to maximize U_1'. At each stage, however, after initially making his demand in a manner consistent with certain expectations, each player's commitment to that demand turns out be only provisional. Subsequently, I observes that II is not conceding at a rate equal to r_2; therefore I's (certain) expectations are revised via a "learning function"; he now expects (with certainty) II to concede at rate r_2', which generates his new demand q_1', etc.

If we consider the mode of their decision-making within the bargaining process, then, Cross bargainers who initially behave as if they were certain of each other's concession behavior, and calculate expected return on that basis, are afflicted with a Cournot-like myopia. The circumstance that each party's expectations at time t are not realized and each feels compelled to concede at $t+1$ does not in the least diminish the faith each has either in the feasibility of his subsequent demand, or that "this time" his opponent's concession behavior will conform to revised expectations.

[6] It follows that although each firmly believes that he has control over exchange price — because he believes that "at the last minute" the opponent will accept an exchange on terms known to be preferable to no-exchange — ultimate control is in fact out of the hands of both. In the international sphere, the Cuban missile crisis of 1962 is an example of the relationship between certainty and conflict. Because the Soviet Union "knew" that the United States would prefer the installation of Soviet missiles in Cuba to an all-out conflict, and the United States "knew" that the Soviet Union would, as an alternative to war, prefer the consequences of dismantling and removing her missiles under pressure, the conflict — which neither wanted — seemed

Situation (2) — with each side uncertain as to the other's reservation price — is the general case that sets the stage for the bargaining process as usually envisaged: demand; counter-demand; the utilization of bargaining tactics such as bluff, deception, etc.; the holding to positions with various degrees of apparent firmness; compromise within the context of a multiple-concession pattern; and ultimate agreement at some intermediate price. Again, the process is considered "indeterminate" because of the overwhelming complexity involved in setting up and then empirically testing a general multi-variable theoretical model that rigorously postulates causality between psychological tactics and the outcome under bargaining.

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imminent. It was only the subsequent injection of uncertainty that permitted compromise and the ultimate agreement: the removal of missiles, and a U. S. pledge not to invade Cuba. Parenthetically, conflict would have been ensured by the strategy of mutual commitment that seemed to be developing during the initial period of the crisis.

It should be added that some outside observers have argued that the U. S. pledge not to invade Cuba was never part of the 1962 agreement. Iklé, for example, states flatly that "[Khrushchev's] demand not to invade... Cuba became lost in the shuffle, when the UN inspection (on which American negotiators made such a pledge conditional) never materialized. (Khrushchev, however, likes to pretend that the pledge had actually been given.)" Iklé, *op. cit.*, p. 196. That the pledge is very much alive and operative, however, is confirmed in a recent statement by the U. S. State Department in regard to the possible construction of a Soviet military base in Cuba. State Department officials affirmed that the Cuban missile crisis had generated an understanding wherein the Soviet Union would not introduce nuclear weapons into the Western Hemisphere, and "the United States portion of the understanding [was] described as a commitment not to invade Cuba". New York Times, Nov. 18, 1970, p. 11.

[7] In our estimation, it is a serious defect of the bargaining theories that postulate a determinate exchange price based on mutually-known utility functions, that they leave unexplained why the breakdown that one would expect is averted. Of course, one might argue that both sides will come to the realization that a breakdown is imminent, and thus agree to one or the other of the concession criteria suggested by the theories of, for example, F. Zeuthen: Problems of Monopoly and Economic Warfare, London 1930, chap. IV; J. R. Hicks: The Theory of Wages, London 1932, chap. VII; L. Foldes: A Determinate Model of Bilateral Monopoly, Economica 31 (1964), pp. 117—131; or R. L. Bishop: A Zeuthen-Hicks Theory of Bargaining, Econometrica 32 (1964), pp. 410—417. But it is important to realize that these theories are then best described and evaluated as normative, and should not have been presented in the guise of positive theories of the determination of the outcome under bargaining.

As for situation (3) — one side certain of the other's reservation price, the other side uncertain — this is the general case of which commitment strategy is a special case. In the general case, while we may not perhaps unreservedly conclude that if only one side is certain of the other's reservation price and makes an offer without commitment at or slightly below that price, the other side will ultimately be forced by uncertainty to join in an exchange on those terms, uncertainty is nevertheless an element that would be likely to influence his decision in that direction, as noted above[8].

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[8] The compelling nature of uncertainty in forcing an exchange is well illustrated by the Dutch auction, in which the price under consideration starts high and moves lower at given intervals. As described by Boulding, the method is most highly refined for agricultural commodities in the Netherlands, where buyers face a large clock-like dial, the hands of which move periodically from a high price to a successively lower price. K. E. Boulding: Economic Analysis, New York 1966, p. 39. The clock stops, and exchange is consummated at the indicated price, when a buyer pushes a button in front of him. As in an ordinary auction, the seller is proscribed by rules from actively participating in the determination of price; he is in effect a price taker (although he may, of course, insist on some minimum). The outcome price is determined as a result of interaction among buyers, and, if it turns out to be the highest reservation price, *uncertainty* will have been a factor in driving the buyer with the highest reservation price to conclude an exchange at that price.

In effect, each potential buyer A views himself as in opposition to an entity B composed of all other potential buyers. This entity itself has a reservation price: the highest reservation price held by a member within that group. With the passage of time, if and when the price under consideration reaches the reservation price of potential buyer A, his decision to press the button and conclude an exchange is a function of an implicit comparison of the benefit to be gained from an exchange at that price with the alternative cost of foregoing the expected benefit of postponing an exchange until the next time period. In essence, the decision may conceived of as depending upon whether:

$$A_t \gtreqless r_t A_{t+1} + (1 - r_t)\, \overline{A}$$

where: $A_t =$ the utility to A of exchange at time period t; $A_{t+1} =$ the utility to A of an exchange at the next lowest price; $\overline{A} =$ the utility to A of no exchange; and $r_t =$ buyer A's subjective estimate of the probability that B's reservation price is at least one increment below the price currently under consideration. The more uncertain is buyer A, the smaller is r_t, and the more likely that A will press the button and conclude an exchange at time period t.

This general conclusion, that A *may* or *may not* conclude an agreement at his reservation price depending upon the degree of uncertainty involved, serves to modify Boulding's unqualified statement that "we may *expect*

As will be clear from what follows, commitment strategy can be used to transform situation (3) into a special case of situation (1) — each side certain of the other's reservation price, with the bargaining range (if it exists) reduced to a single feasible point. Alternatively, situation (2) — uncertainty as to reservation price by both sides — can be unilaterally transformed into a special case of situation (3) by commitment strategy. In both cases, side *A* can employ a strategy of commitment so as to create or establish *B*'s certainty of *A*'s reservation price offer, and a consequent exchange at that price. With this strategy, side *A* in effect unilaterally defines the rules of the game in such a way as to exclude the possibility of his own concession. By irrevocably committing himself to his announced position, the only tactics available to him are those of pure conflict — even though, if commitment follows from situation (2), he may remain uncertain as to *B*'s reservation price until *B* actually concedes. No-exchange following commitment implies the imposition of mutual costs, and if *A*'s position is feasible, *B* will conclude an exchange at that price[9].

III. Commitment Strategy and Uncertainty

An initial, at least nominal, limitation on the applicability of commitment strategy is imposed by the premise that apparently underlies its successful use: since no-exchange would implement mutual costs, commitment as viable strategy would seem at first blush to require that the utilizer be virtually *certain* that his demand is feasible. Professor S c h e l l i n g himself supports by implication the proposition that commitment entails side *A*'s overriding confidence in feasibility, by posing no-exchange costs to be so exorbitant as to

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[italics ours] the button to be pushed by the most eager buyer at a price which is just about the highest he is willing to pay, for the most eager buyer does not know what prices the other buyers are willing to give". *Ibid.*, p. 40.

Boulding goes on to conclude that "a large number of buyers" will always ensure an outcome close to the highest reservation price. In our view, it would be more correct to say that the larger the number of potential buyers, the more uncertain is any individual buyer as to the prospect of a successful postponement strategy, and the more likely that — if given the opportunity — he will conclude an agreement at his reservation price.

[9] Note that although *A* may view *B*'s acceptance of his demand as a "concession", it is only nominally so. Consider that, commitment or no, if *B* is *certain* of *A*'s (feasible) reservation price, *B* will offer — or demand — that price, and stand firm. Side *A*'s commitment is enough to ensure *B*'s certainty of *A*'s reservation price (*A*'s demand); our feasibility assumption is sufficient to ensure that *B* will make an offer at that price.

be *clearly* unacceptable for both participants[10]. (The anomaly: A, by committing himself to accept the unacceptable if B does not comply, insures himself against having to accept the unacceptable.)

Assuming *given goals* for sides A and B, S chelling has side A implicitly consider how large the costs of noncompliance to B need to be in order to ensure success via commitment strategy. With the relatively unlimited ability to impose costs assumed by S chelling, threatened damages should be manifestly large as compared to the costs of exchange on A's terms; the threat is costless if it succeeds, and — given commitment — the greater the threat the more likely it will succeed[11]. S chelling thus argues that commitment, plus mutual costs that far outweigh the costs of compliance, equals compliance.

Regarding, then, the relationship between commitment and un-certainty, it is clear that S chelling's bargainer *is* certain of the feasibility of his commitment price. In other words, for S chelling, situation (3) implicitly prevails as an initial condition for implement-ing commitment strategy. Typically, however, bilateral power rela-tions are initially characterized by situation (2) — each side uncertain as to the other's reservation price. In the more usual case in bilateral

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[10] For example: "Atomic destruction for small misdemeanors, like ex-pensive incarceration for overtime parking, ..." (Schelling, op. cit., f. n. 7, p. 36), "If one driver speeds up so that he cannot stop, ... the latter has to yield" (p. 37), "If I threaten to blow us both to bits unless you close the window..." (p. 123), "If I threaten to blow my brains all over your new suit unless you give me that last slice of toast..." (p. 127), "If a hitchhiker pulls a gun on the driver of a car and the driver threatens to kill them both unless the hitchhiker throws his gun out the window..." (p. 183), "If I say, 'Row, or I'll tip the boat over and drown us both,...'" (p. 196). And a final illustration: "Ideally,... I should have a little black box that contains a roulette wheel and a device that will detonate in a way that unquestionably provokes total war. I then [set it going so that] on any day, the little box will provoke total war. I tell [the Russians] — *demonstrate to them* — that the little box will keep running until my demands have been complied with and that *there is nothing I can do to stop it.*" (p. 197, italics Schelling's.) Many other situations postu-lated by Schelling could be cited, all of which are characterized by a mani-festly wide gap between the cost of compliance and noncompliance.

[11] "... there is no such things a 'too large' a threat; if it is large enough to succeed, it is not carried out anyway." *Ibid.*, p. 36, f. n. 7. We might note at this point that with a *limited* potential to damage, participants with given goals may not in fact have the ability to impose costs — even mutual costs — of the size required to make no-concession an impracticable alternative for the uncommitted.

monopoly, for example, the maximum costs which either side may commit itself to imposing are limited and given, while the commitment *price* is variable and to be determined. *If* a bargainer chooses to utilize commitment strategy here, he must rationally make an implicit calculation as to his optimum demand, a calculation that for each potential demand price incorporates a subjective estimate of the probability that it is feasible.

Consider, first, a simple Schelling-like example of the use of coercive commitment to establish credibility of a threat — but in a fixed-maximum-threat context. Suppose that A and B are in a small room, both aware that any communication between them is being monitored by a neutral third party C. Suppose further that A demands one dollar from B, and, in a country wherein the penalty for lying is death, threatens to detonate the only weapon available — a noise bomb just large enough to break mutual eardrums — if B does not comply. The Schelling outcome would have B pay A one dollar. But, in this situation, why should A demand only one dollar from B? If B's assets amount to, say, $ 100 000, why should not A demand $ 5, $ 10, $ 100 — or $ 100 000? Schelling has nothing to say about how commitment price is determined[12].

In fact, B is willing to pay *some* price, perhaps less than $ 100 000, to avoid broken eardrums — but no more; if A knew what that reservation price was, he would demand that amount, and no less. Being *uncertain* as to B's reservation price, we can reasonably assume that A's choice of a commitment price will be reflected by the expected utility of commitment strategy. We may postulate a von Neumann-Morgenstern utility function, and a subjective distribution function (incorporating A's uncertainty as to B's reservation price) which together generate the expected utility of A's committing himself to each prospective outcome price. Given the usual shape of the utility and distribution functions, at some price this expected utility function will exhibit a maximum. If A acts so as to maximize expected utility, he will commit himself to this outcome, rather than to some random demand determined by what B will

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[12] If A is in fact capable of inflicting unlimited potential damage, A's demand price need be limited only by B's ability to pay, for A can always commit himself to a threat to impose costs which far exceed the cost to B of assent. In our example, instead of a noise bomb, side A could threaten to detonate a vial of nitroglycerin, so as to garner B's entire $ 100 000. Feasibility is assured by A's unlimited ability to impose costs, and the outcome is always equal to the maximum that B is able to pay.

"obviously" prefer to pay in order to avoid the consequences of non-compliance[13].

Uncertainty, then, is a significant determinant of A's commitment price — *if* A opts for commitment strategy. However, it is not clear that commitment strategy itself is unambiguously preferable to a more tractable stand[14].

IV. Commitment versus No-Commitment

First, consider the impact of commitment on future negotiations. If bargaining is institutionalized and a continuing relationship (as is the case in collective bargaining and international relations), the advantage gained from a settlement reached via commitment may be nonrecurring — offset by the disadvantage of engendering a total conflict psychology and early commitment strategy by one's opponent in future negotiations.

Now, if we abstract from its future impact, the question of whether commitment by A is the superior strategy must be answered in the affirmative for our example above. However, it is important to note that this is only because our Schelling-like example proceeds from something *other* than a bargaining situation. In other words, there is neither mutuality nor conflict of interest between the participants *before* commitment, and commitment is in fact a necessary condition to establish the congruence of interest that leads to agreement. *With* commitment by A, side B (whose status is analogous to that of a man already deaf) has something definite to gain from an exchange: sound hearing. Side A, uncertain of B's reservation price, makes a demand which yields a positive expected return. Side B, *certain* of A's reservation price (his demand, following commitment) will either himself offer that price — if it is feasible —

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[13] The maximum expected utility concept traced out here has been developed in much greater detail vis-a-vis the determination of a "target wage rate" in Zeuthen's theory of bargaining. See E. Saraydar: Zeuthen's Theory of Bargaining: A Note, Econometrica *33* (1965), pp. 802—813.

[14] It is, of course, clear that Schelling himself believes commitment to be the superior strategy. A foremost critic of Schelling's approach, J. C. Harsanyi, concedes that it would be "a rational strategy for one of the players to put forward an ultimatum containing the most extreme admissible demand he could make", except that subsequent simultaneous ultimatums would erase the advantage. J. C. Harsanyi: On the Rationality Postulates Underlying the Theory of Games. Journal of Conflict Resolution *5* (1961), p. 182. What we argue in the following is that, even apart from the disutility of a two-party ultimatum, with uncertainty commitment strategy is not necessarily or even likely to be superior to no-commitment per se.

or there will be no exchange. In this somewhat paradoxical case, side *A* might prefer to be in a position to undo his commitment and revise his demand (utilize conciliatory tactics), if it should appear in the last analysis that a no-exchange outcome is imminent; nevertheless, even if he could do so, the result would still be no-exchange — for commitment itself is a necessary condition for exchange. *Without* commitment, side *B*'s offer would drop to *A*'s reservation price — zero — since he is certain that if he refuses any positive price demanded by *A*, there is nothing to induce *A* to carry out his threat, and much to deter him.

Now, let us change our example, to make it somewhat less Schelling-like, by starting from an initial bargaining context of simultaneous mutuality and conflict of interest. Suppose that *B* is the only deaf person in town, and *A* the only ear specialist. Again, exchange involves (via treatment) sound hearing for *B* — who has a reservation price that he is willing to pay, but no more. Should *A* here commit himself to his demand price — the price that maximizes his expected gain — as in the previous example? (Commitment might take the form of *A*'s leaving, say, $ 100 000 with some neutral third party *C* — with an irrevocable pledge to forfeit it to *B* if *A* should accept any price less than his initial demand.)

As before, *with* commitment there is a positive expected gain for *A*, but, unlike the first example, there is also a positive expected return if *A* should adopt the bargaining stance: demand *without* commitment. Side *A*'s no-commitment reservation price is positive, whereas, in the first example it was positive only with commitment. Moreover, *B* — now *uncertain* as to *A*'s reservation price — is certain only that *A*'s demand is greater than or equal to that (reservation) price. Side *B* may therefore respond by making a counteroffer less than or equal to *A*'s demand[15].

For side *A*, the expected utility of adopting a no-commitment strategy, then, is *at least* as great as the utility of a settlement at *B*'s offer, and exceeds that amount by the expected utility of engaging in the subsequent give-and-take of a process characterized by tactics of conciliation as well as conflict[16]. Before negotiations actually get

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[15] Side *B*'s offer must be at least as great as the price that *A* could obtain for his services in some alternative capacity — perhaps as a general practitioner. As noted above, this is in contradiction to the first example, where without commitment it would not be necessary for *B* to pay *A* anything for sound hearing; in that case there is a positive inducement for *A* to provide it free.

[16] *Both* sides under *A*'s commitment would be restricted to conflict tactics: *A* because he is forced to by the exigencies of the situation, and *B*

underway, a rational bargainer must perforce implicitly consider a *whole range* of possible responses to his opponent's demand, including, of course, commitment to his own demand. His choice — in game theoretic terms — will depend upon which "move" is consistent with his choice of the payoff function that will maximize his expected utility. Thus, with uncertainty, the return from no-commitment — a combined strategy of flexibility and firmness — cannot be presumed to be less than that expected from utilizing commitment strategy. We must conclude, then, that commitment is *not* clearly superior to no-commitment strategy in the general case in bilateral negotiations, and, by implication, the "rational" outcome under bargaining remains indeterminate.

V. Summary and Conclusions

Typically, a dual bargaining situation, wherein both participants have some control over the outcome, is characterized by mutual uncertainty as to the reservation price; that is, each side is to some degree essentially uncertain as to the worst terms to which the opponent would agree rather than accept the consequences of a breakdown in negotiations. With uncertainty, and the consequent introduction of bargaining tactics such as bluff and deception, any attempt to develop a positive theoretical model of bargaining that yields a determinate solution becomes exceedingly complex. Although T. C. Schelling has sought to cut through this complexity by postulating "commitment" as optimum strategy, we have seen that — in the general case characterized by uncertainty, and where commitment is not a necessary condition for establishing a mutual interest in agreement — the tactic of establishing the credibility of one's threat via commitment is not demonstrably preferable to adopting a more flexible stance.

However, by analyzing Schelling's model in terms of the duality of forces — conflict and conciliation — that typically operate in a bargaining situation, we may have gained an important insight. In

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because he is certain of *A*'s reservation price. (Commitment ensures that side *B* is certain that *A* will not accept any less than his demand — which may well be lower than *B*'s own reservation price.) On the other hand, if *A* makes a demand *without* commitment, it becomes possible for one side and/or the other to utilize conciliatory tactics. Without *A*'s commitment, *B*'s counteroffer reflects his now uncertain estimate of *A*'s reservation price. Both offers may be feasible, in that they may be preferable to no-exchange for both participants, but, because neither side is certain of this, each side's bargaining attitude and actions are conditioned by forces of conflict *and* conciliation.

economics, we commonly argue that more information for all participants is always preferable to less information for reaching a Pareto-optimal equilibrium. This may not be true in a bargaining situation, wherein each participant has some control over the outcome, because with a conflict as well as a congruence of interests operating simultaneously, more information for each side as to the opponent's preferences is likely to engender tactics of conflict rather than cooperation, intensify both sides' determination to stand fast, and thereby increase the probability of breakdown and no-exchange. The injection of uncertainty, on the other hand, may enhance the feasibility of tactics of cooperation and compromise, and improve the likelihood of settlement at some point on the contract curve.

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