Book Review of "Bargaining Theory with Applications" (Muthoo, 1999)

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"Bargaining Theory with Applications" (Muthoo, 1999)*

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Abhinay Muthoo skillfully synthesizes the literature on non-cooperative bargaining theory that was initiated by Rubinstein's (1982) seminal analysis of the alternating-offers bargaining game and relates it to the well-known Nash bargaining solution. The book also contains new results, in particular regarding the relative impacts of several forces that influence the bargaining outcome. Moreover, Muthoo presents many interesting applications of the theory, including issues such as optimal asset ownership, bribery and the control of crime, corruption in tax collection, and sovereign debt negotiations.

Muthoo first discusses the Nash bargaining solution in chapter 2. We learn that (in the simplest case, given risk-neutrality) two parties divide a cake of size 100 by giving each party the amount it would get if there were no agreement (say, 10 and 70), plus half of the surplus that remains over and above the disagreement point (50% of 100-10-70=20; i.e., the parties get 20 and 80, respectively). This bargaining solution is motivated by plausible axioms (invariance to equivalent utility representations, Pareto efficiency, symmetry, and independence of irrelevant alternatives).

In chapters 3-6, Rubinstein's non-cooperative bargaining game and several extensions are presented. In this game a player makes an offer which the other player can accept or reject. In the latter case, time passes and the second player makes a counteroffer, and so on. The players discount future payoffs. In the unique subgame perfect equilibrium the players immediately agree on a division of the cake. If the time interval between offers tends to zero, the equilibrium shares of the players only depend on the relative size of their discount rates (a

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relatively more patient player receives a larger share, because his costs of haggling are smaller). If the discount rates are identical, the cake is split 50:50 (i.e., according to the Nash bargaining solution with the disagreement point 0,0). If there is no discounting, but bargaining can break down due to an exogenous event yielding payoffs 10 and 70, the players split the cake according to the Nash bargaining solution with the disagreement point (10,70). If there is discounting and a party can, in addition to rejecting an offer and making a counteroffer, also reject and opt out yielding payoffs (10,70), then the cake is split according to the outside option principle: When the discount rates are equal and time intervals between offers converge to zero, the party who could get more than 50 receives its outside option payoff (i.e., 70), while the other party is residual claimant (i.e., it receives 30). If the outside option payoffs of both parties were smaller than 50, each party would get 50. The division of the cake can also be influenced by inside options; i.e., payoffs that the parties obtain while they are bargaining. In general, the disagreement point of the Nash bargaining solution should be identified with the impasse point in the alternating offers bargaining game (i.e., the payoffs in case of perpetual disagreement).

While the subgame perfect equilibrium in the standard alternating offers game is unique and efficient, these properties need not hold in variants of the model. For example, when a player can opt out immediately after his offer is rejected, there may be a continuum of equilibria. In chapter 7 (on bargaining procedures) it is argued that there can be multiple inefficient equilibria if offers can be made simultaneously, if offers are retractable, or if a party can 'burn money', e.g. by making the other player wait before he can make his counteroffer.

While chapter 8 discusses some interesting models in which players can partially commit (revoking claims that are made prior to bargaining is possible but costly), chapter 9 introduces asymmetric information. Under asymmetric information it is possible that for any bargaining procedure all Bayesian Nash equilibria are ex post inefficient. Such impossibility results are shown for the case of one-sided private information when one party's type enters the other party's utility function, and for the case of two-sided private information. Muthoo also analyses a model in which one party has private information, while the other party makes repeated offers, and relates it to the so-called Coase conjecture.

Finally, in chapter 10 repeated bargaining situations are discussed. Interestingly, the equilibrium share of a player may now be smaller if he is more patient (because then his

desire to proceed to bargain over the next cake is stronger). Long-term contracts and reputation effects are also briefly discussed. In chapter 11, Muthoo identifies several avenues for future research.

Throughout the book, Muthoo develops several interesting applications of the theory. For example, do penalties have a role in preventing crime if they can be evaded through bribery? Consider a thief who bargains with a policeman. From the point of view of the two parties, it is efficient if the crime is not reported to the authorities. Thus, in the standard model the parties will agree on this outcome. If reporting the crime is taken as the disagreement point, it is straightforward to show that if the penalty is sufficiently large, the criminal will not commit the crime (because the bribe he would have to pay to the policeman increases with the penalty which determines the criminal's disagreement payoff). But if reporting the crime is interpreted as outside option, a large penalty has no influence on the bribe (because the policeman's outside option payoff is 0, and the criminal's outside option payoff is negative; i.e., according to the outside option principle bargaining will result in a 50:50 split of the stolen money). Hence, in this case a penalty is useless if it can be evaded through bribery. As another example for an application studied in the book, consider sovereign debt negotiations. A country owes a large amount of some foreign commodity to a foreign bank. If the parties fail to reach agreement on some debt repayment scheme, the country has the possibilities to either consume its domestic commodity or trade it for the foreign commodity. In the latter case, the bank can seize a fraction of the country's traded output. Muthoo shows how to model these possibilities either as outside options or as inside options. Whether international trade sanctions (modeled by the fraction that can be seized) have an effect depends on the gains from international trade. These applications (other examples include relationship-specific investments and litigation versus out-of-court settlement) are discussed in subsections immediately following the relevant theoretical results.

Abhinay Muthoo argues in the Preface that this book is partly a textbook and partly a research monograph, which is a very appropriate description. We used the book as text for a one-semester course on bargaining theory. We had to leave out only a few sections and our students considered the text to be accessible, even though they thought that there were some places where additional and more detailed explanations would be helpful. For instance, why has the set of weakly Pareto efficient utility pairs to be closed (Assumption 2.2)? Why is the Nash product maximized only over utility pairs on the Pareto frontier? Must the disagreement

point lie in Ω? The students were a bit confused by the notation in chapter 5 for cases in which the parties' outside payoffs differ depending upon who opts out. We also had to show our students how to derive some equations such as (5.6) which they could not work out by themselves. The students particularly liked the numerous applications. One interesting application which does not yet appear in the book but in our mind is a good addition to chapter 5 is the model by de Meza and Lockwood (1998) and Chiu (1998) on optimal asset ownership and the outside option principle.

While we can recommend the book as a textbook for students with prior knowledge in game theory, it is certainly also recommendable for researchers interested in the theory of non-cooperative bilateral bargaining games. Many recent contributions to the literature that appeared since the publication of Osborne and Rubinstein's (1990) important book are covered. However, Muthoo does not consider multilateral bargaining and solution concepts such as the Shapley value, which has e.g. been applied in the literature on optimal asset ownership (see Hart and Moore, 1990). Moreover, the role of bargaining experiments is only very briefly mentioned in the last section of the book, although we do have sympathy for the views expressed there (see also Rubinstein, 2001).

Of course, chapter 9 on bargaining under asymmetric information cannot provide a complete review of the field, which is important enough to merit a book of its own. We think that the term 'correlated values' is used in a somewhat misleading way in this chapter, where the author refers to common value situations in which one player directly cares about the other player's information (for instance, in Akerlof's lemon example). This has to be distinguished from private values (every party's information parameter enters only its own utility function) which are correlated (see e.g. McAfee and Reny, 1992). An interesting impossibility result with one-sided private information (private values) that is not mentioned in the book is proved by Klibanoff and Morduch (1995), where reservation utilities are type-dependent. Sequential bargaining games under two-sided asymmetric information (and their relation to Myerson and Satterthwaite's (1983) mechanism design approach; see Ausubel and Deneckere, 1993) are not studied in the book.

One important issue that is only briefly touched in chapter 10 is renegotiation. While renegotiation can be beneficial in situations in which only incomplete contracts can be written, the fact that parties cannot commit not to renegotiate can only be harmful if complete

long term contracts are feasible. Hence, what we generally do not like when we analyze bargaining games (that the efficient outcome is not achieved, say due to private information) can in fact be beneficial if the bargaining game under consideration is ex post renegotiation, which from an ex ante point of view we do not want to function perfectly (see e.g. Dewatripont, 1988).

While Muthoo's book clearly demonstrates the enormous amount of basic research on non-cooperative bilateral bargaining performed in the last decade, this literature is still flourishing. For example, Anderlini and Felli (2001) recently showed that there can be a unique inefficient equilibrium of an alternating offers bargaining game when participation is a costly decision. Moreover, Muthoo impressively demonstrates how bargaining theory can be applied to many important economic problems. There can be no doubt that we will see more such applications in the years to come. Muthoo's book is an excellent starting point for economists who want to contribute to this research. We think that students as well as researchers will benefit from reading this book.

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