Mediation, Walrasian Tattonnement, and Negotiations as an Exchange Economy

David Dickenson
Utah State University

Follow this and additional works at: https://digitalcommons.usu.edu/eri

Recommended Citation
https://digitalcommons.usu.edu/eri/269

This Article is brought to you for free and open access by the Economics and Finance at DigitalCommons@USU. It has been accepted for inclusion in Economic Research Institute Study Papers by an authorized administrator of DigitalCommons@USU. For more information, please contact rebecca.nelson@usu.edu.
Economic Research Institute Study Paper

ERI #2003-11

MEDIATION, WALRASIAN TÂTONNEMENT, AND NEGOTIATIONS AS AN EXCHANGE ECONOMY

by

DAVID DICKINSON

Department of Economics and Department of Management & Human Resources
Utah State University
3530 Old Main Hill
Logan, UT 84322-3530

September 2003
MEDIATION, WALRASIAN TÂTONNEMENT, AND NEGOTIATIONS AS AN EXCHANGE ECONOMY*

David Dickinson

ABSTRACT

Alternative dispute resolution (ADR) procedures, such as mediation and arbitration, are becoming increasingly used to help resolve disputes in a variety of areas. Among ADR procedures, mediation is the most utilized yet least analyzed procedure. This article examines negotiations and dispute resolution using the tools of general equilibrium theory. Specifically, mediators function as the Walrasian auctioneers of exchange theory by altering trade-off rates among bargaining issues. In this way, mediators facilitate a process leading towards voluntary settlements. This idea of Walrasian mediation is supported by the literature on mediation and mediator techniques, and so this insight opens up mediation to much more rigorous economic analysis. Among the implications of this approach are: (1) successful mediation leads to Pareto efficient settlements; (2) non-neutral mediators can guide negotiators towards preferred outcomes by introducing resources into mediation; (3) mediation Pareto dominates arbitration for resolving disputes.

JEL classifications: J52, D51

Key words: mediation, dispute resolution, exchange economy
MEDIATION, WALRASIAN TÂTONNEMENT, AND NEGOTIATIONS AS AN EXCHANGE ECONOMY*

1. Introduction

Mediation is one of the world's oldest forms of alternative dispute resolution (ADR). It uses a neutral third-party to help resolve disputes, but mediators generally do not have binding decision-making authority. As such, mediators are effective only in as much as they can facilitate a voluntary settlement among the disputants. This contrasts with arbitration, an ADR procedure that dictates a binding settlement to the disputants. Mediation is utilized across the globe and it helps resolve disputes in a large variety of settings that include labor-management negotiations, international relations, legal disputes, community disputes, and school conflicts, among others (see Wall et al., 2001, for a review).

In the U.S., formal mediation plays a prominent and expanding role in labor contract disputes, court-mandated pre-trial mediation, and community disputes, among others. The Federal Mediation and Conciliation Services, established in 1947 under the Taft-Hartley Act, mediated approximately 20,000 labor disputes annually from 1996-2001 in the U.S. Also, the National Association for Community Mediation reports that the number of community mediation programs in the U.S. has surged in the past decade from about 150 to over 500, and these programs are now estimated to mediate over 45,000 cases annually.¹ The stakes of mediation efforts range from relatively small (e.g., grievance mediation of employment disputes) to

*The author is grateful for helpful conversations with Linda Babcock, John Gilbert, Ronda Callister, and Hisako Kure.

¹Data available from FMCS at http://www.fmcs.gov and from the NAFCM website, http://www.nafcm.org, respectively.
enormous (e.g., U.S. mediation efforts between Israel and Palestine).²

Given the history, growth, and prevalence of mediation it is somewhat surprising that economic research has done little to analyze the process and outcomes of mediation. This is likely due to the prevailing notion that mediation is an “art” form and, since successful mediators “orchestrate” settlements, the process itself is not well suited for systematic analysis. This article highlights how economic analysis can bring something to bear on our understanding of mediation by recognizing that mediators are the essentially Walrasian auctioneers of exchange theory. Our simplest understanding of general equilibrium utilizes the Edgeworth Box and describes the Walrasian auctioneer who calls out prices to generate equilibrium in the exchange of two goods between two consumers. Negotiators who bargain over the allocation of two or more issues can be viewed as participants in an exchange economy, and mediators can then play the role of the Walrasian auctioneer in attempting to generate a Pareto efficient equilibrium. This is a simple yet powerful insight: the basic task of the mediator is to vary the relative price among the issues on the bargaining table in order to induce voluntary agreement among negotiators.

The Walrasian auctioneer approach to mediation is first discussed in Dickinson (2003), and several implications of the “Walrasian mediator” framework will be examined herein. Though mediation is often considered a form of art not well suited to rigorous analysis, the Walrasian mediator generates several important implications immediately. First, mediators can ultimately be successful by varying the perceived trade-off rate (i.e., the relative price) among bargaining issues with little knowledge of negotiator preferences. Secondly, a non-neutral mediator can guide negotiators towards specific outcomes by introducing outside resources into

²The use of mediation is even more widespread if one considers that judges often employ mediation skills in an unofficial capacity outside the courtroom in promoting settlement prior to trial (see Raiffa, 1982). Furthermore, informal mediation occurs whenever a third-party helps to resolve others’ disputes.
mediation—such mediators may be guided by their own preferences, notions of fairness, etc. Finally, mediated outcomes will generally Pareto dominate arbitrated outcomes.

This purpose of this article is not to minimize the importance of the skill required of a successful mediator, but rather to highlight a simple approach to viewing mediation—one that follows from general equilibrium theory. Many mediators may enjoy using an extensive repertoire of techniques to gather information on negotiator preferences during mediation. However, this analysis will show that successful mediation can be accomplished with minimal knowledge of negotiator preferences by simply altering relative prices of bargaining issues in response to excess demand. The implications of this approach to viewing dispute resolution may open the door to a more systematic way of analyzing mediation, while also highlighting its efficiency advantage over arbitration. This efficiency advantage may justify the accolades mediation often receives over other forms of dispute resolution.

2. Negotiations and Dispute as an Exchange Economy

Assume the simplest case of bilateral negotiations of bargainers, $a$ and $b$, over two issues, $x^1$ and $x^2$. This is the simplest case that allows for “trade-offs” between issues, although the analysis extends easily to the $n$-issue case (as well as the $m$-bargainer case). Assume well-behaved preferences such that $U^j_i(x^i_k) > 0$ and $U^j_i(x^i_k) < 0$ for $j = a, b$, $i = 1, 2$. Now consider an Edgeworth “Bargaining” Box. Assume an initial endowment that exhausts the total supply of both items. The initial endowment may be the result of a previous round of contract negotiations in repeated bargaining or long-term relationships. An example of two items in a

---

3 The ability to highlight a basic approach to successful mediation is also important as a growing number of community-based mediation programs utilize community volunteers who, though trained to some extent, may respond better to a simple description of how to accomplish their objectives.

4 This section draws upon insights in Raiffa (1982).
A typical labor-management dispute would be profits (or excess profits) and job security of employees. Management would then have preferences that are increasing in both the amount of its profits retained and in workforce flexibility (e.g., the opposite of job security to the workers). The dimensions of the Edgeworth Box may be determined by physical limitations (e.g., profits), legislated limitations (e.g., work hours limitations), or also by a previous stage of negotiations.

A common characteristic of negotiations is making trade-offs among bargaining issues, \( x_1 \) for \( x_2 \), which is reflected in the bargainers' relative price or terms-of-trade among issues. Figure 1 shows the basic Edgeworth Box diagram under the assumption of an incorrect relative price reflected in terms-of-trade line AB. This relative price leads to package demands \( \mathbf{x}_A = (x_{1A}, x_{2A}) \) and \( \mathbf{x}_B = (x_{1B}, x_{2B}) \) for negotiators A and B, respectively. This implies excess demand for bargaining issue #1 given the endowment, \( E \). Note a key point: any dispute can be viewed as state of excess demand for at least one bargaining issue.

At this point, simple general equilibrium theory introduces the mythical Walrasian auctioneer who calls out prices and adjusts them appropriately to generate equilibrium in the economy. This is precisely the role to be played by a mediator in handling a dispute among negotiators. Mediators facilitate a process of "tâtonnement" (curiously but typically translated as "groping") described in the classic work of Walras (1926), whereby proposed trade-offs between negotiated items go back and forth until there is equilibrium in the system of equations of negotiated items. A mediator has no authority (generally) to impose a binding settlement, and so the key tool at his disposal is the ability to change the terms of trade among \( x_1 \) and \( x_2 \). Specifically, because Figure 1 shows a case of excess demand for issue 1 (e.g., profits, which is

---

5You will notice that we assume some unique initial endowment though it might be contested that bargainers each perceive a distinct endowment. The issue is merely semantic, and we consider this no different than the case where individuals really just demand an excess amount of a particular good relative to what is available.
usually evidenced by a firm’s wage offer < union’s wage demand), the Walrasian mediator must “increase” the price of issue 1 relative to issue 2 to resolve the dispute. This is shown with the dashed terms-of-trade line CB and the resulting negotiators’ common settlement choice at $S^*$. To accomplish this altered terms-of-trade, the mediator might amplify the benefits and/or minimize the costs of issue #2, while doing the opposite for issue #1 as a way of altering the terms-of-trade. By doing so to the correct extent the negotiators would voluntarily choose the equilibrium settlement point $S^*$ in Figure 1, which is guaranteed Pareto efficient by the first welfare theorem. The signal upon which the mediator acts is the excess demand (i.e., dispute) of certain issues, and this approach requires really no knowledge of negotiator preferences at all.

In contrast, an alternative view of mediation, perhaps more espoused by practicing mediators, is that mediation sessions are meant to learn information about the preferences of the negotiators (see also Raiffa, 1982). Once preferences are well-known then mediators can suggest Pareto improving settlements, and perhaps even suggest a Pareto efficient outcome. Of course, some mediators avoid making explicit suggestions, and so this approach does not correctly describe all mediation activity (see Wall et al., 2001; Holley, Jennings, and Wolters, 2001). While preference-learning can also identify mutually beneficial bargaining outcomes, I posit that it is not the only approach. In fact, as I note in the next section, much of the practice of mediation is consistent with the Walrasian auctioneer framework, whether or not practicing mediators describe their activities as such, and so the framework can be as useful to understanding mediation and its outcomes as consumer theory is to understanding individual behavior. Finally, it is clear that the Walrasian mediator approach to resolving disputes requires much less knowledge of negotiator preferences than alternative approaches. This is a definite advantage considering that it is costly to gather information on preferences. The Walrasian mediator
concept still simplifies the job of a mediator, but the point is that the variety of tactics that mediators might employ can be aimed at the basic objective of altering the negotiators' terms-of-trade to bring about "agreement" equilibrium.\(^6\)

This analytical framework can also highlight the difficulties that might arise in successfully mediating a dispute. First, the larger the change needed in the relative price, the more difficult is the mediator's task. One would hypothesize that the failure rate of mediation and/or the time required to mediate a dispute are increasing in the distance between positions on an issue (i.e., the extent of the excess demand), ceteris paribus. Wall et al. (2001) offers some evidence in support of this hypothesis in noting that higher settlement rates are found in mediations of elementary school student disputes versus difficult international disputes. This is consistent with the assumption that excess demand of key issues is greater in international disputes or that it is more difficult to alter the relative price for negotiators' in international disputes.

The Edgeworth Box framework also highlights another important aspect of the mediator's job: identifying the issue(s) for which there is excess supply. With positive prices and well-behaved preferences there will never be excess demand for all bargaining issues. In other words, mediators must always be able to identify the issue(s) for which there is excess supply in order to successfully mediate. This is perfectly consistent with the practice of identifying creative trade-offs in mediation. In the event that negotiators also dispute over the initial endowment, then the mediator must first align beliefs of what the starting point is before moving forward in

\(^6\)One might argue that negotiators may each perceive a different trade-off rate among issues. Negotiators may each desire different price ratios, but it would often be unclear whether negotiators perceive different price ratios, or whether these perceptions are merely reflecting differences in preferences among negotiators. In any event, the analysis still applies in the event that we consider a different price ratio for each bargainer since the mediator's task is still to alter unacceptable terms-of-trade to bring about equilibrium.
mediation. For example, in complex international negotiations a “single-negotiations text” (SNT)—an initial proposal by third party interveners—is often used as a starting point for negotiations (see Raiffa, 1982, for a more thorough description and extended examples). Such a SNT is not meant to be a serious contender for final settlement, but through the negotiators’ criticism of the SNT, mediators can either gain useful information about bargainer preferences or, more simply, the Walrasian mediator can gain information on revealed excess demand for certain issues. Trade-offs can then be suggested in successive attempts to align supply and demand into general equilibrium.

A mediator faces added complexity when a dispute includes a multitude of issues. Nevertheless, it is clear that successful mediation can be viewed as an exercise in changing relative prices—increasing the perceived price of items for which there is excess demand. The existence of multiple options for swapping and trading issues on the bargaining table, though apparently adding complexity, may ironically be advantageous to the skilled mediator who can alter the price ratio by facilitating and highlighting creative trades among multiple issues.

3. Supporting Evidence

Before continuing it is worth examining whether or not evidence supports the notion that mediators work towards changing the trade-off rate of issues on the bargaining table. That is, do mediators behave in a manner consistent with Walrasian mediation? In a recent survey of the literature on mediation Wall et al. (2001) notes a large variety of tactics that might be employed by mediators. Among those of interest for this paper include the following: information provision, pressure tactics, threats, and even monetary compensation. Some of these tactics are

---

7. This would obviously be the appropriate order of the two objectives since establishing the “correct” price ratio without first unifying the initial endowment will just imply that each individual demands a distinct point on the Pareto set (i.e., continued dispute).
culturally specific, and Western cultural does not usually empower mediators to use pressure tactics (Wall and Stark, 1998). This implies that the encouragement of concessions, creative packaging of trade-offs, or information provisions are relatively more important tactics for U.S. and western mediators. However, it is noteworthy that eastern mediators make frequent use of threats as they are empowered by their society to do so (Abu-Nimer, 1996). Furthermore, there is evidence that some eastern mediators literally compensate one or both negotiators either from their own resources or from community funds (Murray, 1997; Wall and Callister, 1999), which highlights some fairly explicit ways to alter the relative price of bargaining issues. Greig (2001) also notes the importance of using outside resources for mediation success in international dispute resolution, and so this more blunt approach to altering the terms-of-trade is not that uncommon.

The mediation literature identifies three different styles of mediation, of which one is of particular interest for this article. The "manipulator" style of mediation can vary the perceived appeal of any suggestions by adding to or subtracting from proposals (see Wilkenfeld et al., 2003, and citations therein). Additionally, these manipulative mediators make use of side payments, a tactic that makes them especially effective. This contrasts with the more passive style of the "facilitator" mediator, though each may be particularly effective in certain situations. Wilkenfeld et al. (2003) notes that in crisis mediation and other intense settings, the manipulative style may be most effective because bargainers are more receptive to mediator pressures. In public sector mediation, Briggs and Koys (1990) conclude that active and tenacious mediators—those who actively package issues, use pressure tactics, and make suggestions—are more successful than passive mediators. The manipulator or active mediator is perhaps most readily

\[\text{The third mediator-type is the "formulator," which lies somewhere between the two extremes. See Wilkenfeld et al (2003).}\]
seen as a Walrasian mediator, though the objective of altered terms of trade is not limited to only the most assertive mediators.

A final example worth noting is that of the U.S. mediation efforts over the Israeli-Palestinian conflict. The U.S. has mediated the conflict between Israel and the Palestinians for years, and the two key issues can be identified as security (relatively more important in Israel's preferences) and land (relatively more important in Palestinian preferences). The U.S. has been somewhat of a manipulator or mediator by contributing much of its own resources to "sweeten the deal" and hopefully achieve agreement among these negotiators. As noted before, one could view the addition of such outside resources as part of the mediation efforts to alter the terms-of-trade between security and land in the conflict. With excess demand for land in the current conflict, the provision of arms and weapons to Israel effectively and explicitly lowers the price of security relative to land in Israel's negotiations with the Palestinians. This also implies a relative increase in the price of land, which can be viewed as a Walrasian mediator technique to bring the two sides closer to agreement.\(^9\) Of course, the likelihood of success in these particular mediation efforts depends a great deal on the Israeli and/or Palestinian willingness to trust the mediators fully and accept new trade-off rates over the bargaining issues.

As may be apparent in many international disputes, mediation is not conducted by a disinterested outsider, but rather by individuals with a stake in the outcome, especially in large-scale international mediation. When such stake-holders choose to actually inject resources into mediation efforts, viewing this as a way of altering the relative price of issues is not the only possibility. One could alternatively view this as expanding the dimensions of the Bargaining box.

\(^9\)Raiffa (1982) gives the example of the Camp David negotiations between Israel and Egypt where a SNT was used along with U.S. mediation pressure and sweeteners for achieving agreements.
Depending on how the additional resources are added to negotiations, this will also affect negotiator endowments. In this way the mediator can alter the location of the contract curve (see Figure 2b). This is analogous to an increase in a factor of production as discussed in Rybczynski (1955). By expanding the dimensions of the Bargaining box, in addition to affecting trade-off rates by means of other mediator tools, the mediator helps push negotiators towards certain desired outcomes.

Consider the example of the mediation efforts in Figures 2a and 2b. Assume the mediator has a certain desired outcome, M, that cannot be supported as a Pareto improving settlement (Figure 2a). The mediator may then choose to inject resources into the negotiations and give additional resources to negotiator A. Figure 2b shows this as the addition of Qs units of issue \( x_2 \) to negotiator A, which both expands the \( x_2 \) dimension of the bargaining box and moves the endowment point to \( E+Q_s \). Of course, this alters the location of the contract curve, and settlement M can now be supported as a Pareto efficient settlement with the appropriate terms-of-trade line CD (Figure 2b). However, the contract curve is unobservable to the mediator and so it cannot be known when enough resources have been added to place M on the new contract curve. The mediator may choose to add resources in several stages, thus allowing the mediator to continue to press for the desired outcome until it may at least represent a Pareto improvement for each negotiator. That is, resources can be added to the point desired outcome M falls within the Pareto improvement lens. Even the second-best outcome of a Pareto improving, but not a Pareto efficient, settlement might be considered a success by the mediator and other interested parties.

\(^{10}\) One might consider this as an example of the U.S.'s attempted mediation between Israel and the Palestinians. Let negotiators A and B be Israel and the Palestinians, respectively. Then let issues \( x_1 \) and \( x_2 \) be security and land, respectively. The addition of security resources to Israel is the result of the U.S. contributing arms and money to Israel. Though U.S. attempts have clearly not been as successful as the mediator efforts in Figure 3, recall that negotiator trust in the mediator is ultimately necessary in order to establish the final relative issue price necessary for settlement.
An injection of resources has the potential to significantly complicate the analysis because negotiators may come to expect an infusion of resources as part of the dispute resolution process. If this is the case, then the mediator becomes part of tri-lateral negotiations with the disputants. In our initial analysis, however, this view that mediators may press for certain outcomes by giving resources to one or both negotiators is not inconsistent with the reality of international mediation where major power mediators can and do bring sizeable resources into mediations efforts. In fact, such resources are often seen as key to successful mediation (Greig, 2001; Wilkenfeld et al, 2003). These stakeholders who sweeten the deal with outside resources are attempting to partly facilitate a settlement, and partly facilitate a settlement acceptable to the mediator. As can be seen in the particular example of U.S. mediation in the Middle East, the addition of resources by no means guarantees successful mediation, and the negotiators’ trust and acceptance of the mediator’s suggested terms-of-trade will always be a key ingredient towards settlement, whether or not additional resources are added.

It is clear that mediators employ several different tactics that can be used to effectively change the relative price in negotiations, and in some cases to actually alter the dimension of the bargaining box and location of the contract curve. This is most apparent in the case where a mediator monetarily compensates one or both negotiators. Information gathering/provision, though not as blunt of a tool, can also be used to highlight aspects of certain trade-offs that effectively alter the terms of trade. The more complicated the negotiations, the more difficult it may be to accomplish the objective of altered terms of trade, but the fact that many of the tools used by mediators can be seen as creative attempts to alter the relative price in negotiations lends support to the Walrasian mediator approach to resolve disputes.
4. Implications

By analyzing negotiations as an exchange economy and mediators as Walrasian auctioneers, we have already noted two important implications.

**IMPLICATION 1:** Successful mediation leads negotiators to a Pareto efficient agreement.

This follows from our assumption that the mediator's basic task is to call out the correct relative price. This restatement of the first welfare theorem is quite a forceful endorsement of mediation. For a given initial allocation of issues (and well-behaved preferences, etc.), there is precisely one relative price that will generate general equilibrium, and this equilibrium will be on the contract curve of Pareto efficient outcomes. This result does assume that negotiators are "price takers" in the sense that they trust the mediator and take mediation suggestions as given. Noncompetitive behavior would imply that bargaining power would be an important part of any settlement.¹¹

Note, however, that this result does not depend on the mediator having complete information on the negotiators' preferences. Mediators must simply alter trade-off rates in response to revealed excess demand for bargaining items.¹²

**IMPLICATION 2:** Mediators can guide negotiators towards desired outcomes when outside resources are utilized.

This second implication is quite interesting in that it suggests that mediators might exploit the fact that they may prefer some outcomes over others. Of course, this suggests a non-neutral

---

¹¹Nickles and Hedgespeth (1991) find that mediator techniques are more effective when bargaining power is relatively equal among negotiators.

¹²Joyce (1998) studies the Walrasian tâtonnement process in a laboratory setting and finds that subjects underreveal demand in an attempt to manipulate price in tâtonnement auctions. Nevertheless, it is noted that symmetric under-revelation would not affect the equilibrium trading price. Even though this study involved numerous subject suppliers and demanders and is therefore not directly analogous to bilateral negotiations, the potential implications on strategic or tactical asymmetry of the negotiators is quite intriguing.
mediator but, as noted before, certain mediation efforts the choice to involve an outsider with a stake in the outcomes is seen as necessary, especially in international mediation. Whether guided by self-interest, or by notions of distribute justice, fairness, etc., a mediator who can alter the dimensions of the bargaining box can exercise some discretion over negotiated outcomes. However, it may be more difficult for the mediator to achieve the first-best Pareto efficient settlement when pushing for a specific outcome, as noted in the previous section. Implication 2 may help explain behavior in international mediation where stakeholders mediate while often adding their own resources to help guide outcomes in a particular way.

It is worth noting that, though the “correct” price ratio will guarantee a Pareto efficient agreement, mediation might still be considered successful by other criteria. One might argue that any agreement indicates successful mediation, and in the previous section we called this a second-best outcome. By definition, any voluntary agreement by both negotiators would have to be a Pareto improvement. However, a non Pareto efficient agreement, which is likely to be the entitlement or endowment of items for future negotiations, may plant the seeds for future dispute. Some may even argue that if disputants are brought closer to agreement, then this implies a measure of success of the mediation process, though clearly less so than when a voluntary settlement is procured.

5. Mediation Versus Arbitration

Another implication of this analysis can be found by comparing mediation and another commonly used form of ADR, arbitration. The primary distinction between resolving disputes with arbitration versus mediation is that arbitrators dictate a binding settlement, whereas mediates do not typically have authority to impose a settlement. An arbitrated settlement of a dispute can therefore be viewed as the imposition of any particular point within the Edgeworth
Box in Figure 3. One item immediately stands out: An arbitrated settlement will not be Pareto efficient, in general. Of course, an arbitrator may choose to “split-the-difference” between the negotiators’ final positions as some have hypothesized, but this still does not imply a Pareto efficient outcome. Consider the following version of arbitration that is commonly used in practice: conventional arbitration.

Conventional arbitration (CA) allows the arbitrator to impose a binding settlement, which implies imposing a point inside the Edgeworth box. Certain points are more likely to be chosen by the arbitrator than others, but empirical evidence is consistent with a certain randomness of arbitrator settlement preferences such that one can view arbitrated settlements as draws from a random number distribution (see Ashenfelter, 1987; Ashenfelter and Bloom, 1984). Of course, the measure of success in arbitration may be that arbitration is not invoked (Stevens, 1966), and risk averse negotiators may willingly negotiate lesser settlements than under risk neutrality in order to avoid the arbitration “lottery” (see analysis in Farber and Katz, 1979). Both mediation and arbitration can therefore promote voluntary settlement. It is more likely the failure of each procedure that highlights mediation’s advantage over arbitration. Once arbitration is invoked, it is clear that the outcome need not even be a Pareto improvement.

Consider that arbitrator settlements are dictated by a bi-variate distribution over \( x_i \) and \( x_j \) that reflects the uncertainty of arbitrated settlement over the bargaining issues. One could then explicitly calculate the probability of a Pareto inefficient arbitrated settlement. Specifically, let \( (\hat{x}_i^a, \hat{x}_j^a) \) be the endowment level of issues 1 and 2 for disputants \( i = 1, 2 \), \( (\bar{X}_1, \bar{X}_2) \) is the total availability of each item defining the dimensions of the bargaining box, and \( x_i^a + x_i^b = \bar{X}_i \) for \( i = 1, 2 \). Define A to be the set of all points \( (x_i^a + x_i^a) \) such that \( U_a(x_i^a, x_j^a) \geq \hat{U}_a(\hat{x}_i^a, \hat{x}_j^a) \). Similarly, define B to be the set of all points \( (x_i^b + x_j^b) \) such that \( U_b(x_i^b, x_j^b) \geq \hat{U}_b(\hat{x}_i^b, \hat{x}_j^b) \).
set $P = A \cap B$ formally defines the Pareto improving region, which is a subset of $R^2$-space—the shaded area in Figure 3. The probability of arbitration producing a Pareto improving settlement, where arbitrated settlements are drawn from the distribution $f(x_1, x_2) = \int_{R^2} f(x_1, x_2) dA$. So, the probability of a Pareto worsening settlement is given by $1 - \int_{R^2} f(x_1, x_2) dA$. Since voluntary agreement under either mediation or arbitration must imply a Pareto improvement, and failed mediation implies the status quo, the probability of an arbitrated settlement, such as settlement $Z$ in Figure 3, that makes at least one negotiator worse-off yields:

**IMPLICATION 3:** Mediation will Pareto dominate arbitration, on average.

For a truly accurate representation of the trade-offs of mediation versus arbitration one must take into account the fact that neither arbitration nor mediation will succeed in producing a Pareto efficient, or even a Pareto improving, settlement 100% of the time. It is difficult to characterize the probability of success in mediation given the variety of factors that are important to successful mediation. One must also take into account the differences in available schemes for mediation due to legislative constraints, as well as the fact that comparing settlement rates of mediation versus arbitration is difficult given that disputes not successfully mediated may only then proceed to arbitration. In other words, the average dispute in arbitration is likely more difficult that the average dispute in mediation. That said, Sulzner (2003) examines a grievance mediation experiment in the Canadian public sector and finds evidence that mediation is successful in settling more serious grievances. His study finds that 85% of grievances that were referred to arbitration were settled by use of an earlier-stage mediation. Since these mediated cases were all initially referred to arbitration (adjudication), it seems to indicate that mediation
can be quite successful even for the more difficult grievances usually headed for arbitration. Other field statistics are reported in Hebdon (1996), where he finds success rates in contract mediation in the U.S. public sector as being anywhere from 26% (New York, 1983) to 98% (New Jersey, 1999). This compares with conventional arbitration success rates (i.e., settlement rates prior to issuance of an arbitrated award) of anywhere from 65% to 82% when examining numerous studies’ settlement rate data from the U.S. and Canadian public sector (see Hebdon, 1996, and references therein).

Overall, given the differences in institutional constraints in the field as well as the sample selection problem in comparing the disputes that go forward to arbitration versus mediation, it is still difficult to make firm conclusions on success rates of formal mediation versus arbitration for comparable disputes. If mediation is more likely than arbitration to generate a voluntary settlement for a given dispute, then this would only magnify the Pareto-advantage that mediation has over arbitration. This Pareto-advantage highlights a clear trade-off in those cases where neither procedure generates a voluntarily negotiated settlement: arbitration at least guarantees a (forced) settlement, but only with a positive probability that it is unacceptable to one or both bargainers.14

6. Discussion

The preceding analysis of mediation considers a simple negotiations case that may not seem to capture the flavor of real world negotiations and/or mediation. The criticism would

13 An additional consideration in comparing mediation and arbitration would be the time costs of each procedure.

14 Another type of arbitration, known as final-offer arbitration (FOA) constrains the arbitrator to choose one of the bargainer’s final package offers. A less constrained version of FOA utilized by some state jurisdictions allows the FOA arbitrator to final-offer select among individual bargaining issues. Neither of these types of FOA rules alters the main result with respect to CA outcomes. A binding outcome that makes one or both bargainers worse off will still occur with positive probability under FOA.
equally apply to general equilibrium theory as a whole. There is a powerful message to convey in noting that the complexities of mediation can be simplified to a basic task of altering terms-of-trade to promote general equilibrium. This is the job of the Walrasian auctioneer as economists know it. Nevertheless, certain assumptions that have been implicit to this point are worth noting, as they are suggestive of where this work can be extended.

First, we do not assume that negotiators gain utility directly from mediation, but evidence suggests that negotiators sometimes gain satisfaction from the process itself (Depner et al., 1994). Similarly, mediation itself might generate a positive externality. For example, Kitzmann and Emery (1994) argue that children are shielded from hostile conflict in custody mediation, and gang mediation has been observed to provide middle-school students with safer schools (Tabish and Orell, 1996). If positive externalities are generated to those external to the mediation itself (e.g., the entire community benefits from lower crime rates or domestic dispute incidents due to community mediation programs), then mediation will be relatively underutilized compared to what would be socially efficient. An additional benefit to bargainers of utilizing mediation or any ADR procedure is that neutral third-parties can be used as scapegoats so that one or both bargainers may "save face." The ability to blame outcomes on mediators can be a valuable and necessary option in negotiations and such a function of mediation helps lower the cost of commitment and the cost of voluntary settlement among negotiators.

Many simplifying assumptions have been introduced for the purpose of initially examining general equilibrium theory’s potential contribution towards understanding mediation. I believe that such simplifications are useful and necessary in order to illuminate the process of mediation for what it is: an exercise in facilitating general equilibrium. While the Walrasian auctioneer is assumed to effortlessly know excess supply and demand in an exchange system, the
mediator must employ a set of skills to gain trust and information about the initial state of the bargaining exchange system. At this point, facilitating settlement implies an objective of correctly altering the terms-of-trade over a potential multitude of issues to eliminate excess demand and bring about a voluntary equilibrium outcome. The parallel of this with the tâtonnement process of exchange theory is evident. Once mediation is cast in the light of an exchange economy, economic analysis can bring much more to bear on this widely-used, but under-analyzed, ADR procedure.
References


FIGURE 1
Initial Excess Demand for Issue #1 (i.e., dispute over issue #1)

Negotiator B

FIGURE 2a
Mediator has a vested interest in outcome M

Note: Altering the terms of trade would never produce outcome M because it does not benefit both sides relative to the status quo, E.
FIGURE 2b
Mediator gives additional $x_2$ resources to negotiator A, followed by tactics to establish the appropriate trade-off rate to reach M

FIGURE 3
Arbitration's inefficiency

Probability of an inefficient arbitrated settlement is probability of a settlement outside the shaded area