One-shot exchange networks and the shadow of the future

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A R T I C L E   I N F O

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A B S T R A C T

From the Prisoner’s Dilemma and other games, it is well known that strategy selection in one-shot games can be very different from that in iterated games. Because exchange structures were studied only as iterated games, whether one-shot structures differ was not known. Nor have exchange theories previously considered whether events in structures would be different if studied as one-shot games. This paper offers new theory to predict one-shot exchange structures and one-shot experiments to test that theory. As predicted, the experiments found that processes and outcomes of one-shot exchange structures are quite different from those of iterated exchange structures. For example, certain relations that are strategically used as threats in iterated exchange structures occur very rarely in one-shot structures. It follows that power differences in one-shot exchange structures regress from those observed for repeated structures.

With the growth of exchange through the Internet, as on Ebay, more and more exchanges are one-shot. Borrowed from game theory, by one-shot we mean an exchange occurring once between people who do not anticipate exchanging again in the future. Even exchange networks such as supply chains, which typically have repeated exchanges (Kinchen, 1974; Hakansson and Ostberg, 1975; Hakansson et al., 1976), can be one-shot if buyers always chase the best price (Williamson, 1981). One-shot exchanges have always been with us, from the trade fairs of the European Middle Ages to many market transactions today. Yet they have fallen outside the bounds of sociological exchange theory, where the exchange relation is defined by a series of transactions (Emerson, 1972: 36ff; 1981: 42ff). As a result, social exchange theories have not asked whether one-shot and repeated exchanges take different forms.

Some social phenomena change as conditions vary from one-shot to iterated and some do not. For example, where the diffusion of job information through a network has occurred primarily through weak ties (Granovetter, 1973), there is no reason to suppose that diffusion will not be through weak ties for repeated job searches. By contrast, while defection is the dominant strategy in a one-shot Prisoner’s Dilemma game, when the game is iterated, as in Axelrod’s round robin tournament, “always defect” scored fewer points than did “Tit-for-tat” (Axelrod, 1980a,b, 1984). Since all previous network exchange research studied only iterated opportunities to negotiate and exchange, there is no evidence indicating whether the interactions and outcomes of one-shot networks would differ.

This paper asks whether one-shot and iterated exchange structures differ and if so how? The answer to that question has theoretical and empirical components. Previously, no theory has been offered that was specifically aimed at explaining one-shot exchange structures. We offer a new theoretical analysis for one-shot exchange structures and contrast it to theory used to predict iterated structures. Then we test that theory with the first experiments run on one-shot exchange structures. In reporting those experiments, we show how results for one-shot experiments differ from iterated experiments previously run. Since our aim is to find whether there ever are differences for the two conditions, potentially any exchange structures will serve our purpose. The three studied here are selected because we have in hand results for them as iterated structures. Displayed in Fig. 1 are the three weak power structures, the 4-Line, Stem and Borg6.

Importantly, the repeated vs. one-shot distinction made here is not the same as made in game theory—nor need it be. In game theory, if a game is repeated there may be a large number of repetitions, the end point of which is indefinite. It is indefinite because, for many games, if the end of the series were known, by backwards induction, all games would be played as if they were one-shot. (But see Hardin, 1982.) For an indefinite series, however, the “shadow of the future” may affect strategy selection. The iterated exchange networks we theorize and report have few repetitions. Nevertheless, they are not one-shot games, can have a future, and it is on the presence or absence of a future that our analysis turns.

The sections to follow apply Elementary Theory (Willer, 1981, 1984, 1999), a rational choice theory (Coleman and Fararo, 1992). For that theory, the first step is to apply its Principle 1 to the modeled
structure (see below). When that application gives the needed predictions, as it will for one-shot weak power networks, the analysis ends. To predict exchange outcomes for iterated weak power networks, however, Resistance equations are applied. After predictions for iterated and one-shot networks are developed, experimental results for both are presented. Contrasts between the two are discussed and their fits to theoretical predictions are evaluated. In Section 7 concluding the paper we suggest that two prominent theories of exchange networks, Power-Dependence and the Core might best be scope limited to iterated and one-shot structures respectively. If so, through previously thought to be competitors, they do not compete: they have no scope in common.

1. Networks and iteration

But for lack of iteration, one-shot networks are studied under the same conditions as have been conventional in previous research on iterated exchange networks. Those conditions are:

1. Exchange is simulated by the division of equal-sized resource pools placed between each pair of connected positions, and
2. for a given time period or round, all positions are limited to maximally a single exchange.2

For reported experiments, information on all negotiations and exchanges is freely available to each position.

We trace the two conditions for the 4-Line of Fig. 1. For the simulated exchange, a conventional pool of 24 resources is divided upon agreement: thus, the sum of the payoffs to the two positions that have reached an agreement will always equal 24. The payoff is zero for any position failing to reach an agreement. Hence resource pool relations, like exchange relations, define a mixed-motive game. Actors in connected positions prefer to reach an agreement and thus gain a non-zero payoff, but any agreement better for one is worse for the other. Being limited to a single exchange, in the 4-Line, either B can exchange with its A or with the other B, but not with both. By contrast, each A has only its B as a partner.

Here is how iterated and one-shot networks differ. In the iterated exchange networks, an experiment began by setting initial conditions such as the distribution and value of resources and shape of the structure. Then subjects negotiated and exchanged. After data were recorded, initial conditions were set again, just as before. Then negotiations and exchanges began anew—and similarly over a large number of iterations. As a result, exactly the same people repeatedly negotiated and exchanged in exactly the same structure. By contrast, in the one-shot experimental exchange structures, initial conditions are set only once and are known to be set only once.

There is but one cycle of negotiation leading to exchange, at which point the experiment ends.

The three networks in this investigation are weak power. By weak power, we mean any network in which (1) all positions are not automorphically equivalent and (2) no position that is always included is connected to a surplus of excludable positions connected only to it.3 Positions that are automorphically equivalent have identical connectivity. Networks composed only of automorphically equivalent positions are called equal power and all theories of network exchange predict equal resource divisions for them (Willer and Emanuelson, 2008). By contrast, in the 4-Line, the Bs are automorphically equivalent as are the As, but Bs and As are not. Thus point number 1 above differentiates weak power networks from those that are equal power.

The second point differentiates weak power from strong power structures. Simpson and Willer (1999) define strong power networks as ones in which positions that are always included have a surplus of positions some of which are necessarily excluded; and that the excludable positions are connected only to the ones that are always included. When a position is always included, there is no configuration of exchanges that does not include it. In the 4-Line, the Bs are always included but the excludable As are not. To have a surplus of excludable positions, each B would have, not a single A, but two or more As, but it does not. In fact, no position in any of the three structures is connected to a surplus of excludable positions. Thus point number 2 above differentiates weak power from strong power networks.

2. Predicting for one-shot networks

In this section we generate predictions for the A–B relations in the one-shot 4-Line and Stem. Then the analysis is generalized to the Borg6. Resource pool relations produce strategy spaces for actors. Taken in isolation, the strategy space produced by any resource pool relation is very large: there are 23 possible resource divisions varying from 23–1 favoring A to 1–23 favoring B.4 In finding the game from which resource divisions can be predicted, that strategy space will collapse to a much smaller number. Network structures do not give their games directly. Nevertheless, for many structures, games can be found that are produced by third actors who constitute the game but do not play it. For example, for the Prisoner’s Dilemma game, Tucker’s prisoners played a dilemma game produced by a third actor, the police. More recently, Willer and Skvoretz (1997) and Borch and Willer (2006) found Prisoner’s Dilemma and other games by attributing strategies to third actors embedded in the network.

Looking ahead, the analysis now offered turns on whether exchanges ever occur in the suboptimal relations in the three networks. A suboptimal relation is one for which, when exchange occurs in it, there will be one fewer than the maximal number of exchanges possible for the network. In the 4-Line, two exchanges are maximally possible, but, if the Bs exchange, only one. Thus B–B is suboptimal. Similarly, in the Stem, both B–C relations are suboptimal as are B–C, C–D and D–F in Borg6. The analysis to follow will show why exchanges do not occur in the suboptimal relations of one-shot exchange networks and the consequences thereof.

The analysis applies Principle 1 of Elementary Theory: “Social actors act to maximize their expected preference state alteration”

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2 The two conditions do not necessarily scope limit the analysis. We believe, but do not prove, that conclusions of this analysis also hold for multiple exchange networks and where exchange is not simulated, but where resources are actually exchanged.

3 To have a ‘surplus of positions’ means that the number of positions connected at i, N_i, is greater than the maximum number of exchanges that i can complete, M, N_i > M_i. (Willer, 1999: 52–53).

4 Resource divisions of 24–0 are precluded by the software used to test our hypotheses. Nor are they theoretically plausible for no exchange can occur without joint agreement and 24–0 divisions have no incentive for one of the two to agree.
INSTEAD, they form an automorphically equivalent pair and they will exchange 12–12.

Now consider the first A–B exchange. Remember that the Bs will always have a partner and thus are never excluded, but, were the Bs to exchange with each other, the As would be excluded. The possibility of a B–B exchange and only that possibility advantages the Bs. How large is that advantage for the one-shot structure when there is no future to affect current decisions? To avoid exclusion, the As must better the 12–12 offer between the Bs by offering 13–11. When they do, from Assumption 2, the Bs need make no better offer because the one unit increment of that offer over the 12–12 offer is preferred by the Bs. Given the two alternatives, Bs, preferring 13 to 12, will not exchange. If the As do not believe the threat, to gain better than 13–11 divisions, the Bs must exchange to carry out the threat. If the As believe the Bs’ threat to exchange with each other, they will accede to exchanges more unequal than 13–11 and the A offers the B 13–11. Since B cannot hope to gain better than 12 when exchanging with the Cs, the network splits into two dyads, anchored by A’s 13–11 offer. Thus again B’s feasible payoffs collapse to 13 or 12.

For the Stem game displayed in Fig. 2b, B plays one of the Cs. Again there are two “third actors” who are now A and the second C. A’s 13–11 offer and the second C’s 12–12 offer produce the game. Similar to above, “+” means accept the offer from outside the B–C game and “−” means reject that offer. In the top left cell, B accepts A’s offer gaining 13 and C accepts the offer of the other C gaining 12. In the top right cell, B accepts A’s offer while C, having initially rejected the other C’s offer, is now in a C–C dyad and exchanges 12–12. The bottom left cell finds C accepting the offer from the other C while B, now in a dyad with the A, gains only 12. Finally, in the bottom right cell, rejecting other’s offers B and C exchange.

In the Stem game only B has a dominant strategy: accept A’s offer. Therefore, we predict 11–13 exchanges for the A–B exchange, that the A is never excluded, and that neither B–C suboptimal exchange ever occurs. Similar to the analysis of the 4-Line, because the Stem is one-shot, there is no future for which a B–C exchange now could induce the A to offer more than 11–13.

The extension of this analysis to the A–B and D–E relations in Borg6 is straightforward. As above, A and E offer B and D respectively 13–11, an offer that is not bettered in any of their other relations and cannot be feasibly countered. As above, B and D both prefer more unequal divisions but have no leverage to gain them. Thus 11–13 is predicted for both relations. It is also predicted that exchanges never occur in suboptimal relations, and A and E are never excluded.

3. Predicting for iterated networks

In contrast to one-shot structures, there can be a future in iterated exchange structures. Thus the suboptimal relations that broke in the one-shot structures, can have a role as threats. For example, in the iterated 4-Line, the Bs’ advantage stems from the pressure exerted on the As by the possibility of the B–B exchange. We now show how the possibility of a B–B exchange produces exchange ratios more unequal than 13–11 in the iterated 4-Line and in other weak power iterated networks.

How often will the threat of a B–B exchange be carried out? To predict that frequency it would be helpful to know the beliefs of the As. If the As believe the Bs’ threat to exchange with each other, they will accede to exchanges more unequal than 13–11 and the Bs need not exchange. If the As do not believe the threat, to gain better than 13–11 divisions, the Bs must exchange to carry out the threat. Not knowing As’ beliefs, we only predict that exchanges in the suboptimal relations will occur more frequently in iterated than in one-shot networks.

To predict resource pool divisions we employ Resistance (Willer, 1981, 1999; Walker et al., 2000; Willer and Emanuelson, 2008). Unlike the analysis of one-shot networks where Principle 1 was
applied, here we need a procedure that takes into account the Bs’ threat. Resistance takes that threat into account by balancing the interest in gaining a better payoff with the cost of disagreement for each actor. Resistance predicts resource divisions by calculating from that balance. Note that, because Resistance treats suboptimal relations as viable, it does not apply to one-shot weak power networks where suboptimal relations break.

3.1. Seek likelihoods and power differences

Three procedures for applying Resistance to iterated weak power networks have been offered (Lovaglia et al., 1999a,b) and the simplest of the three, “GPI-R” has proved to be the most precise (Emanuelson, 2005; Burke, 1997). The first step of GPI-R is to calculate for each position the likelihood that it is included, what is called a “seek likelihood.” Seek likelihoods are hypothetical constructs that are calculated by assuming that all positions distribute their interest in exchanging equally across all their adjacencies. Assigned to positions they indicate relative structural power. Seek likelihoods are entered into Resistance equations to predict resource divisions.6

In the 4-Line, each B seeks to exchange with its A half of the time and seeks to exchange with the other B half of the time. Since the Bs seek exchange with each other, .5 of the time, the likelihood that they exchange with each other is .5 x .5 = .25. When the Bs exchange, the As are excluded. Therefore, the As are included 1 – .25 = .75 of the time while the Bs are always included.

The likelihoods for the Stem also assume that suboptimal relations are viable options. The seek likelihood that B exchanges with either C in the Stem is .40.7 Thus, A is included 1 – .40 = .60 of the time, which is less frequent than either A in the 4-Line. Relative to its A, B in the Stem is more powerful than in the 4-Line. Here, as in the 4-Line and elsewhere, seek likelihoods assume that actors equally distribute their interest in exchanging across all relations to which they are connected.

Since seek likelihoods are not conditioned by a position’s preferences among exchange partners, they are not intended to predict the actual distribution of exchanges. For example, in the 4-Line, B prefers to exchange with its A who is weaker than the other B. Thus, it is reasonable to infer that the Bs will actually exchange with the As more than .75 of the time. In the extreme case, when the As believe that the Bs will fulfill their threat and exchange with each other, resource divisions inflate beyond 13–11 and B–B exchanges do not occur. Conversely, B–B exchanges occur if As believe they will not. While we do not predict a point value for frequency of exchanges in suboptimal relations, we do predict that they occur more frequently in iterated than in one-shot structures. Below we test elements of this line of argument by comparing A–B resource divisions before and after B–B exchanges.

3.2. Resistance and resource divisions

In Eq. (1), $P_A$ is A’s payoff, $P_A^{\text{max}}$ is A’s best possible payoff and $P_A^{\text{con}}$ is A’s payoff at confrontation, when the A–B agreement does not occur, and similarly for B. Then for an A–B equal power dyad,

$$R_A = \frac{P_A^{\text{max}} - P_A^{\text{con}}}{P_A^{\text{max}} - P_B^{\text{con}}} = \frac{P_A^{\text{max}} - P_B}{P_B - P_B^{\text{con}}} = R_B$$

and, when $P_A^{\text{max}} = 24$ and $P_B^{\text{con}} = 0$ for both, by symmetry, $P_A = 12$ and $P_B = 12$. More generally, $P_A^{\text{max}}$ and $P_B^{\text{con}}$ are constants set by initial conditions of the structure and, given their values, Resistance is solved for $P_A$ and $P_B$.8

Seek likelihoods (li) are used to set $P_A^{\text{max}}$ and $P_B^{\text{con}}$ in the following way. For a 24 point resource pool, let $P_A^{\text{max}}$ vary between 24 and 12, $P_B^{\text{con}}$ between 12 and zero, and both vary with li, the seek likelihood that i will be included (Lovaglia et al., 1999a). Then

$$P_i^{\text{max}} = 12(li + 1)$$
$$P_i^{\text{con}} = 12li$$

For the 4-Line, $l_A = .75$ and $l_B = 1.0$. Thus, $P_A^{\text{max}} = 12 (1 + l_A) = 12 \times 1.75 = 21$ and $P_A^{\text{con}} = 12 l_A = 12 \times .75 = 9$. For B, $P_B^{\text{max}} = 24, P_B^{\text{con}} = 12$, and

$$R_A = \frac{21 - P_A}{P_A - 9} = \frac{24 - P_B}{P_B - 12} = R_B$$

Since the sum of A’s and B’s payoffs is 24, solving $P_A = 10.5$ and $P_B = 13.5$. Thus Resistance predicts that B exercises slightly more power over A than the 13–11 predicted for the one-shot 4-Line.

Other iterated weak power networks are calculated similarly. For the repeated Stem, $l_A = .60$ and $l_B = 1.0$. Plugging into the equations above, the A–B exchange is predicted to average 9.6–14.4 which is more unequal than 11–13 predicted for the one-shot Stem.

In the Borg6, $l_A = .76$ and $l_B = 1.0$. $l_C = .85$, $l_D = 1.0$, $l_E = .60$ and $l_F = .73$. We focus on A–B and D–E where power differences should be greatest. For the iterated Borg6, plugging into the equations above, predicts 14.4–9.6 for the D–E relation and 10.5–13.5 for A–B. In the one-shot Borg6, we predicted 13–11 divisions for both D–E and A–B and, unlike the iterated Borg6 where suboptimal exchanges are expected, for the one-shot condition, exchange is predicted not to occur in the B–C, C–D or D–F suboptimal relations.

4. Hypotheses

Here we state six hypotheses. The first two hypotheses address power development in iterated networks. The third hypothesis addresses power development in one-shot networks. Next, we hypothesize the effect of repetition on exchange payoffs by comparing payoffs in one-shot and iterated networks. Lastly, Hypotheses 5 and 6 differentiate the best methods for predicting payoffs in one-shot and in iterated networks.

**Hypothesis 1.** In iterated weak power exchange structures, disadvantaged positions face higher rates of exclusion than like positions in one-shot weak power networks.

As discussed above, the lower power positions in one-shot structures should never be excluded while, in iterated structures, if they do not believe the threat, they will be excluded.

**Hypothesis 2.** In iterated weak power exchange structures, if there is a change, payoffs in the position’s advantaged relation are larger after having exchanged in suboptimal relations than before.

Lower power positions who do not believe the threat signal that lack of belief by agreeing to only slightly unequal resource divisions. Having been excluded, they believe and agree to more unequal divisions.

**Hypothesis 3.** When exchanges in one-shot weak power exchange structures are sequential, advantaged positions receive more if they

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6 Other likelihood methods (Friedkin, 1993; Buskens and van de Rijt, 2008) can be used in resistance equations. See Willer and Emanuelson, 2008—

7 Seek likelihoods for networks more complex than the 4-Line are substantially later for each position the likelihood that it is included, what is called a “seek likelihood.” Seek likelihoods are hypothetical constructs that are calculated by assuming that all positions distribute their interest in exchanging across all relations to which they are connected.

8 Resistance is algebraically equivalent to the Raifa (1953) and Kalai and Smorodinsky (1975) solutions.
exchange with their disadvantaged partner while all their alternative partners are available.

After others exchange, positions that had been advantaged are limited to exchanging in equal power dyads.

**Hypothesis 4.** Advantaged positions in iterated weak power exchange networks receive more than do like positions in one-shot networks.

In iterated structures, that there is a future allows advantaged positions to fulfill threats driving payoffs up across iterations.

**Hypothesis 5.** Network Exchange Theory's Principle 1, not Resistance, better predicts payoffs to advantaged positions in one-shot weak power networks.

**Hypothesis 6.** Network Exchange Theory’s Resistance, not Principle 1, better predicts payoffs to advantaged positions in iterated weak power networks.

Resistance necessarily assumes that all relations are viable: Principle 1 does not.

### 5. Design of the experiments

The experiments test the six hypotheses above. These results are presented in five tables. Experiments were conducted using ExNet 3.0, Web-based software designed for network exchange experiments. Subjects were recruited from undergraduate classes at a large state university. Interacting through ExNet 3.0, subjects sent and received offers, and made exchanges. Full information on all offers, counteroffers and exchanges was displayed on each subject’s screen. At the conclusion of the study, subjects were paid by points earned. The weak power structures studied here are the 4-Line of Fig. 1a, the Stem of Fig. 1b and the Borg6 of Fig. 1c. The suboptimal relations are B–B in the 4-Line, the two B–C relations in the Stem, and B–C, C–D and D–F in the Borg6.

For the iterated 4-Line, Stem and Borg6, sessions consisted of periods and rounds. The number of sessions for the 4-Line is eight, the Stem is eleven and the Borg6 is seven. The number of periods equaled the number of positions in the network. At the conclusion of a period, participants rotated to new positions such that each had the opportunity to occupy all positions in the network thereby controlling for individual-level effects. Each period consisted of four rounds of negotiation and exchange. In each round participants could negotiate over the division of 24 point resource pools. All positions were limited to maximally one exchange. Each round ended when all exchanges that could occur had occurred or, failing that, when 3 min had expired. Subjects were not told the number of rounds in each period or the number of periods in the session.

Because Table 1 compares frequencies of exchange, n is the number of rounds in which exchange can occur. For Table 2, n is the number of events where payoffs varied before and after exchange in a suboptimal relation. Instances where payoffs did not change were dropped prior to the analysis. In calculating iterated mean payoffs seen in Tables 3 and 4, the last three rounds were averaged to provide a single datum point for each period. For Table 3, degrees of freedom were calculated for networks by adding ns seen in Tables 4 and 5.

In all one-shot networks, participants had up to 5 min to exchange in a session consisting of only a single round. The 4-Line had twenty-six sessions, the Stem fourteen and the Borg6 fourteen. Subjects for these experiments were volunteers who had completed unrelated experiments held immediately before. Piggybacking on prior experiments had the advantage that knowledge of how to interact and exchange using ExNet was fresh in the subjects’ minds. Two of the networks, the 4-Line and the Stem were run using 20 point profit pools. In the Borg6, 24 point profit pools were used. Again, all were limited to maximally one exchange. Subjects were paid by points earned in the single round of negotiation.

## Table 1
Comparing the frequency that advantaged positions in iterated networks do not exchange in suboptimal relations to like frequencies in one-shot networks.

<table>
<thead>
<tr>
<th>Network</th>
<th>One-shot</th>
<th>Iterated</th>
<th>z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-Line [B in A–B]</td>
<td>.960 [n = 26]</td>
<td></td>
<td>.805 [n = 128]</td>
<td>.911</td>
</tr>
<tr>
<td>Stem [B in A–B]</td>
<td>1.0 [n = 14]</td>
<td>.835 [n = 176]</td>
<td>.65</td>
<td>.05</td>
</tr>
</tbody>
</table>

Note: Values represent the percentage of exchanges where the disadvantaged position could exchange because exchange did not occur in their partner’s alternative relation(s), n equals the number of exchange opportunities, i.e., the number of rounds.

## Table 2
Comparing payoffs in the position’s advantaged relation before and after exchange outside that relation: frequency of increase compared to baseline.

<table>
<thead>
<tr>
<th>Structure</th>
<th>Frequency of increase</th>
<th>n</th>
<th>z</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-Line</td>
<td>.857</td>
<td>14</td>
<td>2.67</td>
<td>.005</td>
</tr>
<tr>
<td>Stem</td>
<td>.714</td>
<td>14</td>
<td>1.60</td>
<td>NS</td>
</tr>
<tr>
<td>Borg6</td>
<td>.75</td>
<td>24</td>
<td>2.45</td>
<td>.01</td>
</tr>
</tbody>
</table>

Note: n is the number of times that an advantaged position exchanged in a power relation after exchanging in a suboptimal relation.

### Table 3
Comparing observed mean payoffs to like positions in one-shot and iterated weak power networks.

<table>
<thead>
<tr>
<th>Network</th>
<th>Iterated observed mean</th>
<th>One-shot observed mean</th>
<th>Pooled Sd.</th>
<th>df</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-Line [P in A–B]</td>
<td>13.58</td>
<td>13.47</td>
<td>.462</td>
<td>78</td>
<td>.238</td>
<td>NS</td>
</tr>
<tr>
<td>Stem [P in A–B]</td>
<td>14.41</td>
<td>12.62</td>
<td>.252</td>
<td>55</td>
<td>7.10</td>
<td>&lt;0005</td>
</tr>
<tr>
<td>Borg6 [P in A–B]</td>
<td>14.02</td>
<td>12.08</td>
<td>.926</td>
<td>52</td>
<td>2.095</td>
<td>&lt;05</td>
</tr>
<tr>
<td>Borg6 [P in D–E]</td>
<td>14.52</td>
<td>15.22</td>
<td>.636</td>
<td>49</td>
<td>−1.10</td>
<td>NS</td>
</tr>
</tbody>
</table>

Note: To allow comparison between iterated and one-shot networks, values for the one-shot 4-Line and Stem were rescaled to fit a 24 point resource pool. The degrees of freedom used in this table are calculated by adding the n for the iterated and one-shot structures and subtracting 2. For ns, refer to Tables 4 and 5. For example, in the 4-Line, n = 32 in the iterated networks and n = 48 in the one-shot networks. df = 32 × 48 − 2 × 78.
Comparing observed mean payoffs to advantaged positions in iterated networks to predictions for iterated and one-shot networks.

### Table 4

<table>
<thead>
<tr>
<th>Structures</th>
<th>Pool</th>
<th>Observed mean</th>
<th>Standard deviation</th>
<th>One-shot prediction</th>
<th>Iterated prediction</th>
</tr>
</thead>
<tbody>
<tr>
<td>4-Line, n = 32a</td>
<td>24</td>
<td>13.58</td>
<td>1.787</td>
<td>13 [1.81]</td>
<td>13.5 [0.249]</td>
</tr>
<tr>
<td>Stem, n = 44b</td>
<td>24</td>
<td>14.41</td>
<td>2.740</td>
<td>13 [1.37]</td>
<td>14.4 [0.0239]</td>
</tr>
<tr>
<td>Borg6 (P&lt;sub&gt;a&lt;/sub&gt; in A–B), n = 42c</td>
<td>24</td>
<td>14.02</td>
<td>2.953</td>
<td>13 [2.21]</td>
<td>13.5 [1.13]</td>
</tr>
<tr>
<td>(P&lt;sub&gt;b&lt;/sub&gt; in D–E), n = 42</td>
<td>24</td>
<td>14.52</td>
<td>2.877</td>
<td>13 [3.38]</td>
<td>14.4 [0.267]</td>
</tr>
</tbody>
</table>

Note: One-tailed test [r-value in brackets]. There is one datum point for each period in a session. Datum points are calculated by averaging the payoffs to the advantaged positions in the last three rounds of exchange.

a The iterated 4-Line has eight sessions with 4 periods each, n = 8 × 4 = 32.
b The iterated Stem has eleven sessions with 4 periods each, n = 11 × 4 = 44.
c The iterated Borg6 has seven sessions with 6 periods each, n = 7 × 6 = 42.

6. Results

Results in Table 1 address Hypothesis 1. Do disadvantaged positions in iterated weak power networks face a higher rate of exclusion than like positions in one-shot networks? We predict that they do. For example, adding across the three one-shot networks there were 68 opportunities for exchange in suboptimal relations and four suboptimal exchanges. In Table 1, we measure the likelihood that the disadvantaged position's partner did not exchange in its alternative, suboptimal relation(s). For example, 1.0 means that the disadvantaged position was never necessarily excluded while, at the other extreme, zero means that it was always excluded. The table gives results for z-tests for two independent proportions. Results offer some support for our prediction. In all four networks, the disadvantaged position in the iterated network was necessarily excluded more often. Of those four, two are significant at .05 and all are in the predicted direction. Overall, results give some support for the assertion that exclusion is present more frequently in iterated than in one-shot networks.

Table 2 tests our prediction for iterated networks that, when they change, payoffs to advantaged positions increase after disadvantaged positions are excluded. For example, in the 4-Line we compare A–B exchange ratios before and after the Bs exchange with each other. Comparing Bs payoff in A–B exchanges after excluding the A and before shows an increase approximately 86% of the time. The table reports frequency of increase in payoffs to advantaged positions from before to after the completion of a suboptimal exchange. Since only changed payoffs are considered, the z-tests for proportions take the frequency 0.5 as the null hypothesis. The payoff to the advantaged position increased significantly more often in two of three networks. Importantly, for all networks, advanced positions experienced an increase in payoff more frequently than decrease.

Taken together Tables 1 and 2 indicate the importance of exclusion in iterated networks. Exclusion is more frequent in iterated networks and, when disadvantaged positions experience exclusion, advantaged positions gain better payoffs. By contrast, exclusion does not occur or is very infrequent in one-shot networks. Furthermore, when networks are one-shot, there can be no adjustment of payoffs after exclusion. Since exclusion does not produce unequal payoffs in one-shot networks, why are some positions advantaged? In one-shot weak power exchange structures, Hypothesis 3 asserts that advantaged positions receive more if they exchange with their disadvantaged partner while all of their alternative partners are still available. Since we predict but a single point difference between first and second exchanges the statistical power is low. For example, in the one-shot 4-Line and Stem that have 20 point resource pools, we predict the first to exchange gains 11 and the second 10. The observed means in the one-shot 4-Line give almost exactly that one point difference: 10.96 for the first exchange and 9.77 for the second. For our ns, that difference is too small to be significant. In the Stem, B received 11.43 when exchanging first and 11.0 when exchanging second, a difference smaller than we predict. The Borg6 results, where the resource pool was 24, fit the hypothesis better. When exchange in A–B occurred first, the advantaged position, B’s average payoff was 13, and was only 11.2 when exchanging last. Here no test is appropriate because the A–B exchange happened first only twice. When exchange in the D–E relation occurred first, the payoff to D, the advantaged position averaged 14, but was only 12 when that exchange occurred last. Here again no test is appropriate because D–E occurred last only once.

Power develops differently when weak power networks are iterated than when they are one-shot. We assert that these different
processes result in larger payoffs to advantaged positions in iterated networks. Table 3 displays and compares the means for iterated and one-shot networks. As shown in Table 3, that assertion receives support in three of four relations, two of which are significant. Not supportive is the payoff to the D in D–E of the Borg6 that is higher in the one-shot than in the iterated network, a difference that is not significant.

Hypothesis 5 states that Resistance is more accurate than Principle 1 at predicting observed means in iterated weak power networks. As can be seen in Table 4, all observed mean payoffs to advantaged positions are significantly larger than predictions for one-shot structures. In addition, all observed means for iterated structures are not significantly different from Resistance predictions. Hypothesis 5 is supported.

Table 5 addresses Hypothesis 6. Does the analysis based on Principle 1 predict payoffs in one-shot weak power networks more accurately than Resistance? The answer is mixed. Note first that the size of resource pools in 4-Line and Stem are not 24 but 20. The effect of using the smaller sized pool for the 4-Line is to shrink the predicted difference iterated vs. one-shot to 11.25 – 11 = -.25, exactly half the difference for the 24 point pool seen above. Given the variance for our n, it is not possible to detect a difference that small. In the case of the Stem, however, the difference is larger: the mean payoff to the advantaged position fits well the one-shot prediction and is significantly different from the iterated prediction. For the Borg6, the results for the D–E relation do not support predictions. But the results for the A–B relation support one-shot predictions and not iterated predictions.

7. Discussion

Are repeated social situations more ‘mild and favorable in effect’ than ones that happen only once? The trickery of the confidence man relies upon his relations being one-shot as does that of the professional thief (Sutherland, 1937). When trust is low, according to Yamagishi and Yamagishi (1994) people come to rely on assurance given by a web of close relations that happen over and over again. Even coercive relations are affected by repetition. The state that stands in coercive relations with its citizens is at least minimally interested in their welfare as a source of taxes, an interest that is not shared at all by the mugger. Certainly Tit-for-Tat in the Prisoner’s Dilemma game is more ‘mild and favorable in effect’ than defection.

If there were a generalization to be made linking welfare to repetition, the results of this study would be the exception. Higher power actors in one-shot weak power structures cannot benefit from previous or future exclusions of their lower power partners. As a result, those lower in power gain resource divisions at or near equality. Said somewhat differently, higher power positions in one-shot networks have little opportunity to manipulate their lower power partners and are also less exploitive. By contrast, in repeated weak power structures, there are opportunities to exclude, opportunities that are used with the result that those in higher power positions increase their payoffs at the expense of their lower power partners. In general, one-shot weak power exchange structures appear more ‘mild and favorable in effect’ than are repeated ones.

This paper proposed six hypotheses finding strong support for some and partial support for others. Lower power actors face relatively higher rates of exclusion in iterated weak power networks, whereas those same positions in one-shot weak power networks are rarely if ever excluded. In iterated networks, exclusion has the effect of increasing payoffs to advantaged positions and, not surprisingly, they usually gain more than their counterparts in one-shot networks. In one-shot networks the order of exchange matters: first exchanges are more unequal than later exchanges. The results of this research bear upon where components of Network Exchange Theory should best be applied. The analysis developed for one-shot networks using Principle 1 better predicted results there than did Resistance and conversely for iterated networks. These results are consistent with the formulation of Resistance. Whereas Resistance assumes that all relations of the network are feasible, in one-shot weak power networks suboptimal relations are not. In effect, Resistance should be scope limited to iterated networks—insofar as weak power networks are concerned.

Results reported here have implications for other exchange theories including two of the most long-standing, Power-Dependence and the Core. Previous studies have treated the Core and Power Dependence as competing theories (Skvoretz and Willer, 1993; Lovaglia et al., 1999a; Willer and Emanuelson, 2008), but the analyses and results here suggest that they are not. Theories can compete only if they share a common scope and, for weak power networks, it is doubtful that they do. We suggest that Power Dependence Theory applies only to iterated exchange networks. Like Resistance, it does not apply to one-shot networks for it predicts power by calculating from alternative relations, like the suboptimal B–B in the 4-Line that are not used under one-shot conditions. Nor is this limit contrary to Power Dependence theorists who, as quoted in the introduction of this paper, have always seen their phenomenon as repeated.

The Core is a game-theoretic solution concept applied to exchange networks by Bienenstock and Bonacich (1992, 1993). It predicts that suboptimal relations are never used even in iterated weak power networks. That prediction is inconsistent with results reported here as well as those previously reported by Simpson and Willer (1999) which show that suboptimal relations are assuredly used in iterated weak power networks. But these results do not bear upon the Core if it is scope limited to one-shot exchange networks. That scope limitation seems consistent with Shubik: the Core “does not adapt with ease even to the finite extensive form, let alone infinite-horizon games.” (1982: 286). Given that scope limitation together with the scope limitation of Power Dependence, the two have no scope in common. Thus they do not compete.

An important issue left unresolved by this research is predicting the frequency of exchange in suboptimal relations for repeated weak power structures. Earlier, we suggested that threats are actually acted on only if they are not believed by lower power actors. Is knowing whether the threat is believed sufficient to predict its use? Perhaps. But it is doubtful that beliefs can be measured during the exchange process without rendering that process itself unpredictable.

Only one theory of exchange networks, Expected Value Theory, gives point predictions for frequency of exchanges (Friedkin, 1995). The only test of those predictions thus far did not meet with success according to its authors (Bonacich and Friedkin, 1998). Is there a way forward to extend theory to more accurate predictions of exchange frequencies? We note that Expected Value Theory uses a single frequency to infer the relative power of positions and frequency of exchange. Using only one may be problematic. For example, in the Stem, B prefers to exchange with A who is weaker than either C. The seek likelihood of A–B exchange is .60, but the observed proportion is much larger at .835. (See Table 1.) It should be much larger because B prefers to exchange with A where B’s payoff is higher than when exchanging with either C. Perhaps the next step is for theory to generate two likelihoods, one for the relative power of positions and, in light of that value, a second for the frequency of exchanges.

This paper began by asking whether one-shot and iterated exchange structures differ and if so how? Theory and research results presented here both assert that they do. The study of one-shot networks throws new light on iterated networks, their dynamics and why they have the outcomes they do. Iterated weak power structures offer greater opportunities to manipulate, to exer-
cise power, and to exploit than do one-shot structures. Still only three networks have been studied. All were weak power and all have an even number of positions. While commonly found in weak power networks with even number of positions, suboptimal relations are quite rare in weak power networks with odd numbers of positions. How then does power develop there and are there differences between one-shot and iterated structures like those found here? Finally, what of the extension of this research to strong and equal power networks? Are there issues there to study?

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