CURRENT RESEARCH IN SOCIAL PSYCHOLOGY

Volume 5, Number 6
Submitted: February 18, 2000
Resubmitted: March 9, 2000
Accepted: March 16, 2000
Publication date: March 20, 2000

APPLYING RESISTANCE TO ORDERING IN EXCHANGE NETWORKS: A THEORETICAL EXTENSION

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ABSTRACT

This paper introduces "ordering" as a newly discovered "structural condition of power." The relations of a structure are ordered when more than one relation must be completed in a given sequence. Gatekeeping, a familiar example of ordering, occurs when an actor controls access to valued relations and benefits from that control. Resistance equations are used to predict 1) the size of benefits gained from controlling ordering and 2) the interaction between ordering and other recognized structural power conditions of exchange networks. One result of these applications of resistance is an array of predictions for experimental investigation.

INTRODUCTION

Structural ordering occurs when an actor must engage a series of relations in a given sequence. For example, access to the Dean, is given by the department Chair. Access to the Provost is controlled by the Dean. "Gatekeeping," a special case of ordering, occurs when an actor controls access to valued relations and benefits from that control. Ordering of social relations is quite ubiquitous and cases of gatekeeping are important instances thereof.

Historically, structural ordering has taken many forms. Tepperman (1973) provides an example from fourteenth Century guild organization in England. Seeking to practice a craft, the apprentice must *first* undergo training of long duration under a Master craftsman. Typically Masters were organized in guilds that acted as licensing Boards. "The guild was the channel by which men gained income, authority, and prestige in the town ... One became a full member of a guild through apprenticeship, which varied widely in duration ... but lasted on the average about seven years." (Tepperman 1973:4). Thus the relevant order here is, apprentice-Master, then apprentice-guild. Furthermore, the guild system may be viewed as a "shared ordered structure" in which Masters shared the structural advantage of ordering – the guild acting as a licensing board.

Over the term of apprenticeship, Masters accumulated wealth by extracting useful work from apprentices (Tepperman 1973). The ordering effect is the apprentice's cost of gaining access to practicing as a Master, a cost which is a benefit to the Master.

Contemporary organizations are a fertile ground for ordering. Burawoy (1979) recounts experiences as a machinist including his frustrations at gaining access to needed tools. At the end of each day, tools were stored in the tool cage. Each subsequent day, a machinist can begin work only when serviced by the employee running the tool cage. But that employee always passed tools to long-term workers first leaving Burawoy to last. Without tools Burawoy could not begin work and, since work was paid at piece rate, could earn no money.

The order here is clearer when viewed from the point of view of the job. From that point of view, the relevant order is, Burawoy-access to needed tools (through the tool cage custodian), then Burawoy-work and pay. Subsequently Burawoy won the Christmas lottery, a ham which he promptly gave to the tool cage man. From that time Burawoy's requests were treated the same as those of long-term employees. Here, the ordering effect is the gift of the ham which is Burawoy's cost of gaining access to needed tools, work and pay.

Structural ordering also occurs in white-collar work. In a study of an unemployment bureau, Blau (1987) reports an "exchanging of values" (p. 47). Under bureaucratic rules, agents unable to solve work problems were required to seek help from their boss. Blau puts it thus: "Agents, however, were reluctant to reveal to their superior their inability to solve a problem for fear that their ratings would be adversely affected" (p. 47). As a result, an informal system was developed wherein more knowledgeable colleagues were consulted. "The questioning agent is enabled to perform better than he could otherwise have done, without exposing his difficulties to the superior.... The consultant gains prestige, in return" (p. 47-48). To perform and not receive low ratings, agents had to go through knowledgeable colleagues acting as informal consultants. The cost paid by agents, the ordering effect, was the deference paid to their more knowledgeable colleagues.

Because gatekeepers control access to advantages, they exercise power and benefit from the control. A theory which explains gatekeeping and other kinds of ordering must explain what determines the size of the benefit gained by gatekeepers and by others favored by the ordering of relations. Resistance Theory asserts that the size of that benefit is a function of the value of the access sought. Gatekeepers who control access to highly valuable relations will gain more than gatekeepers who control access to relations of nominal value. In this paper, resistance equations will be used to generate metric predictions, calculating from the expected benefit to be gained back to the costs of gaining access.

As indicated by the foregoing examples, ordering is not limited to exchange networks. Nevertheless, exchange networks offer a well understood context to study ordering. For example, an exchange ratio can stand for a benefit. The more favorable the exchange ratio for the actor controlling access, the higher the payoff to that actor and the lower the payoff to the actor seeking access. Then the increment of the payoff above equipower is the benefit to the actor controlling access. And the cost of the benefit is the increment of payoff below equipower for the actor seeking the access.

In the sections to follow, the paper evolves thus: First, resistance is introduced and applied to ordering to generate metric predictions. Next, I investigate the interaction of ordering with other structural power conditions. These analyses will generate predictions which will be tested in a future paper.

APPLYING RESISTANCE

Resistance has been extensively used to predict exchange ratios under a variety of network conditions (cf. Willer 1984, 1992; Skvoretz and Willer 1991, 1993; Willer and Skvoretz 1997). In "power relations," actors' interests are produced by the mixed motives of relations. In mixed motive games, each player seeks its best outcome, here called Pmax, and seeks to avoid its worst outcome, here called Pcon. Resistance captures the mixed motives of power relations in the following kind of way: when P_i is the payoff to *i*, $P_{i\max}$ is *i*'s best payoff and $P_i$con the payoff at confrontation (when exchange does not occur), *i*'s resistance,

$$R_i = \frac{P_i \max - P_i}{P_i - P_i con} \quad (1)$$

And Principle 2 of the theory asserts that:

Agreements occur at equi-resistance (Willer 1981&1999).

Thus resistance predicts that exchanges occur when $R_i = R_j$. For example, in a dyad in which A and B divide a pool of 24 resources, the most that either can gain is 23 leaving the 24 - 23 = 1 for the other. Therefore, Pmax = 23. When A and B fail to reach an agreement, they are in confrontation, no exchange occurs and Pcon = 0 for both:

$$R_A = \frac{23 - P_A}{P_A - 0} = \frac{23 - P_B}{P_B - 0} = R_B \quad (2)$$

By symmetry $P_A = 12$ and $P_B = 12$. Since the dyad has no conditions which produce power differences, its payoffs are counted as equipower (Willer 1999). Note that here Pcon = 0 because neither actor benefits when exchange does not occur. Unless otherwise noted, all following examples will use 24-point resource pool.

APPLYING RESISTANCE TO PREDICT ORDERING EFFECTS

Before proceeding with the analyses of this paper, a useful notation for the tables is introduced here: The term "Br" refers to a "Branch" network having one central position and two or more peripherals that are connected only to the single center position. For the purpose of identifying structures used in the analyses, and represented in the tables, Br1_1 denotes a 2-Branch where a central position has two exchange partners and the two exchanges must occur in order. Similarly, Br1_1_1 denotes a 3-Branch where a central position has three exchange partners, with whom exchanges must occur in order. When the number of resources varies, Br1_1: 24_12 indicates that there are 24 resources in the first relation to be divided and 12 resources in the second. Similarly, Br1_1: 24_48 indicates there are 24 resources in the first relation and 48 in the second. When the number of resources are not given, the default value is 24 resources in all relations.

Br21_1, Br1_21, Br22_1 and Br1_22 are all 3-Branch networks with two "ordered steps." In the first step of Br21_1, the central position is exclusively connected to two exchange partners. Once the exchange with either one of the two positions in the first step is completed, the central position can then exchange with the third partner in the second step. By contrast, in Br1_21 the central position is exclusively connected in the second step of the order. In Br22_1, the central position has two exchange relations in the first step, of which it may exchange with either or both of the two partners, and a single exchange in the second. Finally, in Br1_22 the central position has a single exchange relation in the first step of the order, and may then exchange with either or both exchange partners in the second step.

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Now consider the A - B - C network in which B must exchange first with A in order to reach C. At issue is the cost of B’s access to C as measured by the A - B exchange ratio. After A exchanges with B, ordering is completed. Thus the B - C exchange relation is equipower and, with 24 resources to divide, B can reasonably expect to gain 12. But, if the A - B exchange is not completed, B cannot access C and the 12 will be lost. Therefore, $P_{Ba}con$ = - 12 and

$$R_B = \frac{23 - P_B}{P_B - (-12)} = \frac{23 - P_A}{P_A} = R_A \qquad (3)$$

For any agreement $P_A + P_B = 24$. Substituting and solving equation 3 gives $P_B = 9.72$ and $P_A = 14.28$. Therefore, resistance predicts that A will exercise power over B in the first exchange while the second exchange will be equal power. To find B’s cost of access subtract P_B from 12, the payoff at equipower; 12 – 9.72 = 2.28. And 2.28 is A’s benefit as gatekeeper for 14.28 = 12 + 2.28.

More generally, the effect of ordering on the first exchange relation is to reduce the value of Pcon by the value to be gained in the second. For the A – B – C structure,

$$P_{Ba}con = - P_{Bc}.$$

For example, when the total resource pool value of the second exchange, B - C, is halved to 12, B can expect to gain 6 in that exchange and therefore P_{Ba} con = - 6 (the value to be lost if the B -

A exchange is not completed) and resistance predicts B's payoff in the first exchange to be 10.73. When the resource pool of the second exchange, B - C, is doubled to 48, P_{Ba} con = - 24, and B's payoff in the first exchange declines to 8.23. Table 1 summarizes some resistance values for the central position, B, for the ordered 2-Branch and 3-Branch used for the analysis of this section.

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Table 1: Pcon and Predicted Payoffs in Ordered 2- and 3-Branch Networks

Structure	Exchange	Pcon	Predicted Payoff
Br1_1:24_12	first	-6	10.73
Br1_1:24_24	first	-12	9.72
Br1_1:24_48	first	-24	8.23
Br1_1_1	second	-12	9.72
	first	-21.72	8.47

Extending this analysis to larger networks is straightforward. Begin with the last exchange (which will be equipower) and work to the first applying resistance sequentially. For example, consider a 3-Branch where B exchanges with A, C and D and must exchange in that order. Once again the last exchange is equipower. Then the second exchange is calculated like the A – B exchange above; since P_{Bd} = 12, P_{Bc} con = - 12 and P_{Bc} = 9.72. Because the value of both B – C and B – D will be lost if B – A is not completed, P_{Ba}con = - (P_{Bc} + P_{Bd}) = - (9.72 + 12) = - 21.72. Plugging that value into resistance for the first exchange gives P_{Ba} = 8.47.

THE INTERACTION OF ORDERING WITH EXCLUSION AND NULL CONNECTION

Previous research has shown that structural power conditions interact and that when two or more conditions are present their joint effects can be predicted (Szmatka and Willer 1995; Willer and Skvoretz 1997). Completeness requires an explanation of how ordering interacts with other structural power conditions. Readers familiar with the application of resistance to the types of connection will recognize the similarity between the applications of resistance to ordering and inclusion.

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In fact ordering and inclusion are similar but distinct phenomena. Consider the A - B - C network. For both ordered exchange and inclusive connection, the central B is lower power in one of two exchanges. Furthermore, the amount of power exercised over B for ordering and inclusion is identical. Equation 3, used here to predict ordering was previously used to predict inclusion (Patton and Willer 1990). Nevertheless, the effects of the two conditions are clearly distinct; in the A – B – C network, ordering affects the *first* of B’s exchanges whereas inclusion affects the *second*.

Before examining the interaction of ordering with exclusion and null, it is useful to introduce the idea of "steps" in the ordering process. In the discussion above, each exchange relation was treated as a single step. Now, ordering effects occur between steps and each step can contain multiple exchange relations. Consider a network with two "ordered steps." In the first step, B has two exchange partners, A and C. In the second step B has one exchange partner, D. Assume that B must complete only one of two exchanges in the first step to access D in the second. At issue is how B’s alternatives interact with ordering to determine the exchange ratios of the first step.

The Interaction of Ordering with Exclusion

Structural ordering may be combined with exclusion in two ways: 1) exclusion can occur in relations which must be completed prior to one or more others, or 2) exclusion can occur in the last step. It will now be shown why the effect of ordering should be eliminated only when exclusion occurs in relations which must be completed prior to the last step of the ordering.

Let B be exclusively connected to A and C in the first step such that exchange with one must be completed before B can exchange in the second step with D. It will now be shown that exclusion eliminates the effect of ordering. Applying equation 2, it is inferred that B and A can agree to a 9.72 - 14.28 exchange and B turns to C for an alternative offer. For the B – C relation, $P_B$con = 9.72 because, if B fails to reach an agreement with C, B gains 9.72 from A. Furthermore, $P_C$max = 14 because C will be excluded unless it makes an offer better than A’s to B. Therefore,

$$R_B = \frac{23 - P_B}{P_B - 9.72} = \frac{14 - P_C}{P_C} = R_C$$

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P_B = 16.67 and P_C = 7.33. Exclusion has already reversed the power process. But the power process will continue in the B – A relation. Facing exclusion, A will make a better offer than C’s, while subsequently C will better A’s offer. The end point is 23 – 1 favoring B. Thus resistance asserts that exclusion completely eliminates the effect of ordering. Table 2 summarizes some resistance factor and predicted values used for the analysis of this section. When ordering has multiple steps, it is predicted that exclusion eliminates ordering only in the step (or steps) in which it occurs.

Table 2: Pcon and Predicted Payoffs for Exclusively Connected Ordered 3-Branch

Structure	Exchange	Pcon	Predicted Payoff
Br21_1	first	approaches Pmax	23
Br1_21	first	23	8.33

When exclusion occurs in the last step, the ordering is already complete so there is no ordering effect to eliminate. Therefore, exclusion operates exactly as it does in the absence of ordering. Since it does, exclusion may inflate the effect of ordering in earlier relations for the following reason. When exclusively connected in the final step, B will gain maximally. For example, let B be central in a 3-branch to A, C and D. In the first step B exchanges with A. Only when that exchange is complete may B exchange with either C or D but not both. In the second step, B will gain $P_B = P_B max = 23$. Therefore, for the first step, $P_B con = - 23$. By contrast, if B had only C for the last step, the B – C exchange would be equipower and, since then $P_B con = - 12$, the effect on earlier relations is less than when B excludes one of C and D.

The Interaction of Ordering with Null Connection

Structural ordering may also be combined with null connection in the same two ways. That is to say, 1) null connection may occur in relations which must be completed prior to others or 2) null connection may occur at the end of the order. As for exclusion, these two have different effects. Only when null connection occurs in steps which must be completed prior to the end of the ordering, is the effect of ordering eliminated.

To show that the ordering effect is eliminated for any step where null connection occurs, consider the 3-Branch where the two exchanges of the first step are null connected. The central B now must complete exchange with A or C or both before exchanging with D. Since B need only to exchange with one of the two, B's access to D cannot be stopped by either A or C alone. Furthermore, once an initial offer from either one is received by B, the ordering effect is eliminated for the other relation. Therefore, both relations are predicted to exchange at equipower. When ordering has multiple steps, it is predicted that null eliminates ordering only in the step (or steps) in which it occurs.

Alternatively, null connection can occur at the end of the order. If so, the size of the ordering effect on earlier relations increases with the sum of the settlements gained. Consider the case where a central B exchanges first with A and then is null connected to C and D in the second step. Again all relations contain 24 resources to divide. B should gain 12 resources when exchanging with C and 12 more when exchanging with D. Therefore, in the A - B exchange P_B con = - (12 + 12) = - 24. This same confrontation value was seen in a structure analyzed earlier where B exchanged last in a 48 pool relation. There the second, and last, exchange occurred at equipower and $P_B con = - 24$ for the first exchange. For that value it was found that $P_B = 8.23$ for the first exchange which is also the prediction here. Table 3 presents some resistance factor values used for the analysis of this section.

Table 3: Pcon and Predicted Payoffs in Null Connected Ordered 3-Branch

Structure	Exchange	Pcon	Predicted Payoff
Br22_1	first	0	12
	second	0	12
Br1_22	first	24	8.23

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CONCLUSION

This paper has introduced ordering as a structural power condition. And, resistance has been applied to predict the effects of structural ordering on relations. Resistance asserts that the size of the ordering effect is a function of the size of the benefits to be gained from later relations. For example, when B must exchange with A prior to exchanging with C the network is ordered and resistance predicts that A benefits at the expense of B. Furthermore, resistance also predicts that the B – C exchange, the last in the ordering, is not affected; B and C exchange at equipower. Resistance asserts that because positions like A control access to valued relations, they have the structural advantage of ordering, and exercise power over positions subject to that control. To this end, the predictions of resistance in this paper have significant empirical implications.

The significance of ordering is importantly related to its occurrence in everyday life. We find that ordered relations are by no means limited to exchange networks. In fact, ordering is frequently encountered in the field, and, when encountered, can have substantial effects. In hierarchical organizations, each level gatekeeps for the next higher one, and additional gatekeepers, like administrative assistants, are also frequently encountered. Similarly, because individuals seeking entry for themselves and/or their merchandise must go through border check-point officials, these officials can be very powerful. Customs officials in some parts of the world become very powerful and rich because they determine who may pass and who may do business. Here the use of gatekeeping as a source of profit may be illegal. When it is, either gatekeepers do not profit or profits are hidden. Note that when the use of gatekeeping as a source of profits is illegal, part of the ordering effect is the cost of monitoring the activities of officials to ensure compliance.

In sum, the actor through whom one must go in order to gain access to advantages can exercise power and benefit from the relation. At issue is what determines the size of that benefit? The application of resistance here asserts that the size of that benefit is a function of the size of the benefits to be gained from later relations.

Applying resistance to ordered exchange predictions have been offered for:

- How ordering affects exchange ratios in exchange networks.
- How ordering and exclusion interact to determine exchange ratios.
- How ordering and null connection interact to determine exchange ratios.

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Because identifying structural power conditions allows exchange ratios and thus power exercise to be predicted, a central issue for any theory of exchange networks is to find those conditions. Here resistance theory has been used to examine ordering, a newly discovered structural power condition. The discovery of structural ordering and the prediction of its effects substantially extends the "prospective scope" of Elementary Theory to a new domain for investigation. Hypotheses have been offered and, if supported in testing, the scope of Elementary Theory will be extended.

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