STRUCTURE, ACTION, AND OUTCOMES: THE DYNAMICS OF POWER IN SOCIAL EXCHANGE*

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Two levels of power — the structure of power in exchange networks, and the strategic use of power resources by actors — affect the frequency and distribution of exchange outcomes. Theories of power and exchange suggest alternative hypotheses about how structural power and strategic action are related to each other and to outcomes. These are tested with data from a series of experiments in which power relations are based on control over rewards and punishments. Both *structural power and its strategic use have substantial effects on exchange outcomes, but structure and action are related only weakly to each other. Their relative effects on exchange outcomes vary with the base of power. Structural power has stronger effects on reward exchange, and strategic action on punishment exchange. The asymmetry of reward exchange in the relation, the traditional measure of power use in power/dependence theory, is affected by both.*

Social scientists have conceptualized power in various ways: as a structural potential (Bierstedt 1950; Wrong 1968; Emerson 1962), as a process of behavioral or tactical influence (Rubin and Brown 1975; Michener and Suchner 1972; Tedeschi and Bonoma 1972), and as the successful outcome of influence (Dahl 1957; Mayhew, Gray, and Richardson 1969; Simon 1957). I argue that a complete analysis of power must include all three facets. Understanding the relations among them requires integrating concepts at "micro" and "macro" levels of analysis (Alexander 1987; Munch and Smelser 1987). The "macro" level of power is the structure of control that provides the opportunities and constraints within which the "micro" level of power, the strategic behavior of actors, operates. Together, structure and action produce outcomes of consequence for actors and relationships.

I investigate how structure and action affect the amount and distribution of exchange in power/dependence relations. Previous research on power and exchange has studied only the relations between power structure (the structural relations of dependence in exchange networks) and power outcomes (the resulting distribution of exchange among actors) (e.g., Cook and Emerson 1978; Cook, Emerson, Gillmore, and Yamagishi 1983; Molm 1981). As Turner (1988) notes, theories of social exchange say little about the actual process of interaction. Theories of bargaining power, on the other hand, have tended to ignore structure and examine only the relations between strategies or tactics of influence (threats, promises, concessions, and so forth) and power outcomes. (See Bacharach and Lawler 1981, and Lawler and Bacharach 1987 for an exception.) None of these analyses conceptualizes or measures power use dynamically, by examining how actors use their power resources selectively and contingently in response to others' behavior, to influence the course of the ongoing exchange relation. I investigate the role of these behavioral strategies in power relations, using statistical techniques recently developed for analyzing patterns in interaction sequences (Gottman 1980; Allison and Liker 1982).

Theory and research on power and exchange suggest that structure and action may be related to power outcomes in several ways: structural

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power may affect exchange outcomes directly, regardless of interaction strategies (Emerson 1972; Cook and Emerson 1978); structural power may affect exchange outcomes indirectly, through its effect on action (e.g., Thibaut and Kelley 1959); and interaction strategies may affect exchange outcomes independently of structural power (Bacharach and Lawler 1981; Markovsky 1987). These causal relations are tested with data from a series of experiments on power in exchange relations imbedded in larger networks. The experiments systematically manipulate three dimensions of structural power — the source or base of power (control over rewards or punishments), the asymmetry or imbalance of power, and the total strength or magnitude of power in the relation — and then measure corresponding dimensions of power strategies and power outcomes.

BASIC CONCEPTS AND CONDITIONS OF EXCHANGE

The analysis is based on the social exchange theories originally formulated by Thibaut and Kelley (1959) and Emerson (1962, 1972), and subsequently developed and extended by Emerson, Cook, and their associates (Cook and Emerson 1978; Cook et al. 1983) and Molm (1987, 1989). Since differences exist within this theoretical research program (Cook, Molm, and Yamagishi, forthcoming), it is important to specify the basic concepts and conditions of exchange that I assume.

The basic theoretical unit is the *exchange relation* between two *actors* A and B, who exchange *resources* with one another. Actors may be individuals or collectivities. Each actor's resources in the exchange relation are items in that actor's behavioral repertoire that produce consequences of value for the other actor (Emerson 1972).[1] The valued consequences of A's behavior for B may be tangible objects such as money or goods, social rewards such as status or approval, or psychological states such as happiness or self-esteem. The exchange relation provides actors with opportunities to exchange resources; relations vary in the frequency with which these opportunities are used over time and the value and distribution of exchange.

Because actors provide valued benefits for one another, they are mutually dependent. A's *dependence* upon B varies (1) directly with the value of the benefit B can provide, and (2) inversely with the availability of the benefit to A from alternative sources (Emerson 1972). These alternatives are typically other exchange relations, connected to one another in larger *exchange networks*. Two relations are *connected* if exchange in one relation affects the frequency or value of exchange in the other. Network connections are *positive* to the degree that exchange in one relation is contingent upon exchange in the other, and *negative* to the degree that exchange in one relation is contingent upon nonexchange in the other (Emerson 1972). Only negatively connected relations are analyzed here. Because they involve exchanges in the same resource domain, negatively connected relations provide alternative exchange partners. For example, in the B–A–C network (where the A–B and A–C relations are negatively connected at A), B and C might represent alternative employees for a single job controlled by employer A, or countries that are alternative suppliers of a natural resource needed by country A.

Actors in structurally identical locations in a network are said to occupy the same *position*. Structurally identical locations provide equivalent access to alternative relations of equivalent value, i.e., relations of dependence are equal (Cook and Emerson 1978).

Within this general framework, this analysis is based on certain assumptions about the nature and conditions of social exchange: (1) Exchange behavior is choice behavior. The structure of exchange relations provides actors with a set of opportunities to choose among alternative exchange relations and, within those relations, alternative behaviors that produce specific value for a partner (e.g., going to a movie the other wants to see, critiquing a colleague's paper, voting for a political candidate). (2) Actors choose exchange partners and behaviors on the basis of the rewards and costs that these choices have produced in the past or can be expected to produce in the future. Actors behave in ways that tend to maximize

[1] Resources are not defined as objects that are transferred from one actor to another; instead, they are behaviors that one actor performs to produce consequences of value for another actor. This definition is consistent with Emerson's (1972) original conception of resources. These behaviors may impose costs on the actor performing them, both in the form of opportunity costs and costs attached to the behavior *per se*.

rewards and minimize costs. (3) Actors initiate exchanges without formal negotiations and without explicit agreements of whether, when, or to what degree others will reciprocate. (4) As a consequence of (3), exchange relations develop as extended sequences of interactions in which the "returns" for one's investment are uncertain, and the distribution of exchange outcomes is determined over time rather than on discrete transactions.

Some of these conditions differ from those used in analyses of exchange as bargaining transactions, in which actors formally negotiate trades and agree upon the division of joint profit (e.g., Cook and Emerson 1978; Markovsky, Willer, and Patton 1988). While some social exchange relations exhibit these characteristics, many others do not. Consider, for example, the exchange relations that might develop between work associates, spouses, or political cronies. During their extended interaction, the actors may perform many behaviors that benefit one another — they support another's political position, they cook the other's favorite dinner, they attend a committee meeting in the other's place. They do not negotiate a deal, but they expect some reciprocity. Because the exchange relation involves many such actions by both parties, it is difficult to identify a discrete "transaction" in which A gives x and B gives y. Instead, over time the distribution of these behaviors determines who is contributing more to the relation.

These conditions of exchange are closer to those of the early exchange theorists such as Homans (1974), Blau (1964), Thibaut and Kelley (1959), and Emerson (1972) in his original formulation. While previous studies conducted under both sets of exchange conditions have supported the basic predictions of Emerson's theory of power/dependence relations [e.g., Cook and Emerson (1978) for bargaining exchanges, and Burgess and Nielsen (1974) and Molm (1981) for choice exchanges], one should not assume that the hypotheses tested in this paper generalize to other conditions without empirical test. Thus, my four assumptions constitute the scope conditions for the theoretical predictions.

CONCEPTS OF POWER: STRUCTURE, ACTION, AND OUTCOMES

Emerson (1972) distinguishes between *power* as a structural attribute of exchange relations or networks and *power use* as a behavioral attribute of actors. I further distinguish between two aspects of power use: *strategic action*, which is the dynamic process of using structural power, and the *exchange outcomes* of power use, which are the resulting frequency and distribution of exchange.

Structural Power

Structural power is the potential power created by the relations of dependence among actors in exchange networks. It encompasses several specific dimensions, defined below. All of these definitions are derived from the basic insight that A's power over B is equal to B's dependence on A. In turn, B's dependence on A is a function of access to alternative exchange relations and the value of those alternative relations. I combine these two variables, available alternatives and their value, to produce a quantifiable definition of dependence that allows measurement at the ratio level: B's *dependence* on A, and A's *power* over B, is equal to the value that B can receive from A's behavior, divided by the total value that B can receive from all of B's potential partners in the network. Thus, if B can exchange only with A, B is completely dependent on A; if B has other potential exchange partners, B's dependence is a function of the relative control over benefits exercised by B's alternative exchange partners.

Two central dimensions of structural power in the A–B relation, power imbalance and average power, are derived from the power/dependencies of the individual actors:[2] The *power imbalance* of the relation is the difference between the actors' power/dependencies. If B is more dependent on A than A is on B, then the less dependent and more powerful actor, A, has a power advantage in the relation. The greater the asymmetry in power, the greater the imbalance. The *average power* in the relation is the average of the two actors' power/dependencies.

Whereas power imbalance is a measure of the relative power of actors in the relation, average power is a measure of the absolute strength of their mutual power over one another.[3] Even in a balanced relation, power is

[2] Lawler and Bacharach (1987) refer to these same two dimensions as relative power and total power.

[3] Emerson (1972) proposes that average power is a measure of the cohesion in the relation. Although this point is debatable (cohesion may be affected by

fully operative, and variations in the strength of this power can affect behavioral exchange. These two dimensions can vary independently i.e., two relations can have the same level of imbalance but be high or low on the absolute strength of power. Together, the two dimensions completely define the amount and distribution of structural power in an exchange relation.

A third dimension of structural power is its *base*. Traditionally, social exchange theories have been restricted to power based on control over rewards. Aversive actions ("positive punishment" in behavioral terms) have been omitted from their scope, and the only costs considered have been opportunity costs. I have recently argued that control over punishments, the "coercive" power classically studied by sociologists (e.g., Bierstedt 1950), is also a source of dependence and can be studied productively within the same theoretical framework (Molm 1988, 1989). If A's behavior produces consequences for B that are either positive or negative in value, then B is dependent on A for the quality of outcomes B experiences and A has power over B. In most power relations, actors control a range of rewards and punishments for each other. For example, employers can hire or fire, promote or demote, praise or criticize their employees. Family members and nations similarly control, and use, a range of rewards and punishments in their interaction with one another.

Theoretically, an actor's control over rewards and punishments for another constitutes a single variable, consisting of the range of consequences — from positive to negative — that one actor's behavior can produce for another. This range might vary, for example, from +5 to 0 if an actor controls only rewards, but from +5 to -5 if an actor controls both rewards and punishments. Reward and punishment power are analyzed here as separate bases rather than as a single continuum because extensive empirical evidence suggests that equivalent gains and losses do not have equivalent effects on judgments or behavior (see Kahneman and Tversky 1979, Gray and Tallman 1987, and previous studies in this research program such as Molm 1988, 1989).

relational dimensions other than average power, including power imbalance), the importance of this dimension of relational power remains.

Strategic Action

Structural power provides actors with the means to influence the outcomes of exchange. How that power is exercised depends on its strategic use. By selectively giving or withholding rewards or punishments for exchange partners, contingent on the other's prior behavior, actors can use their structural power to alter the frequency and distribution of exchange outcomes in the relation. This is a straightforward notion that has its roots in the behavioral bases of exchange theories. But where behavioral analyses traditionally examine the impact of scheduled contingencies of reinforcement or punishment on behavior, taking those schedules as a given, the analysis of social interaction requires a different set of questions: How do actors use their power resources contingently to influence each others' behavior? How does the structure of relationships affect this strategic use of power? And how do power strategies affect exchange outcomes? By examining both the determinants and effects of contingent action, this approach combines the rational choice and behavioral perspectives that characterize exchange theories.

Power strategies may take many forms. In this analysis, strategy refers to the contingent use of power resources (rewarding and punishing behaviors), i.e., *power strategies* are conditional relations between sequential behaviors of two actors, in which the probability of one actor's behavior is contingent upon the other actor's prior behavior.

Strategies specify the conditional relations between specific behaviors, by specific actors, at specific time lags. For example, one might specify the conditional relation between A's punishment of B at time t and B's nonexchange with A at time t-1. *Reciprocal* strategies are conditional relations between functionally equivalent behaviors of actors, e.g., the contingency of one actor's rewarding behavior on another actor's prior rewarding behavior. *Nonreciprocal* strategies are conditional relations between nonequivalent behaviors of actors, e.g., the contingency of rewards on prior punishment.

Strategies also vary on dimensions parallel to those defined for structure. First, they vary by the base of the contingent behavior, i.e., whether it is rewards or punishments that are contingent on another's prior behavior. Second, measures of the average strength and asym-

metry of specific strategies used by both actors in a relationship can be computed from the measures for the individual actors.

Exchange Outcomes

The outcomes of power refer to the amount and distribution of behavioral exchange over the course of extended interaction. Exchange may be rewarding or punishing, it may be high or low in value or frequency, and it may be distributed symmetrically or asymmetrically between the actors in a relation. These distinctions describe four power outcomes that correspond to the dimensions of structural power: the average reward exchange in the relation, the asymmetry of reward exchange in the relation, the average punishment exchange, and the asymmetry of punishment exchange. Like power strategies, the outcomes of power are behavioral measures, but they are summaries of the frequencies of exchange over time rather than measures of the conditional relations between sequential behaviors.

Within the framework of social exchange theory, it is these outcomes that actors try to change to their advantage. I examine how both structural power and the strategic use of that power affect actors' abilities to do so. The asymmetry of reward exchange is the traditional measure of the outcome of power use in power/dependence relations; it measures the *relative* benefits that actors receive from the relation. Less attention has been paid to the average exchange in the relation, but actors benefit from the absolute amount of reward exchange (and suffer from the absolute amount of punishment exchange) as well as from a favorable distribution of exchange.[4]

PREDICTING RELATIONS AMONG STRUCTURE, ACTION, AND OUTCOMES

Power/dependence theory distinguishes between structural power and the outcomes of power use and posits a causal relation between the two. The role of strategic action in this model is less clear. The classical theories of social exchange (Thibaut and Kelley 1959; Homans 1974; Blau 1964) view action as mediating the relation between structure and outcomes. For example, Thibaut and Kelley (1959) explicitly propose that "fate control" (structural power) can be converted to "behavior control" if actors make their valued resources conditional on others' behavior. Consider two co-workers who hold reward power over one another (A controls valued information about the company bureaucracy; B has greater technical expertise). Let's say power imbalance is tipped in favor of B. This proposition suggests that B's power advantage will give B an advantage in the exchange (relatively more information in return for relatively less expert help) *only* if B makes expert help contingent on information, withholding help until information is forthcoming.

This is a straightforward behavioral prediction, i.e., to the extent that one's control over another's rewards and punishments is used contingently to reward desirable behaviors and punish undesirable behaviors, structural power should be more effective. However, Thibaut and Kelley do not propose a direct functional relation between structural power and its use. A structural power advantage does not, in and of itself, cause an actor to make the rewards or punishments they control contingent on the other's behavior. In the above example, B's power advantage does not *cause* B to make expert help contingent on information from A. But if B uses power strategically, B's greater structural power will enhance the effectiveness of that strategy.

Emerson's (1972) subsequent development of power/dependence relations in social exchange does not include strategic action as a separate causal link. Both Emerson's theoretical statements, in particular his well-known phrase, "to have a power advantage is to use it" (1972, p. 67), and subsequent empirical work (Cook and Emerson 1978; Cook et al. 1983) suggest a direct functional relation between structural power and power outcomes as long as (1) nonstructural constraints on power use are absent, and (2) actors behave rationally (i.e., they try to maximize their benefits).

Under some conditions, it may be reasonable to assume that strategies of actors are relatively unimportant. They are most likely to affect outcomes under the scope conditions of the present theory, in which actors make choices without knowing the terms or timing of the

[4] Outcomes of power use may also be subjective, i.e., actors may be relatively satisfied or dissatisfied with their objective outcomes from the relation. Actors' subjective ratings of their relations are measured in these experiments and analyses of the effects of structure and strategy on these outcomes are in progress.

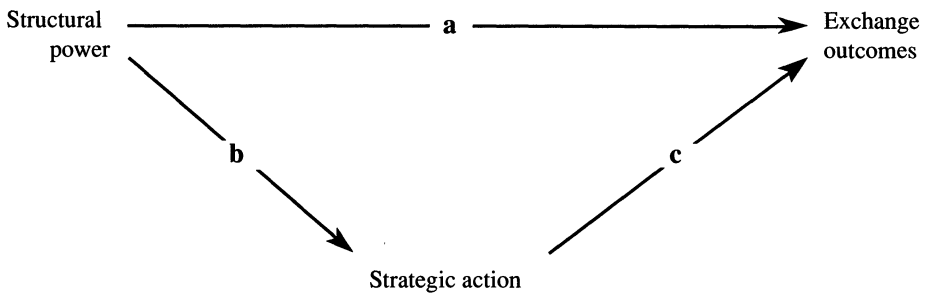

Figure 1. Model of Potential Relations Among Structure, Action, and Outcomes

other's reciprocity. Under such conditions of uncertainty, actors are more likely to use behavioral influence to affect exchange outcomes. The results of many studies suggest that structural power does not completely determine power outcomes. When reward power is imbalanced, the asymmetry of exchange often falls below the maximum level predicted, and sometimes structural power is not used at all. The relation between punishment power and power outcomes is particularly weak. Punishment is rarely used, and a punishment power advantage is effective only under particular conditions (Molm 1988, 1989). Michaels and Wiggins (1976) have suggested that structural power determines the *range* of values within which the distribution of exchange must fall (what they called the "profit latitude," i.e., the range of exchange ratios that are mutually profitable), but not the specific location within this range. Similarly, Bacharach and Lawler (1981) have argued that strategic action not only intervenes between structural power and outcomes, but can alter the power relationship. Recent simulation experiments by Markovsky (1987) show that power outcomes can be determined jointly by the strategies of individual actors and the structure of the relations among them. These analyses suggest that action not only mediates the effects of structure, but affects outcomes independently of structure.

In summary, previous work suggests three potential causal relations among structural power, strategic action, and exchange outcomes, shown in Figure 1 and stated here as the three central hypotheses of this study:

(1) Structural power has direct effects on exchange outcomes (path a in Figure 1).

(2) Structural power affects exchange outcomes indirectly, through strategic action (path b–c in Figure 1).

(3) Strategic action affects exchange outcomes directly, independent of structure (path c, independent of b in Figure 1).

Let us consider in more detail how different dimensions of power must be related to one another to produce these effects. The central prediction of power/dependence theory, that *imbalance* in structural power produces asymmetry in exchange outcomes, is supported in numerous studies (e.g., Burgess and Nielsen 1974; Cook and Emerson 1978; Cook et al. 1983; Molm 1981). In parallel fashion, Emerson (1972) predicts the *average* frequency of exchange in a relation will increase with the average power/dependencies of the actors, and Michaels and Wiggins (1976) find that it does. If these effects occur indirectly, through strategic action, then specific corollaries to hypothesis 2 obtain:

(2.1) Reciprocal strategies increase, and nonreciprocal strategies decrease, with average structural power of the same base.

(2.2) Nonreciprocal strategies increase, and reciprocal strategies decrease, with structural power imbalance of the same base. Both reciprocal and nonreciprocal strategies become more asymmetrical, favoring the power-advantaged actor.

If reward and punishment strategies affect exchange behavior in accord with basic behavioral principles (i.e., rewards increase, and punishments decrease, the frequency of behaviors on which they are contingent), then another corollary follows:

(2.3) The average frequency of exchange increases with the average frequency of reciprocal strategies of the same base, and the asymmetry of

exchange increases with the average frequency of nonreciprocal strategies of the same base and with asymmetry in both reciprocal and nonreciprocal strategies.

If these three corollaries are supported, power strategies should mediate the traditional relations between power imbalance and exchange asymmetry, and between average power and average exchange. For reward-based power, greater average reward power will increase the reciprocity of rewards, which in turn will increase the average frequency of reward exchange. Reward power imbalance will lead to asymmetrical reward exchange through the mediating effects of nonreciprocal strategies of reward and nonexchange: the more powerful actor will reciprocate (i.e., reinforce) the other's rewards only intermittently, whereas the less powerful actor will maintain this pattern by rewarding the other's nonexchange. For punishment-based power, greater average punishment power will increase the reciprocity of punishment, which in turn will increase the average frequency of punishment exchange. Punishment power imbalance should lead to asymmetry in both punishment exchange and reward exchange, through the mediating effects of asymmetries in both reciprocal and nonreciprocal punishment strategies: the more powerful actor should be more likely to punish the other's nonexchange as well as the other's punishment. This strategy in turn should decrease the occurrence of those behaviors and increase the frequency of the other's reward exchange.

To the extent that the relations among structure, action, and outcomes deviate from these predictions, the indirect effects of structural power will be weaker. If strategic action affects exchange outcomes independently of structural power, we should find support for corollary 2.3, but not for corollaries 2.1 or 2.2. Thus, corollary 2.3 is also a corollary to hypothesis 3.

Variations by Base of Power

The relative strengths of the causal relations proposed in hypotheses 1-3 are likely to vary for reward- and punishment-based power. Structural power is expected to have weaker direct and indirect effects on punishment exchange than on reward exchange. This is suggested by a variety of theoretical perspectives. Several theorists (e.g., Blau 1964; Eckhoff 1974) argue that nonstructural variables, such as norms of justice, constrain the use of punishment power more than reward power. When used, punishment is more likely to provoke retaliation, either by reciprocal punishment (e.g., Lawler and Bacharach 1987) or by withdrawal of the other's valued reward exchange. In addition, recent analyses of individual choice and decision-making (Kahneman and Tversky 1979; Gray and Tallman 1987) find that potential losses have stronger effects on behavioral choices than potential gains. In exchange relations of bilateral power, this tendency has two implications: First, if actors fear the other's retaliation of punishment more than they value the rewards it might bring, they will be less likely to use a punishment power advantage. Thus, the effects of structural power on the frequency of punishment will be weaker than the effects of structural power on the frequency of reward exchange. Second, punishment strategies when enacted should have stronger effects on exchange outcomes than reward strategies.

The two bases of power also provide different structural incentives to use a power advantage. Structural power imbalance can *directly* induce the use of reward power, without intervening strategies, but not the use of punishment power (Molm 1989). The reason lies in the different effects of alternatives. Regardless of awareness of power or intent to influence, imbalanced reward power will lead to reduced exchange by the more powerful actor simply because that actor has more valuable alternatives. The alternatives provide the structural incentive to withhold rewards from the more dependent actor. Reward exchange can be withheld intentionally and contingently, to influence the other's behavior, but it need not be. Reward power imbalance can directly produce reward exchange asymmetry without intervening power strategies.

In contrast, the average strength and imbalance of punishment power affect actors' relative capacities to inflict harm on one another, compared to other actors in the network; but alternative sources of punishment provide no incentive to use that power. The mere potential for punishment can have direct effects on *reward* exchange (fear of punishment can increase the other's reward exchange, even if punishment is not used), but it is unlikely to affect *punishment* exchange directly. As several theorists have pointed out, the use of punishment power must be an intentional response to

another's behavior (Miller and Vidmar 1981; Eckhoff 1974). It can be affected indirectly by structural conditions that affect the partner's behavior, but direct effects are unlikely.

This analysis suggests three additional hypotheses that are modifications, rather than corollaries, of hypotheses 1 through 3, and are therefore labeled differently:

(1A) Structural power directly affects reward outcomes but not punishment outcomes.

(2A) Structural power has weaker indirect effects on punishment outcomes than on reward outcomes.

(3A) Punishment strategies have stronger effects on reward and punishment outcomes than reward strategies.

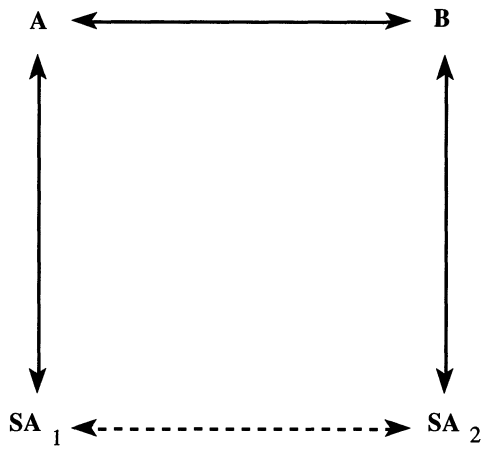

Figure 2. The Exchange Networks in the Experiments

METHOD

The data are taken from a series of five experiments on reward and punishment power. The experiments used identical procedures, subject pools, and conceptual and operational definitions of the variables.

The Exchange Setting

The exchange setting in the experiments is consistent with the conditions of exchange specified earlier. On a series of exchange opportunities, actors choose between different behaviors with consequences of fixed value for other actors in their exchange network, without explicit agreements of whether or when others will reciprocate. To simplify the analysis, behavioral choices toward another actor are limited to (1) producing a reward of fixed value for the other, (2) producing a punishment of fixed value for the other, and (3) not acting toward the other (i.e., choosing to reward or punish a different partner). The costs to the actor of performing an action with consequences for another are limited to opportunity costs.

The exchange networks structure different relations between actors on dimensions of structural power. They provide subjects with varying degrees of dependence on one another for a valued benefit — money (subjects were undergraduate students, recruited on the basis of their desire to earn money). Power/dependence relations were manipulated by varying the amount of money subjects could add to each other's earnings (reward power) or subtract from each other's earnings (punishment power) on each of a series of exchange opportunities.

All networks were presented to the subjects as consisting of four actors, connected to one another as shown in Figure 2. In fact, only actors A and B were real subjects; the other two positions were played by computer simulated actors (SA's). Each real subject in the network was negatively connected to the other real subject and to one of the simulated actors, giving each subject a mutually exclusive choice between two partners on each exchange opportunity. Thus, the number of alternative partners was held constant. Structural power was manipulated by varying the value of exchange in the alternative relations.

Subjects interacted with each other through remote video terminals connected to a central microcomputer. A preliminary matching game with the computer provided subjects with a "bank account" of money that could be added to or subtracted from during the exchange. Following this game, subjects exchanged with each other for 250 exchange opportunities. On each opportunity, subjects made two choices: (1) which of their two interaction partners they wished to act toward, and (2) which action they wished to make, adding or subtracting a fixed number of points to or from the other's earnings (one point equaled one cent). Neither action affected the actor's own points. Subjects made their choices simultaneously, without knowledge of their potential partners' intentions. They were informed of their partners' choices at the end of each exchange opportunity. Subjects could potentially gain (or lose)

points from both of their partners' actions on the same exchange opportunity; it is that possibility that makes an asymmetrical exchange of rewards beneficial to the actor who exchanges less. Because that actor uses fewer opportunities to act toward his or her partner for a given level of returns, he or she has more chances to enter into the alternative exchange relation that can provide additional rewards.

The Manipulation of Structural Power

Subjects were randomly assigned to different conditions of structural power and to the A or B position of the relation. Dimensions of structural power — average reward power, average punishment power, reward power imbalance, and punishment power imbalance — were manipulated by systematically varying the number of points that subjects could add to or subtract from each other's earnings. Subjects were fully informed about the point values that they and their two partners could exchange.

The operational definitions of dimensions of structural power correspond to the conceptual definitions stated earlier: *A's reward or punishment power over B* is equal to the total reward or punishment units (i.e., points) that B can receive from A's behavior, divided by the total points that B can receive from both of B's potential partners in the exchange network. Each subject could gain a total of 10 points if both partners added to his or her points on an exchange opportunity, or lose a total of 10 points if both partners subtracted from his or her points. If, for example, A could receive 8 cents from B and 2 cents from SA_1 on each exchange opportunity, then A's reward dependence on B (and B's reward power over A) was equal to 8/(8+2), or .8, and A's reward dependence on SA_1 was .2. Punishment power was calculated in a comparable way, with power defined by the number of points that one actor could subtract from another.

The manipulated values of structural power in the relation are derived from these values of individual power. Each of the five experiments varied two or more of the dimensions of structural power while holding the others constant. When imbalanced, reward power always favored actor A. Punishment power also favored actor A when it was the sole source of structural imbalance. When both reward and punishment power were imbalanced, the direction of punishment power imbalance was also manipulated, so that power favored either actor A or actor B. For this analysis, the actual ratio values of average power and power imbalance are used; they range from 0 to .8.

The variables are operationally defined as follows:

Average reward power =
[(A's reward power over B) +
(B's reward power over A)]/2

Average punishment power =
[(A's punishment power over B) +
(B's punishment power over A)]/2

Reward power imbalance =
(A's reward power over B) -
(B's reward power over A)

Punishment power imbalance favoring A =
(A's punishment power over B) -
(B's punishment power over A)
when punishment power imbalance favors A;
otherwise 0.

Punishment power imbalance favoring B =
(B's punishment power over A) -
(A's punishment power over B)
when punishment power imbalance favors B;
otherwise 0.

Table 1 shows the values of these five variables in the 29 conditions of the five experiments.[5]

The structural relations of the simulated actors to their partners and the probabilities of their programmed behavior were identical in all conditions. For analytical purposes, they could be treated as experimental controls. In all conditions, the power relations between each subject and the SA were balanced. The simulated actors' behavioral choices were contingent on the prior choices of the real subjects with whom they were paired; in general, they responded in a tit-for-tat fashion, but at probabilities less than 1.0 to prevent suspicion.

Ten exchange networks were run in each of the 29 experimental conditions. A total of 580 subjects participated in the five experiments, with equal numbers of male and female subjects in each condition. Only same-sex networks were studied. Gender is of no theoretical inter-

[5] The ranges of values for average reward power and average punishment power were constrained by the manipulation of power imbalance in the same experiments. Very high or very low levels of average power permit little imbalance in power; consequently, moderate levels of average power were used.

Table 1. Values of Manipulated Structural Power Variables by Experimental Condition

Experiment/Condition	Average Reward Power	Average Punishment Power	Reward Power Imbalance	Punishment Power Imbalance Favoring A	Punishment Power Imbalance Favoring B
Experiment 1					
Condition 1	.6	.6	0	0	0
Condition 2	.6	.6	.4	0	0
Condition 3	.6	.6	0	.4	0
Condition 4	.6	.6	.2	.2	0
Condition 5	.6	.6	.4	0	.4
Experiment 2					
Condition 1	.6	.9	0	0	0
Condition 2	.6	.3	0	0	0
Condition 3	.6	.9	.2	.2	0
Condition 4	.6	.3	.2	.2	0
Experiment 3					
Condition 1	.6	.6	0	.8	0
Condition 2	.6	.6	.4	0	.8
Condition 3	.6	.6	.4	.4	0
Condition 4	.6	.6	.4	.8	0
Experiment 4					
Condition 1	.65	.65	.5	0	.5
Condition 2	.65	.65	.5	.5	0
Condition 3	.35	.65	.5	0	.5
Condition 4	.35	.65	.5	.5	0
Condition 5	.65	.35	.5	0	.5
Condition 6	.65	.35	.5	.5	0
Condition 7	.35	.35	.5	0	.5
Condition 8	.35	.35	.5	.5	0
Experiment 5					
Condition 1	.55	.35	.3	0	.5
Condition 2	.55	.35	.3	.5	0
Condition 3	.55	.65	.3	0	.5
Condition 4	.55	.65	.3	.5	0
Condition 5	.55	.35	.7	0	.5
Condition 6	.55	.35	.7	.5	0
Condition 7	.55	.65	.7	0	.5
Condition 8	.55	.65	.7	.5	0
All Conditions					
$\bar{X}$	.56	.54	.37	.24	.18
(s.d.)	(.09)	(.17)	(.22)	(.22)	(.25)

est in this analysis and was counterbalanced for control purposes.

Measures of Strategy

For each case, a data set consisting of 250 sequentially ordered behavior choices made by each of the two subjects was recorded. To measure the conditional relations between behaviors of the two actors, estimates of how much each actor's behavior choice is affected by the other actor's prior behavior choice are computed across all 250 exchange opportunitities for specific combinations of behaviors by A and B. On each exchange opportunity, each actor could perform one of three behaviors toward the other — rewarding, punishing, or not acting (nonexchange). Thus, nine combinations of behaviors by two actors are possible, and measures of nine separate strategies for each of the two actors are computed.[6]

These measures of strategy were obtained by an innovative technique for measuring lagged

[6] The nine behavior combinations for the A–B relation, representing one actor's behavior at time t and the other actor's behavior at time t+1, are: rewarding-rewarding, punishing-rewarding, nonex-

dependencies in sequential categorical data on dyadic interaction suggested by Allison and Liker (1982). The estimated logistic coefficient for the lagged dependence of one actor's behavior on the other's provides the desired index of the contingency of that actor's behavior on the other's behavior. Rather than the usual use of regression analysis to test hypotheses, it is used here to produce measures of strategy which serve as variables in subsequent analyses.[7]

A series of logistic regressions was calculated for each A-B dyad. One set regressed A's behavior *i* at time t on B's behavior *j* at time t-1. A second set regressed B's behavior *j* at time t on A's behavior *i* at time t-1, where *i* and *j* index the three categories of behavior. These categories were transformed into indicator variables for the analysis, with the category of interest coded 1 and the remaining two categories coded 0. Each regression controlled for the dependent variable actor's own behavior at time t-1. The regressions computed the relations for up to 5 lags, but the effect of one actor's behavior on another's was rarely significant for more than one lag. Therefore, the analyses reported here are restricted to the lag 1 results.[8]

The estimated logistic coefficient for each regression is the natural logarithm of the odds ratio and has a range of $\pm\infty$. It is zero when the two actors' behaviors are statistically independent. A positive coefficient indicates that a prior behavior by one actor increases the likelihood of a subsequent behavior by the other actor; a negative coefficient indicates a decrease in likelihood.[9] For some of the analyses, particularly those involving punishment, the coefficient estimates are based on too few observations to be reliable. To give greater weight in the analysis to the more reliable estimates, the logistic coefficients are divided by their standard errors.

These regressions produce nine measures of strategy for each actor in the A–B relation. Two relational measures were created from each set of measures for the individual actors: *average strategy strength*, computed by averaging the individual measures of strength for the two actors, and *strategy asymmetry*, computed by subtracting the measure of the contingency of A's behavior on B's behavior from that of B's behavior on A's behavior. Greater strategy asymmetry indicates that B (the actor who is disadvantaged in all reward power imbalanced relations) is more responsive to A's behavior than the reverse.

The mean strategy values shown in Table 2 indicate that actors tend to reciprocate the behavior of the other actor on the previous trial, a tendency that obviously will lead to symmetrical exchange. Thus, to produce the predicted outcome of imbalanced structural power — asymmetrical behavioral exchange — reciprocal strategies must decrease and nonreciprocal strategies increase.

Measures of Exchange Outcomes

Because actors in the experiments exchange resources of fixed value without negotiated agreements, exchange outcomes are measured by the frequency rather than the value of exchange. As Thibaut and Kelley (1959) point out, a more powerful actor is expected to receive more frequently the benefits he or she most values from the other, but these values will not necessarily be higher in an absolute sense.

The frequency of each actor's rewarding or punishing behavior toward the other is measured as a proportion of the total (250) exchange opportunities; e.g., A's rewarding = (frequency of A's rewards to B)/250. Measures of the average frequency and the asymmetry in frequency of reward and punishment exchange are derived from these measures:

Average reward exchange =
[(A's rewarding) + (B's rewarding)]/2

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change-rewarding, rewarding-punishing, punishing-punishing, nonexchange-punishing, rewarding-nonexchange, punishing-nonexchange, nonexchange-nonexchange.

[7] Ordinarily, the use of logistic regression assumes independence among observations. In this case, the lack of independence among observations is not a problem because the objective is to measure the degree of dependence between observations.

[8] The probability of A's behavior *i* at time t, given B's behavior *j* at time t-1 and controlling for A's own behavior at time t-1, is estimated by β_2 in the following logistic equation:

$$\text{logit}\,[\Pr(A_t = 1 | B_{t-1}\, A_{t-1}] = \beta_0 + \beta_1 A_{t-1} + \beta_2 B_{t-1}$$

[9] Allison and Liker (1982) recommend using the coefficient of a logistic analysis as an index of contingency primarily because it is insensitive to the distribution of marginal totals. Thus, the variation across dyads and across behavioral categories in the number of observations will not affect the measures of contingencies between behaviors.

Average punishment exchange =
[(A's punishing) + (B's punishing)]/2

Reward exchange asymmetry =
(B's rewarding) - (A's rewarding)

Punishment exchange asymmetry =
(A's punishment) - (B's punishment)

In all conditions, positive values of exchange asymmetry indicate that asymmetry favors A, the actor with greater reward power in all conditions with imbalanced reward power. Average exchange can range from 0 to 1 and exchange asymmetry from -1 to +1.

Means and standard deviations for these variables are shown in Table 3. The average frequency of punishment, and hence its asymmetry, are very low. Because of the relatively low mean proportions of several of the outcome variables, the arcsine transformations of all four are used for the analyses.[10]

Table 2. Means and Standard Deviations for Power Strategies (N = 290)

Strategies[a]	Dyadic Average[b] Mean (S.D.)	Dyadic Asymmetry[c] Mean (S.D.)
Reward Strategies:		
R|R	3.00 (1.77)	1.21 (3.01)
R|N	-2.82 (1.68)	-1.16 (2.89)
R|P	-.24 (.88)	-.30 (1.60)
Nonexchange Strategies:		
N|R	-2.38 (1.75)	-1.08 (3.05)
N|N	2.66 (1.64)	1.06 (2.94)
N|P	-.35 (.84)	.37 (1.52)
Punishment Strategies:		
P|R	-.58 (.80)	.06 (1.22)
P|N	.21 (.86)	-.01 (1.79)
P|P	1.11 (1.38)	-.12 (-1.70)

[a] i|j = the contingency of behavior *i* on the prior occurrence of behavior j, where i and j = R (reward), N (nonexchange), and P (punishment) by each of the two actors

[b] [(A's *i*|*j*) + (B's *i*|*j*)] / 2

[c] (B's *i*|*j*) - (A's *i*|*j*)

RESULTS

Ordinary least squares regression is used to examine the effects of structural power on exchange outcomes and strategic action, and the effects of strategic action on outcomes. The unit of analysis is the A–B relation, not the individual; all analyses are based on 290 dyads. Each of the two levels of power, structure and action, is measured by a set of variables representing the dimensions of base, asymmetry, and average strength. Theoretically, we are interested in the effects of each set of variables on the exchange outcomes and the effects of the individual dimensions of power within those sets.

Estimating the direct and indirect effects of structural power as a set of variables poses special problems. Sets of variables do not lend themselves to traditional path analytical procedures. Instead, the sets of structural and strategy variables are entered in separate steps of hierarchical regression analyses (Cohen and Cohen 1983). By comparing differences in R^2, the variance explained by structure and strategy is partitioned into three components: (1) the variance explained uniquely by structure, (2) the variance explained uniquely by strategy, and (3) the shared variance. Because structural power is causally prior to strategic action, the shared variance can be attributed to the indirect effect of structure through action. Thus, comparing R^2 for the effects of structural power with and without strategic action in the equation provides an estimate of the relative strength of the direct and indirect effects of structure.

Structural Power and Exchange Outcomes

To assess the overall relation between structure and outcomes, each of the four exchange outcomes is regressed on the five structural power variables. These results are reported in the columns of Table 4 labeled Model I. A second set of regressions (labeled Model II) estimates the same effects after first controlling for the full set of 18 strategy variables.[11] The coefficients

[10] The formula used for the arcsine transformation of variable X is 2(arcsine $\sqrt{X}$) (Cohen and Cohen 1983).

[11] These analyses were also conducted control-

for the variables in Model II represent the direct effects of dimensions of structural power as proposed in hypotheses 1 and 1A. Differences between the coefficients in Models I and II represent the indirect effects of structural power through its strategic use as proposed in hypotheses 2 and 2A. The direct and indirect effects of the full set of structural variables can be estimated, respectively, from the net R^2 in Model II (the variance explained uniquely by structure), and from the difference between the total R^2 in Model I and the net R^2 in Model II.

The R^2 values show that structural power has both direct and indirect effects on exchange outcomes, but as predicted by hypotheses 1A and 2A, the relative strengths of these effects vary with the base of power. In Models I and II, the variance explained by structural power is much greater for reward exchange outcomes than for punishment outcomes, and more of the structural variables have significant effects on reward exchange than on punishment exchange. As predicted by hypothesis 1A, the net R^2 values show that structural power has direct effects only on reward exchange. The effects of structural power on punishment exchange are reduced virtually to zero once strategies are controlled. Because the total effects of structure on punishment exchange are so small, however, the issue of whether they are direct or indirect is less important.

Somewhat unexpectedly, hypothesis 2 is supported only for average reward exchange. Indirect effects of structural power on the other three exchange outcomes are negligible. Thus, the different effects for reward and punishment exchange predicted by hypothesis 2A are only partially observed. The direct and indirect effects of structural power on average reward exchange are roughly equal in magnitude. The pattern of effects for the asymmetry of reward exchange is quite different, suggesting some suppression of structural effects by strategy rather than mediation. The R^2 for the structural variables changes only slightly when the strategy variables are added, and some coefficients increase when strategy effects are controlled.

Turning to the relations between the individual dimensions of structure and outcomes, the effects of structural power on average reward exchange provide strong support for the conceptual equivalence of reward and punishment power as sources of dependence. As the coefficients in the first two columns of Table 4 show, comparable dimensions of reward and punishment power affect average reward exchange in the same direction, although the effects of reward power are stronger, as expected. Reward exchange increases with the mutual dependence (average power) of actors on one another for either rewards or punishments, and decreases with the imbalance of either reward or punishment power that favors actor A. Punishment power imbalance favoring B has no effect on reward exchange.

Table 3. Means and Standard Deviations for Exchange Outcomes (N = 290)

Exchange Outcomes	Mean (S.D.)
Reward Exchange:	
Average rewarding	.42 (.18)
Reward asymmetry	.14 (.12)
Punishment Exchange:	
Average punishment	.04 (.04)
Punishment asymmetry	-.01 (.06)

The similar effects of structural reward and punishment power on average reward exchange do not extend to the asymmetry of reward exchange (the next two columns). Reward exchange asymmetry, the traditional measure of power use, is affected only by structural reward power. The results support the classical prediction that reward exchange asymmetry increases with reward power imbalance and also show that it increases with average reward power. This latter effect most likely occurs because average reward power of .5 or greater is a necessary condition for social exchange (Michaels and Wiggins 1976). As average reward power decreases, reward exchange becomes less profitable for both actors and eventually even asymmetrical reward exchange will cease. Punishment power imbalance favoring actor B tends to counter the effects of A's reward power advantage, but the effect is weak and falls short of significance.[12]

ling for only those strategy variables that had statistically significant relations with either the structural power variables or the outcome measure. Both analyses produced the same results.

[12] Punishment power imbalance favoring actor B significantly reduces A's reward power advantage

Table 4. Unstandardized Coefficients for Regressions of Exchange Outcomes on Structural Power (N = 290)

	Reward Exchange				Punishment Exchange			
	Average		Asymmetry		Average		Asymmetry	
Structural Power	Model I	Model II	Model I	Model II	Model I	Model II	Model I	Model II
Average reward	2.06***	1.84***	.71***	.80***	.23	.08	-.18	-.05
Average punishment	.26**	.21	-.04	-.07	-.06	-.12**	.06	-.04
Reward imbalance	-.70***	-.52***	.72***	.72***	.01	-.02	-.22**	-.11
Punishment imbalance favoring A	-.22*	-.24**	.03	.02	.18**	.06	-.04	-.09
Punishment imbalance favoring B	.03	-.03	-.12	-.04	.26***	.07	-.11	-.09
F/F change	58.25***	36.61***	25.27***	25.07***	4.22***	2.19	3.57**	1.31
Total R^2	.51	.58	.31	.45	.07	.68	.06	.35
Net R^2	----	.29	----	.26	----	.01	----	.02

*$p<.05$ **$p<.01$ ***$p<.001$

Note: Model I - without controls; Model II - with controls for all 18 strategy variables. For Model I, the F-ratios are displayed; for Model II, the changes in F-ratio after entering the structural variables are displayed.

Results for punishment exchange, displayed in the last four columns of Table 4, show few effects of any structural variables. Average punishment exchange increases with punishment power imbalance favoring either actor, and the asymmetry of punishment exchange decreases with reward power imbalance. This latter effect indicates that it is the actor who is disadvantaged on reward power who punishes more. When strategies are entered in the equations before the structural power variables (Model II), however, the change in F-ratio for the structural variables is not significant.

These results support the classical predictions of power/dependence theory for the relations between dimensions of structural reward power and reward exchange outcomes. They also show that structural punishment power has similar but weaker effects on average reward exchange, but fails to affect the asymmetry of reward exchange significantly. The analysis of structural effects begins to explain how these effects occur: structural power affects average reward exchange both directly and indirectly through strategic action, but the effects of structural reward power on the asymmetry of reward exchange are almost entirely direct. As predicted, structural punishment power has no direct effects on punishment outcomes, and few indirect effects. To understand why the intervening effects of strategy are so limited, we examine the relations between structure and its strategic use and between strategies and outcomes.

under specific conditions of average reward power and average punishment power (Molm 1989). These interactions were not examined in this analysis.

Structural Power and Strategic Action

Table 5 summarizes the regressions of the strategy measures on the dimensions of structural power. Only reward and punishment strategies are included in the table. The contingent use of nonexchange is omitted because it is neither conceptually nor empirically independent from the other two categories. Potentially, it constitutes the withholding of both rewards and punishments; empirically, it functions primarily as reward withholding. The results for nonexchange strategies (not shown here) are almost identical to those for reward strategies, but with opposite signs.

Each set of three strategies is examined as an interdependent group. Each set represents the contingency of a single behavior on the three categories of prior behaviors, e.g., R|R, R|N, and R|P represent the contingency of rewarding on rewarding, on nonexchange, and on punishment, respectively. These contingencies are not independent. For example, if the likeli-

Table 5. Unstandardized Coefficients for Regressions of Power Strategies on Structural Power (N = 290)

	Reward Strategies					
	Average			Asymmetry		
Structural Power	R|R	R|N	R|P	R|R	R|N	R|P
Average reward	1.11	-.88	-1.32*	1.33	-2.59	1.50
Average punishment	-.09	-.03	.08	.73	.77	-2.03***
Reward imbalance	-2.11***	1.81***	.79**	3.10**	-2.97**	-.75
Punishment imbalance favoring A	.26	-.14	.07	-.22	.17	.31
Punishment imbalance favoring B	.83	-.51	-.27	-1.13	1.68	-.22
F	3.83**	3.21**	3.96**	2.25*	2.86*	3.67**
R^2	.06	.05	.06	.04	.05	.06

	Punishment Strategies					
	Average			Asymmetry		
Structural Power	P|R	P|N	P|P	P|R	P|N	P|P
Average reward	-1.59**	2.50***	.14	-1.09	1.89	.12
Average punishment	-.41	-.35	1.50**	.08	-1.34*	.46
Reward imbalance	.36	-.52*	-.38	.01	1.40**	-.13
Punishment imbalance favoring A	-.54*	.58*	.44	-.15	-1.21*	.01
Punishment imbalance favoring B	-.79**	.87**	.70	-1.07**	-.76	1.11
F	4.13**	6.17***	2.39*	2.58*	3.25**	1.54**
R^2	.07	.10	.04	.04	.05	.03

*$p < .05$ **$p < .01$ ***$p < .001$

hood of A's rewarding increases after B's nonexchange, then it must decrease after one or both of B's other behaviors.

The most striking result is the consistently weak relation between structural power and its strategic use. Although structural power significantly affects each group of strategy variables, the low R^2 values indicate that it explains relatively little of the variance. These results help to explain the findings of the previous analysis: the effects of structural power cannot be mediated to any great extent by a set of variables on which it has little influence.

Although the effects of structural power on strategy are relatively weak, the results generally support the predicted pattern of effects for reward strategies. As predicted by hypothesis 2.2, greater reward power imbalance decreases the reciprocity of rewards (R|R) and increases nonreciprocal strategies, particularly the contingency of rewards on nonexchange (R|N). The opposite signs of these effects for dyadic asymmetry indicate, as predicted, that the reciprocity of rewards becomes more asymmetrical, with the more reward dependent actor reciprocating more as reward power imbalance increases. The effects of average reward power on strategies are much weaker, but in the direction predicted by hypothesis 2.1: higher average reward power increases the average reciprocity of rewards (R|R) and decreases nonreciprocal reward strategies (R|N and R|P). The only other effect appears for reward strategy asymmetry: B becomes less likely to follow A's punishment with rewards (R|P) as the strength of that punishment increases.

In contrast, results for punishment strategies show less support for hypotheses 2.1 and 2.2. Punishment strategies are subject to a variety of determinants, many relatively weak in strength. Virtually every dimension of structural power significantly affects at least one of the component punishment strategies. Unlike reward strategies, which are primarily affected by power imbalance of the same base, punishment strategies are affected as much — if not

more — by the average power dependencies in the relation, and by the *opposite* base of power, reward power. Two findings support the predicted effects of structure on strategies: (1) as hypothesis 2.1 predicts, the average reciprocity of punishment (PIP) increases, and nonreciprocal punishment strategies decrease, with average punishment power, and (2) as hypothesis 2.2 predicts, the average contingency of punishment on the other's nonexchange (PIN) increases with punishment power imbalance. Contrary to hypothesis 2.1, average reward power has a stronger effect on average strategy strength than punishment power, suggesting that the tendency to punish the other's nonexchange is affected more by the incentive to punish provided by high reward dependence than by the power to punish.

The results for the asymmetry of punishment strategies show this same pattern, but the effects of reward power and punishment power conflict with one another. Again, contrary to hypothesis 2.2, the strongest predictor is a dimension of reward power, not punishment power: reward power imbalance is positively related to the asymmetry of PIN, indicating that B, the actor with less reward power, is more likely to punish A's nonexchange as reward power imbalance increases (and A's exchange decreases). But all dimensions of structural punishment power have a negative effect on this same variable, including (nonsignificantly) B's own punishment power advantage.

These analyses help explain the previous results — dimensions of structural power are not translated into power strategies in a one-to-one manner. First, the relations between structure and strategy are unexpectedly weak, explaining the limited extent to which strategies mediate the effects of structural power on exchange outcomes. Second, structural power has the predicted pattern of effects on reward strategies, showing efforts by actors to increase their relative or absolute benefits from the relation in response to their relative advantages on reward power, but multiple and contradictory effects on punishment strategies. The strongest inducements to punish the other's nonexchange are not dimensions of punishment power, but strong dependence on the other's reward exchange and structural conditions that reduce that exchange. The effects of reward and punishment power on punishment strategies sometimes work in opposite directions, explaining why structural punishment power has weak indirect effects on exchange outcomes as well as no direct effects.

Strategic Action and Exchange Outcomes

Because power strategies are only partially determined by structural power, I examine their effects on exchange outcomes not only as variables that may mediate the effects of structure (hypothesis 2), but as independent determinants of exchange (hypothesis 3). Somewhat different analytical approaches are used to estimate the effects of the separate strategy dimensions and the variance explained by the entire set.

The bottom rows of Table 6 show the variance explained by the full set of 18 strategy variables, before and after controlling for the effects of structural power. Both the total R^2 for the equations and the net R^2 for strategic action independent of structure are shown. Two results are striking. First, comparisons of the total R^2 in Model I with the net R^2 in Model II show that controlling for structural power substantially reduces the effects of strategies on average reward exchange (the net R^2 in Model II is near zero, and the F-ratio is not significant) but has only a small effect on the other exchange outcomes. These results support the earlier finding that only the effects of structure on average reward exchange are mediated to any extent by the strategic use of power. They further show, in support of hypothesis 3, that strategies have substantial independent effects on punishment outcomes and moderate effects on reward exchange asymmetry. Strategies have a much stronger effect on punishment exchange than on reward exchange, the reverse of the effects of structural power observed earlier.

A modified approach was used to examine the relations between particular dimensions of strategies and exchange outcomes. Because of the high multicollinearity among the three variables in each interdependent strategy group, their effects are uninterpretable if all three are entered in a single regression equation.[13] In addition, reward and nonexchange strategies are highly correlated because of the latter's appar-

[13] The extent of multicollinearity is indicated by regressing each strategy variable on all other strategy variables. For all 18 strategy variables, the average R^2 is .97; when each strategy variable is regressed on only the two other variables in the interdependent group, R^2 is still as high as .94 when the antecedent behavior of the dependent strategy is rewards or nonexchange.

Table 6. Unstandardized Coefficients for Regressions of Exchange Outcomes on Power Strategies (N = 290)

	Reward Exchange				Punishment Exchange			
	Average		Asymmetry		Average		Asymmetry	
Power Strategies	Model I	Model II	Model I	Model II	Model I	Model II	Model I	Model II
Equation 1:								
Avg (R|R)	.04**	.01	-.03***	-.02	.00	.01	.01	.00
Avg (P|R)	-.08**	-.03	.02	.02	-.16***	-.16***	.02	.02
Asym (R|R)	-.01	.00	.01*	.00	.00	.00	.00	.01
Asym (P|R)	.00	.00	.05***	.06***	-.01	.00	.07***	.07***
F/F change	4.96***	.98	10.76***	11.40***	46.26***	46.80***	10.57***	9.75***
Equation 2:								
Avg (R|N)	-.03*	-.01	.04***	.02*	.00	.00	.00	.00
Avg (P|N)	.14***	.08***	.02	.01	.06***	.06***	-.02	-.02
Asym (R|N)	.01	.00	-.02***	-.01	.00	.00	-.01	-.01*
Asym (P|N)	-.02	-.01	-.01	-.02**	.00	.00	-.06***	-.06***
F/F change	9.87***	5.03***	6.66***	3.94**	5.48***	4.12***	15.31***	14.73***
Equation 3:								
Avg (R|P)	-.13***	-.06*	.05*	.03	-.03*	-.03**	-.03	-.02
Avg (P|P)	-.02	-.02	.00	.00	.07***	.07***	.00	.00
Asym (R|P)	-.01	-.01	.00	.00	-.01	-.01*	.00	.00
Asym (P|P)	.01	.00	-.03***	-.03***	.00	-.01	.01	.01
F/F change	5.40***	1.67	5.30***	5.36***	30.26***	35.10***	.80	.65
Full equation — all strategy variables:								
Total R^2	.29	.58	.20	.45	.67	.68	.33	.35
Net R^2	----	.07	----	.15	----	.61	----	.29

*$p < .05$ **$p < .01$ ***$p < .001$

Note: Model I - without controls; Model II - with controls for all 5 structural variables. For Model I, the F-ratios are displayed; for Model II, the changes in F-ratio after entering the strategy variables are displayed.

ent function as reward withholding. Consequently, the regression analyses include only reward and punishment strategies as predictors, and each equation includes only strategies based on a single antecedent behavior. In the first set of regressions the antecedent behavior is rewarding (equation 1), in the second set nonexchange (equation 2), and in the third set punishment (equation 3). Each of these regressions was conducted with and without structural power variables in the equation (Models II and I respectively).

The relations predicted in hypothesis 2.3 are expected to hold if either hypothesis 2 or 3 is supported. These predictions are based on the assumption that the effects of reward and punishment strategies follow behavioral principles of reinforcement and punishment. This assumption appears valid for all outcomes except average punishment exchange, and when it holds, the predicted effects are observed.

The effects of strategies on average reward exchange, shown in the first two columns, follow straightforward behavioral principles. Model I results show that average reward exchange varies with average strategy strength as predicted in hypothesis 2.3: mutual reward exchange increases with the average strength of reciprocal rewarding (avg R|R) and decreases with nonreciprocal rewarding (avg R|N and

R|P). It also decreases when rewarding behavior is punished (avg P|R), and increases when other behaviors are punished (avg P|N). Because these strategies partially mediate the effects of structural power, the strength of these relations is substantially reduced when structural power is controlled (Model II).

In contrast, the effects of average strategy strength on average punishment exchange appear contrary to behavioral principles and do not support hypothesis 2.3. The contingency of punishment on punishment (avg P|P) or nonexchange (avg P|N) increases average punishment, the contingency of punishment on rewards (avg P|R) decreases average punishment, and the contingency of rewards on punishment (avg R|P) decreases average punishment. In other words, responding to punishment with more punishment increases the level of punitive interaction, while responding to it with rewards reduces it. These relations do not change when structural power is controlled (Model II). Although these findings refute basic principles of reinforcement and punishment, they are consistent with the use of punishment as an intentional means of influence. If the aim of using punishment is to decrease the other's nonrewarding behaviors and increase rewarding ones, then we would expect a decrease in punishment when it induces rewards successfully, and an increase in punishment when the other's use of punishment continues.

The results for both reward and punishment exchange asymmetry support the effects of reward and punishment strategies predicted in hypothesis 2.3. The Model I equations show that nonreciprocal reward strategies (avg R|N and R|P) increase reward exchange asymmetry and reciprocal rewarding (avg R|R) decreases it, but these effects are reduced once structural power is controlled (Model II). In contrast, the effects of punishment strategies are independent of structural power. Both forms of exchange asymmetry, coded so that higher values favor A (indicating relatively more rewards and fewer punishments), are decreased when B's punishment is more contingent on nonexchange than is A's (asym P|N), and increased when B's punishment is more contingent on rewards than is A's (asym P|R). Reward exchange asymmetry is also reduced when B is more likely than A to reciprocate punishment (asym P|P).

The results for all four outcomes support the prediction that punishment strategies have stronger effects on exchange outcomes than reward strategies (hypothesis 3A). After controlling for structural power (Model II), substantial effects of punishment strategies remain; in contrast, reward strategies have scattered weak effects. With structure controlled, the asymmetry of both reward and punishment exchange is affected primarily by the asymmetry of punishment strategies. As these results show, an actor can shift the asymmetry of reward exchange in his or her favor by punishing the other's negative behavior more than the other reciprocates that punishment, as behavioral principles would predict. What is interesting is that these effects, unlike the effects of reward strategies, are independent of structural power. These findings show that even though exchange asymmetry is unaffected by structural punishment power, it is significantly affected by how punishment is used.[14]

DISCUSSION

I have examined how structural power and the strategic use of power resources are related to one another and to exchange outcomes. Three possible causal relations were tested: structure affects exchange directly, independent of action; structure affects exchange indirectly, through action; action affects exchange directly, independent of structure.

The results show that the effects of structural power on reward exchange are primarily direct. The underlying assumption of some classical theories of social exchange, that structural power affects exchange indirectly through its effects on strategic action, receives little support. Strategies partially mediate the effects of structural power on the frequency of reward exchange in the relation, but the effects of structure on the distribution of that exchange are entirely direct.

At the same time, however, the results suggest that theories that neglect the effects of actors within given structural conditions are incomplete. *Both* structural power and strategic action have substantial effects on exchange outcomes, but these effects are largely independent of one another. *How much* power an actor has, both absolutely and relatively, and

[14]Analyses not reported here also show that the asymmetry of reward exchange is unaffected by the frequency and distribution of punishment, i.e., it is only the strategic use of punishment power that affects reward exchange asymmetry.

how that power is used to respond to another's behavior are best conceptualized as distinct determinants of exchange outcomes.

The weak relation between structural power and strategic action is one of the most surprising findings of the study. Structural power is obviously a prerequisite for the strategic use of that power, but variations in the magnitude and asymmetry of structural power do not produce comparable variations in the magnitude and asymmetry of power strategies. Two explanations for this finding are worth testing in future research. First, the effective use of power may require not only the resources provided by the network structure, but behavioral skills that are developed independently of that structure. Structural power, in and of itself, does not ensure that actors know how to make good use of the opportunities it provides or recognize the constraints it imposes. Abilities such as information processing, behavior monitoring, and risk-taking may be required for effective strategic action.

While variations in actor skills probably account in part for the weak relation between structure and strategic action, a different explanation is also possible: the assumption that effective power users closely match their strategies to their structural power may be wrong. Rather than mediating the effects of structural power, strategic action may instead be used to compensate for the lack of power. Creating strong behavioral contingencies is one way that structurally weak actors can make their less valuable resources more potent. Powerful actors, in contrast, have less need to use power strategically. The results provide some support for this explanation: more powerful actors in reward power-imbalanced relations increased reward exchange asymmetry in their favor simply by reducing their own exchange. This action improved the powerful actor's benefits from the exchange by lowering their costs (i.e., the cost of reciprocal exchange) rather than by increasing the other's exchange. Influencing the other actor's behavior was not necessary for effective power use. On the other hand, the weaker actors in reward power imbalanced relations could only improve their benefits by increasing the other's exchange. They were more likely to punish the other's nonexchange, and their greater use of strategic punishment significantly affected the distribution of reward exchange in the relation, independent of structural power.

The second major issue is how the base of power affects the relations among structure, action, and outcomes. As predicted, the effects of structure and strategic action on reward and punishment exchange vary markedly in strength. Reward exchange is primarily affected by structural power, either directly or indirectly. In contrast, structural power has almost no effects, direct or indirect, on punishment exchange. The average frequency and distribution of punishment is affected far more by how punishment is used and responded to in power strategies than by the structural potential for power.

In addition, the relations between structure and strategic action vary for the two bases of power. Strategies are not strong intervening variables for either base, but for different reasons. For reward-based power, the pattern of relations between dimensions of structure and strategy are precisely those predicted if strategic action mediates the effects of structure, i.e., reward strategies vary predictably with the absolute and relative strength of reward power. They do not mediate structure to any extent simply because the strength of these relations is weak. Reward strategies have no independent effects on reward exchange, however; to the small extent that they affect it, they do so only as intervening variables.

The pattern of relations for punishment-based power is markedly different. Actors' strategic use of punishment is influenced more by dimensions of reward power that affect the incentive to use punishment than by the absolute or relative strength of punishment power. Moreover, the two bases of structural power conflict in their effects on the dimensions of punishment strategies that most affect the asymmetry of both punishment and reward exchange. In particular, the results show that an actor who is disadvantaged on reward power can reduce the other's reward exchange advantage by increasing the contingency of his or her punishment on the other's punishment and nonexchange. But rather than increasing the strength of these strategies, dimensions of punishment power either decrease them or have no effect on them. Consequently, the independent effects of these strategies are stronger than the effects of structural punishment power.

None of these findings implies that reward and punishment power are fundamentally different phenomena requiring different theories. On the contrary, this study provides strong empirical evidence that both bases of power

are sources of dependence that increase attraction to the relation, as measured by the mutual frequency of reward exchange. When actors control greater rewards or greater punishments for each other, they engage more frequently in mutual exchange. This finding validates the incorporation of both bases of power within the power/dependence framework. It is when power is imbalanced and actors have conflicting interests that the differences between reward power and punishment power become most apparent. Actors shift the exchange relation in their favor by withholding rewards or administering punishment, and the different inducements of those two behaviors produce the different effects of reward power and punishment power.

The independent effects of strategic action strongly suggest that further development of exchange theory requires a more complete model of the behavior of actors. The structural emphasis of Emerson's theory of exchange and power has been one of its greatest strengths and the basis for a truly sociological theory of interpersonal relations. But in developing exchange theory structurally, building toward network-level analyses, less attention has been paid to theoretical analysis of the behavioral choices of actors within those networks. The next challenge is to integrate both structure and strategic action within a more complete theory of exchange and power.

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