Social Science Research 45 (2014) 131–151

Contents lists available at ScienceDirect

Social Science Research

journal homepage: www.elsevier.com/locate/ssresearch

Power-use in cooperative competition: A power-dependence model and an empirical test of network structure and geographic mobility

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ARTICLE INFO

Article history:
Received 16 December 2012
Revised 7 December 2013
Accepted 9 January 2014
Available online 19 January 2014

Keywords:
Power-dependence theory
Social exchange theory
Exponential random graph models

ABSTRACT

Although the social exchange paradigm has produced a vibrant research program, the theoretical tradition is rarely used to model the structure of social networks outside of experiments and simulations. To address this limitation, we derive power-dependence predictions about network structure and geographic mobility—the outcomes of power-use—and test these predictions using complete data on competition networks and travel schedules among amateur sports teams. Poisson regression and exponential random graph models provide strong support for our predictions. The findings illustrate exchange dynamics in which status resources desired by teams, coupled with the availability of geographically proximal alternatives, create power and dependence that dictate where and with whom teams compete. Although evidence supports Georg Simmel's classic proposition that networks form on the basis of values and propinquity, we show that this complex dynamic is conditional on power and dependence. We conclude by discussing implications and directions for future research.

> "Sociation. . .is the form (realized in innumerable, different ways) in which individuals grow together into units that satisfy their interests. These interests, whether they are sensuous or ideal, momentary or lasting, conscious or unconscious, causal or teleological, form the basis of human societies."
>
> –Georg Simmel (1950: 41)

1. Introduction

The proposition that networks form on the basis of values and propinquity is among Georg Simmel's most influential contributions (Simmel and Wolff, 1950; see also Blau, 1977; Blau and Schwartz, 1984; Bossard, 1932). To secure wants and desires, actors who share a common location will crystallize lasting relationships that, when taken aggregately, unintentionally produce unique network structures. And these structures, once they materialize, simultaneously constrain and enable individual desires that foster network evolution and change. The result is a dynamic relationship between the individual and structure, where the actor and the network are dependent upon each other and the social space in which they are embedded.

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http://dx.doi.org/10.1016/j.ssresearch.2014.01.004

Contemporary efforts to understand how and why this occurs within the broad sociological literature are perhaps most visible in the social exchange tradition (Blau, 1964; Ekeh, 1974; Emerson, 1962; Emerson, 1964, 1972a,b; Homans, 1950, 1974). Over the last half century this tradition has produced numerous theoretical and empirical insights, ranging from how typologies of exchange produce differential levels of trust and power (Cook et al., 1983; Cook and Emerson, 1987; Molm, 2003; Molm et al., 2007, 1999, 2000; Stolte, 1988; Thye et al., 2006) to how exchange networks constrain individual decisions and shape patterns of social interaction (Cook and Emerson, 1978; Lawler et al., 2008; Lawler and Yoon, 1993; Skvoretz and Lovaglia, 1995; Stolte and Emerson, 1977). The paradigm has also been witness to numerous sub-theoretical innovations, such as power-dependence theory (Cook and Emerson, 1978), resource dependence theory (Pfeffer and Salancik, 1978), exchange-resistance theory (Skvoretz and Willer, 1993), graph-analytic theory (Markovsky et al., 1988), core theory (Bienenstock and Bonacich, 1992), expected value theory (Friedkin, 1986, 1992), and affect theory (Lawler, 2001), all of which have contributed to the growth and development of this tradition.

Despite these substantial accomplishments, and the accumulated body of experimental and observational research (e.g., Schaefer, 2012; Van de Rijt and Macy, 2006), few studies in the social exchange literature have attempted to test Georg Simmel's original insight—that networks form on the basis of individual interests and social propinquity—using naturally occurring network data (see Corra and Willer, 2002; Simpson and Willer, 2002 for exceptions).[1] The missing linchpin connecting social exchange theory (SET) to network analysis is undoubtedly related to issues of appropriate data and methods. This is because standard surveys have difficulty recording the structure of sociation without producing missing data (Butts, 2003; Kossinets, 2006); ethnographies of large populations are too costly and prone to measurement error (Wasserman and Faust, 1994); and analyzing social network data with classic generalized linear models or ordinary least squares regression produces biased and inconsistent estimates (Snijders, 2011). Recent advances in digital record keeping, however, are providing new terrain for social research: real world populations leave digital traces of interaction, including the characteristics of actors, the content of action, and the structure of their relations. Furthermore, advances in the statistical analysis of social networks have created the necessary and proper tools for social scientists to analyze such data (Frank and Strauss, 1986; Pattison and Wasserman, 1999; Wasserman and Pattison, 1996). All of these developments are creating avenues for new research that include the possible fusion of SET with real world network analysis.

Benefitting from these new advents, the present study utilizes innovative network methods, exponential random graph models (Frank and Strauss, 1986; Robins et al., 2007a,b; Snijders et al., 2006), as well as a previously unavailable data set: records of a full community of competitive social actors who are free to, and in fact are obligated to, craft the structure of their own interactions. The case is drawn from a unique corner of competitive amateur sports that blends competition with personal responsibility and self-organization, what is often referred to by outsiders as "Ultimate Frisbee" or by those within the community simply as "Ultimate." Despite the desire to win, Ultimate teams establish their competition schedules cooperatively and cooperatively self-referee their established competitions. These cooperative competitions have been taking place for years, but it is only until recently, with the advent of computer mediated communication systems, that Ultimate competitions have been centrally recorded and easily accessible for empirical analysis.

This unique and previously untapped data set, in addition to the innovative network methods, allows us to investigate SET hypotheses about network formation in naturally occurring settings. Inspired by Georg Simmel's original insight, we derive several hypotheses from power-dependence theory and other models of social exchange (Foa and Foa, 1974, 1976; Meeker, 1971) predicting the network structure of Ultimate competitions and the geographic mobility of Ultimate teams, and operationalize these hypotheses with respect to the institutional features of Ultimate. We propose that Ultimate teams pursue and exchange status as a valued resource (see Foa and Foa, 1974, 1976), and define status as a team's relative rank (or standing) within the Ultimate community's competition hierarchy. To increase status, teams choose competitors whose status yields the greatest mutual dependence and lowest power imbalance. Yet, we expect this process to be conditional on propinquity since geographic distance increases the monetary costs of competition and decreases the availability of alternatives. Thus, increasing geographic space between mutually dependent teams results in more local competition among power imbalanced teams and less extra-local competition among mutually dependent teams. We also expect teams to use structural positions of power to gain distributional bargaining advantages, producing nonmonotonic power-outcomes in which geographic mobility increases at a decreasing rate with status.

Using exponential random graph models and Poisson regression to test these predictions, we demonstrate support for our hypotheses and produce three key findings. First, we show that the desire to increase status in the Ultimate community generates a network of mutually dependent *and* power balanced competitions where the status of two competing teams is equivalent and comparable. High-status teams compete against teams predominantly within and immediately below their status, while low-status teams compete against teams predominantly within and immediately above their status, which allows middle-status teams to bridge the status divide and compete against teams above, below, and within their status. Second, we show that this effect is conditional on propinquity: when geographic distance is great among mutually dependent teams and small among power imbalanced teams, teams will compete against lower status teams from their own region rather than teams of equal or higher status from nonadjacent regions. Third, we show that geographic mobility increases nonmonotonically with status to form an inverted U-shaped relationship where low-status teams and elite-high-status teams travel less

[1] For research exploring similar processes outside of the social exchange tradition see Casciaro and Piskorski (2005), Gulati (1995), Hedstrom (1994), and Zhu et al. (2013).