The Psychology of Rivalry: A Relationally-dependent Analysis of Competition

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Abstract

We investigate the psychological phenomenon of rivalry, and propose a view of competition as inherently relational, thus extending the literatures on competition between individuals, groups, and firms. Specifically, we argue that the relationships between competitors – as captured by their proximity, relative attributes and prior competitive interactions – can influence the subjective intensity of rivalry between them, which in turn can affect their competitive behavior. Initial tests of these ideas within NCAA basketball indicate that (1) dyadic relationships between teams are highly influential in determining perceptions of rivalry (2) similarity between teams and their histories of prior interactions are systematically predictive of rivalry and (3) rivalry may affect the motivation and performance of team members. These findings suggest significant implications for both the management of employees and the competitive strategies taken by organizations.

Keywords: rivalry; rivals; competition; competitiveness; motivation; relationships; social relations model

"When the new schedule would come out each year, I'd grab it and circle the Boston games. To me, it was The Two and the other 80."

Magic Johnson, former professional basketball player for the Los Angeles Lakers.

"The first thing I would do every morning was look at the box scores to see what Magic did. I didn't care about anything else."

Larry Bird, former professional basketball player for the Boston Celtics.[1]

Competition is a fact of life; employees compete for promotions, groups of researchers vie for grants, and companies fight for market share. Typically associated with competition is the drive to win, or defeat one's opponents. However, not all opponents are alike. Certain competitors, or rivals, can instill a motivation to perform that goes above and beyond ordinary competitive spirit or the objective stakes of the contest. Indeed, it is clear from the opening quotes that Magic Johnson and Larry Bird viewed contests against each other as more significant than games against other teams and players.

Although rivalries are prominent in sports, they exist in a broad range of settings. A student may be particularly motivated to outperform certain peers; a university professor may closely monitor the citation counts of certain scholars. In the business world, rivalry may be especially common. Within firms, employees may see certain coworkers as rivals in the battle for career advancement. Between firms, longstanding industry competitors, such as Oracle and SAP, Coke and Pepsi, and Microsoft and Apple, often come to view one another as much more than simple competitors. In fact, these rivalries often grow so intense as to lead to abnormal or irrational competitive behavior. For example, in 1993, Virgin Atlantic won a libel suit against British

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[1]http://www.nba.com/encyclopedia/ryan_rivalries.html

Airways after the latter admitted to having launched a "dirty tricks" campaign against its rival, which included calling Virgin's customers and lying to them about flight cancellations in addition to circulating rumors that Virgin CEO Richard Branson was infected with HIV (Branson, 1998). In a slightly less scandalous example, Boston Scientific recently overpaid for its acquisition of Guidant – later referred to as "arguably the second-worst" acquisition ever – in large part because it was bidding against rival Johnson & Johnson (Malhotra, Ku, & Murnighan, 2008; Tully, 2006).

It is evident from these examples that rivalry can be a powerful psychological phenomenon with substantial behavioral consequences. To date, however, the psychology of rivalry has received little attention from researchers, which is symptomatic of a broader lack of study on the relationships between competitors. We attempt to fill this gap by presenting a theory of rivalry as a subjective relationship between competitors, and by investigating its antecedents and consequences. In doing so, we draw upon the literatures on competition between individuals, groups, and organizations. After outlining our theoretical model, we conduct a first-test of our hypotheses within a setting known to be rife with rivalry: NCAA basketball.

BACKGROUND AND THEORY DEVELOPMENT

Prior Research on Competition

A logical starting point for the study of rivalry is the broader topic of competition. Because research on competition exists at the individual, group, and organizational levels, we briefly review each of these literatures. A common theme across them is an under-emphasis on the relationships – and by extension, the rivalries – that exist between competitors.

Competition between individuals. Deutsch (1949) defined competition in purely situational terms – as a setting in which the goal attainment of participants is negatively linked, so that the

success of one participant comes at the failure of the other. Following from this definition, studies on inter-individual competition have typically examined participants in a laboratory setting, pitting them against one another or against confederates of the experimenter (e.g., Beersma, Hollenbeck, Humphrey, Moon, & Conlon, 2003; Deci, Betley, Kahle, Abrams, & Porac, 1981; Reeve and Deci, 1996; Scott & Cherrington, 1974; Stanne, Johnson, & Johnson, 1999; Tauer & Harackiewicz, 1999). For example, participants are paired with a confederate and told to try to complete more puzzles than this person (Deci et al., 1981). Unfortunately, such an approach may fail to fully capture the essence of competition in the real world, where competitors often know one another and may have histories of prior interaction. Indeed, the vast majority of studies on inter-individual competition match unacquainted individuals in the laboratory, and even field studies of competition do not typically distinguish participants based on their prior relationships (e.g., Tauer & Harackiewicz, 2004; Brown, Cron, & Slocum, 1998).

The nature of competition, however, will likely vary depending on the relationship among competitors. For instance, competing against a familiar foe may be quite a different experience than competing against a stranger. Although little research has directly examined relationships between competitors, related literatures suggest their importance. For instance, game theorists have shown that the decisions made by participants in a prisoner's dilemma game are affected by the prior interactions they have had with their partners (Bettenhausen & Murnighan, 1991). This has led researchers to focus on repeated game scenarios as opposed to isolated interactions (e.g., Boles, Croson, & Murnighan, 2000; Chen & Bachrach, 2003; Sivanathan, Pillutla, & Murnighan, 2008). Similarly, researchers in the area of negotiations have shown that relationships and prior interactions can affect both negotiators' behaviors and outcomes (Drolet & Morris, 2000; Thompson, Valley, & Kramer, 1995; Valley, Neale, & Mannix, 1995). Finally, a recent study on

auction behavior indicates that people are more likely to exceed their bidding limits when facing a few, rather than many, competing bidders – suggesting that rivalry may be developing between bidders and pushing them to try to achieve "victory" (Ku, Malhotra, & Murnighan, 2005).

Competition between groups. Studies examining competition between groups have closely resembled those on competition between individuals. In the typical laboratory experiment, participants are placed into groups, these groups are pitted against one another, and measures of motivation, cohesion, and performance are then collected (e.g., Mulvey & Ribbons, 1999). Sometimes, an individual-level competition condition is included as well, with the goal of comparing inter-individual to intergroup competition (Erev, Bornstein, & Galili, 1993; Hammond & Goldman, 1961; Julian & Perry, 1967; Tauer & Harackiewicz, 2004; Young, Fisher, & Lindquist, 1993). Regardless, the relationships between competing groups are rarely measured or manipulated.

Certain studies on the related topic of intergroup bias do support the idea that relationships can be an important determinant of intergroup attitudes and behavior. Intergroup bias refers to tendency for people to perceive their own groups more positively than other groups (Brewer, 1979; Sherif, Harvey, White, Hood, & Sherif, 1961; for a recent review, see Hewstone, Rubin, & Willis, 2002). Although much of this work is steeped in the "minimal group paradigm," where arbitrary characteristics are used to divide participants into groups (e.g., Brewer, 1979; Tajfel, Billig, Bundy, & Flament, 1971), a number of studies have considered the moderating effects of the relationship between groups. These studies indicate that the strength of intergroup bias can depend on the amount of interaction between groups (e.g., Janssens & Nuttin, 1976; Rabbie & Wilkens, 1971), the nature and outcomes of these interactions (e.g., Pettigrew, 1998; Rabbie, Beoist, Oosterbaan, & Visser, 1974; Wilson & Miller, 1961), perceived similarity (e.g., Jetten,

Spears, & Manstead, 1998), and relative status (Branthwaite & Jones, 1975; for a recent meta-analysis, see Bettencourt, Dorr, Charlton, & Hume, 2001).

Competition between organizations. Historically, much of the research on interfirm competition has also ignored the role of relationships. Organizational ecologists have typically conceived of competition as occurring between organizational forms, or populations of similarly structured organizations (Carroll & Hannan, 1989; Hannan & Freeman, 1989). Network researchers have examined competition between firms by their structural positions (e.g., Burt, 1988), rather than the specifics of their relationship. And, in classical economic theory, competition is generally treated as a property of the aggregate market structure (e.g., a free market vs. an oligopoly; Scherer & Ross, 1990), with competing firms depicted as anonymous actors (Porac, Thomas, Wilson, Paton, & Kanfer, 1995).

However, over the past two decades, there has been increasing focus on the role of relationships in interfirm competition (e.g., Baum & Korn, 1999; Chen, 1996; Chen, Su, & Tsai, 2007). Following Porter (1980), researchers have studied the exchange of competitive moves between firms – referred to as "interfirm rivalry" – such as market entry or new product launches (Chen, 1996; Chen & Hambrick, 1995; Chen, Smith, & Grimm, 1992). Studies suggest that the competitive strategies that competing firms pursue are influenced by aspects of their relationship, such as relative size (Chen et al., 2007), market overlap (Baum & Korn, 1996), multimarket contact (Baum & Korn, 1996; Baum & Korn, 1999), and resource similarity (Chen, 1996).

Rivalry – A Relational and Subjective Phenomenon

We believe that our understanding of competition can be increased via consideration of the relational context. As reviewed, research on inter-individual and intergroup competition has generally overlooked the relationship between competitors – thus effectively excluding the study

of rivalry – despite evidence from related literatures that suggests its importance. Research on competition at the firm-level has made greater progress, having identified a number of relational predictors of competitive behavior (e.g., levels of market overlap, resource similarity, etc.). However, much remains to be studied. First, the heavy emphasis on the relative attributes of competing firms (e.g., relative size, resource similarity) has left the role of prior interactions between firms relatively unstudied (although Chen at al., 2007 do consider how recent competitive exchanges may influence ensuing strategic endeavors). Second, it seems that the conception of interfirm rivalry could be expanded to encompass more than just the exchange of competitive moves. These moves are but one possible consequence of rivalry and may also be influenced by factors orthogonal to rivalry, such as market conditions.

We define rivalry as a subjective competitive relationship that increases the psychological involvement of competitors beyond what the objective characteristics of the situation would predict. In other words, rivalry exists when an actor places greater significance on competition against certain other opponents as a direct result of his or her competitive relationships with these opponents, controlling for any objective stakes (financial, reputational, or otherwise). Thus, rivalry helps to capture the extent to which competition is relational as opposed to a series of isolated interactions. Several aspects of this definition warrant further discussion.

First, the relational and subjective nature of rivalry means that rivals cannot be identified solely from their positions within markets, hierarchies, or other competitive arenas (e.g., Bothner, Kang, & Stuart, 2007; Garcia, Tor, & Gonzalez, 2006), nor can rivalry be inferred simply from the characteristics of the competitive setting (e.g., Deutsch, 1949). Instead, rivalry as we conceive it exists within the minds of competitors, and thus it differs from the more

objective conceptions of competition reviewed above.[2] Second, prior interaction is central to

rivalry, as relationships are generally formed over time and via repeated interaction. Although

the role of relative attributes in determining competitive behavior has been explored within

certain literatures, the role of prior interaction has gone widely unstudied. We believe that

competitive experiences can leave a lasting psychological residue that can influence competitors'

behaviors long after the contests have been resolved.

Third, given that rivalry magnifies competitors' psychological involvement and desire to win

independent of objective stakes, it may lead to departures from rational or typical competitive

behavior. Examples include Boston Scientific's costly acquisition of Guidant, and the general

tendency for bidders to exceed their pre-auction limits when facing fewer competitors (Ku et al.,

2006). Similarly, as contests between rivals are relationally embedded, their competitive

behavior may be influenced by aspects of the relationship – such as prior contests long since

decided – that should be irrelevant from a rational standpoint. This distinction between

psychological and objective stakes represents another departure from prior research on

competition and rivalry, particularly within economics. Fourth, rivalry may vary in strength,

much like friendship or other relational constructs. Lastly, although it may often be two-sided,

the subjective nature of rival means that reciprocity is not a requirement – one side could feel

rivalry while the other does not.

Rivalry across multiple levels of analysis. Anecdotal evidence indicates that rivalry can form

between individuals, groups, organizations, and even countries. Although there are surely some

level-specific aspects of rivalry, we attempt to develop hypotheses that are general enough to

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[2] Certain macro-level researchers have similarly argued the importance of subjective perceptions of competition, and
have shown that managers' competitive perceptions can diverge from objective indicators employed by researchers
(Chen et al., 2007; Porac & Thomas, 1994; Porac et al., 1995; Reger & Palmer, 1996). This work generally depicts
such perceptions in rational terms – i.e., perceptions of competitive intensity are driven by objective threat (e.g.,
Chen et al., 2007) – which differs from our conception of rivalry.

apply across levels of analysis, and leave the investigation of differences for future work. Our theoretical arguments are largely psychological in nature; however, there is reason to believe that they apply to larger collectives as well as to individuals. Dating back to behavioral theories of the firm (Cyert & March, 1963), organizational researchers have long used psychologically-based theories to predict firm-level competitive behavior. Social comparison theory (Festinger, 1954) formed the basis for the study of aspiration levels among firms, which in turn have been shown to predict organizational strategy and growth (Greve, 1998; Greve, 2008). Cognitive biases have been argued to affect firm-level decisions to enter new markets and make acquisitions (Zajac & Bazerman, 1991). Managerial confidence has been posited as a predictor of competitive inertia (Miller & Chen, 1994) and the complexity of firms' strategic repertoires (Miller & Chen, 1996). Lastly, the "awareness-motivation-capability" perspective is a prevailing theoretical framework within recent competitive strategy research (e.g., Chen et al., 2007; Chen, 1996). More generally, given that firm strategy is typically determined by a few key individuals and decision-makers, firm-level outcomes can be influenced by the dispositions, cognitions and motivations of these individuals (Hambrick & Mason, 1984; Hayward & Hambrick, 1997; Hiller & Hambrick, 2005; Miller & Dröge, 1986; Staw & Sutton, 1993).

THEORETICAL MODEL AND HYPOTHESES

Figure 1 depicts our theoretical model of rivalry, and highlights the hypotheses that we test empirically. These hypotheses are written in general terms, with 'actor' and 'competitor' meant to include competing individuals, groups, and organizations.

Rivalry Varies at the Relationship Level

Based on our arguments with respect to the relational nature of competition, we predict that, within a given competitive environment, perceptions of rivalry between actors will vary

meaningfully at the relationship, or dyad, level. That is, actors will reliably identify certain opponents as rivals, based upon the relationships they have with these opponents. Again, this stands in contrast to the idea that competition is driven purely by the characteristics of the competitive environment, i.e., the extent to which competitors are vying for scarce resources. Further, this means that rivalry, and hence, competitive intensity, cannot be fully predicted by the attributes of the individual actors. For example, although high-status actors might elicit higher competitive intensity from their opponents on average, we predict that additional patterns of rivalry will emerge that can only be captured by the unique relationships between competitors.

Hypothesis 1A. Perceptions of rivalry vary significantly at the dyad level.

Furthermore, we predict that perceptions of rivalry will not only vary at the dyad level, but will be driven more by competitors' relationships than by their individual characteristics.

Hypothesis 1B. Perceptions of rivalry are determined more by the relationship between competitors than by their individual characteristics.

Antecedents of Rivalry

In addition to testing the extent to which rivalry varies according to competitors' relationships, we investigate how and why rivalry forms, and the factors that determine its strength. Although idiosyncratic events likely play a role, certain general conditions may also contribute to the formation of rivalry. We focus our theorizing on three broad factors that influence relationships: actors' proximity, relative characteristics, and history of interaction. A common theme runs across the first two factors: similarity, both in terms of location and actors' attributes, may be an antecedent of rivalry.

A large body of research within psychology and sociology suggests that similarity generally fosters increased liking and attraction (McPherson, Smith-Lovin, & Cook, 2001). However, with

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respect to competitors, this may not be the case – instead, greater similarity may breed greater rivalry, for several reasons. First, with regard to location, closely-located competitors are more visible and salient in actors' minds, and thus may be more likely to be seen as rivals (e.g., Porac et al., 1995). Indeed, research indicates that geographically proximate firms compete more intensely (Baum & Mezias, 1992; Porac, Thomas, & Badenfuller, 1989; Yu & Canella, 2007). Of course, geographic proximity may be less relevant to large geography-spanning organizations, although a recent study of competition between multinational automakers found that geographic distance between home countries still predicted the likelihood and frequency of competitive action (Yu & Cannella, 2007). Further, many large companies such as hotel chains and airlines compete within geographically defined markets, suggesting that the geographic overlap of firms' markets may drive rivalry as well (Chen, 1996).

Second, with regard to actors' characteristics, social comparison theory posits that people strive to evaluate themselves, and as a consequence, tend to compare their performance to others of similar ability-levels (Festinger, 1954; for similar firm-level arguments, see Greve, 1998; Greve, 2008; Porac et al., 1989). In turn, this increased focus on the performance of similar others can lead to heightened competitiveness (Goethals, 1986; Goethals & Darley, 1977). Group researchers have found that out-groups that are similar to the in-group are perceived as more threatening and tend to elicit greater intergroup bias (e.g., Henderson-King, Henderson-King, Zhermer, Posokhova, & Chiker, 1997; Jetten, Spears, & Manstead, 1998). Further, firms that are similar in size (Baum & Mezias, 1992), form (Porac & Thomas, 1994) and resource or market profile (Chen et al., 2007; Baum & Korn, 1996) tend to compete more intensely.

Lastly, similar competitors – both in terms of location and characteristics – may have similar valued identities. For example, two closely-located universities may both covet the title of top

school in the region; two runners of same gender and similar age may both strive to be among the best within that sub-category of runners. Thus, competition against similar others may be more identity relevant, which in turn should increase the psychological stakes of competition and hence rivalry. Indeed, Britt (2005) showed that people's levels of motivation and stress are increased when a task is seen as relevant to their valued identities, and Tesser (1988) argues that people are threatened by the success of close others on self-relevant dimensions.

Overall, we predict that similarity between competitors, in terms of their location and characteristics, will foster greater rivalry. Of course, there are rational reasons for why similarity should result in increased competitiveness – e.g., similar competitors often compete for the same scarce resources, and thus pose greater objective threats to one another (e.g., Chen et al., 2007). However, as discussed above, similarity may also affect subjective perceptions of competitive stakes, suggesting that it is an antecedent to rivalry.

Hypothesis 2. Rivalry between competitors is positively related to their similarity.

We next turn our attention to competitors' histories of prior competitive interaction, both in terms quantity and quality. Although several prior studies speak to the relationship between similarity and competitiveness, the role of prior interaction between competitors is less understood. From a rational standpoint, there is little reason to believe that contests no longer relevant to the current competitive setting will continue to influence competitive perceptions. However, taking a psychological perspective suggests otherwise. We posit that the experience of competition can leave a competitive reside that endures even after contests have been decided. In support of this idea, a recent study found that participants who initially competed with each other continued to compete even after the task conditions were changed such that cooperation was in their best interest (Johnson, Hollenbeck, Humphrey, Ilgen, Jundt, & Meyer, 2006).

With regard to the quantity of competitive interactions, therefore, repeated competition is likely to foster greater rivalry, as the competitive residue from past contests accumulates. In a reversal of the "mere exposure" effect (Zajonc, 1968), researchers found that repeated exposure to initially aversive stimuli led to increasingly negative evaluations (Brickman, Redfield, Crandall, & Harrison, 1972). Similarly, repeated exposure to the same competitive stimulus (i.e., an opponent) may lead to increasing competitiveness. At the firm-level, research has shown that managers' perceptions of their primary competitors may reflect past competitive conditions as opposed to current ones (Reger & Palmer, 1996), also in line with the idea that competition can leave a lasting psychological residue. Although other research has found that high levels of multi-market competition can actually lead firms to limit their aggressive moves towards one another (a phenomenon known to as *mutual forbearance*), this is likely due to increased concerns over possible retaliation (e.g., Baum & Korn, 1996) rather than any reduction in feelings of rivalry. That is, although multi-market contact can indeed constrain firms' competitive moves, underlying feelings of rivalry may still exist and may influence behavior in other domains.

Hypothesis 3. Rivalry between competitors is positively related to the number of competitive interactions in which they have engaged.

It is worth noting that although competitive relationships can often be broken down into a series of contests – such as games between sports teams and the exchange of competitive moves (e.g., product innovations) between firms – competition may also be continual, such as two firms that are constantly jockeying for market share. Therefore, repeated competition could also be conceptualized as simply the length of time during which actors have competed with each other.

The outcomes of past competitive interactions may also influence the formation of rivalry – i.e., certain contests may leave more of a lasting trace than others. Specifically, we predict that

rivalry will be positively related to the "competitiveness" of prior contests, or the extent to which competitors have been evenly-matched. First, contests decided by small margins are likely to elicit counterfactual thoughts about what might have been (e.g., "If things had gone slightly differently, I would have won") and stronger emotional reactions (Medvec, Madey, & Gilovich, 1995; Medvec & Savitsky, 1997). Close contests, therefore, may be more likely to live on in the minds of competitors, thus more strongly influencing their ensuing competitiveness and rivalry. Second, competitors who have been evenly-matched in the past will likely anticipate being evenly-matched in the future, which may also increase subjective competitiveness, or rivalry. Indeed, research shows that outcome significance – i.e., the importance that people place on success – tends to be highest under conditions of moderate difficulty as opposed to easy or impossible conditions (Brehm, Wright, Soloman, Silka, & Greenberg, 1983).

Hypothesis 4. Rivalry between competitors is positively related to the historic competitiveness of their match-up.

At the firm level, competitiveness could be measured in terms of firms' relative performance during past financial periods. For example, airlines measure performance in terms of revenues per available seat mile flown (Miller & Chen, 1996) and via FAA statistics on lost luggage and on-time arrivals. Therefore, we might predict that airlines that have been historically evenly-matched on these metrics will have stronger rivalries. More broadly, a variety of regularly released performance metrics exist at the firm level, including sales, earnings, changes in market share, changes in stock price, and quality ratings (e.g., J.D. Power and Associates), all of which could form the basis for a historically competitive match-up.

Overall then, we predict that similarity, repeated competition, and past competitiveness will all lead to rivalry. In effect, we are proposing a path-dependent conception of competition –

prior contests between competitors are expected to influence their competitive perceptions even after outcomes have been decided. Again, this contrasts with the majority of prior research on competition with psychology, organizational behavior, and economics, and suggests the potential for irrational competitive behavior.

It is important to note that the proposed antecedents of similarity (in ability or status) and competitiveness can be closely related. For example, sports rivalries may involve competitors who are roughly equal in ability and who have also been historically evenly-matched. Rival firms may hold similar levels of market share, in addition to having achieved comparable levels of profitability during prior financial periods. However, although similarity and competitiveness may often be correlated, they are conceptually distinct. Similarity is measured in terms of relative observable characteristics; competitiveness in terms of the outcomes of prior contests. We expect past competitiveness to predict rivalry even when controlling for similarity in status or ability, thus supporting our notion of rivalry as path-dependent.

Consequences of Rivalry

We believe that rivalry may have a range of important consequences for the attitudes, decisions, and behaviors of competitors. In this initial investigation, however, we focus on motivation and task performance, the dependent measures that have historically attracted the most attention from psychological researchers of competition. Indeed, in what is recognized as the first published study in the field of social psychology, Norman Triplett (1898) documented a link between competition and task performance. Specifically, Triplett observed that bicyclists were faster when racing together than when racing alone, and that the fastest times were produced by cyclists racing in direct competition with each other, which Triplett attributed to the "power and lasting effect of the competitive stimulus" (4-5).

Since Triplett, many researchers have studied the effects of competition on motivation and performance, with mixed results. On one hand, a number of studies have similarly linked competition to enhanced motivation (e.g., Mulvey & Ribbons, 1999; Tauer & Harackiewicz, 2004) and task performance (e.g., Brown, Cron, & Slocum, 1998; Erev, Bornstein, & Galili, 1993; Scott & Cherrington, 1974; Tauer & Harackiewicz, 2004). On the other hand, some studies have shown that competition, as compared to cooperation, results in reduced motivation and productivity (e.g., Deci et al., 1981; Deutsch, 1949; Hammond & Goldman, 1961; Kohn, 1992; Stanne, Johnson, & Johnson, 1999). A number of apparent moderators help to explain these divergent findings. For example, individuals high in the personality trait need for achievement appear to be particularly motivated by competition (Epstein & Harackiewicz, 1992; Tauer & Harackiewicz, 1999). Also, cooperation appears to benefit performance under conditions of high task interdependence, whereas competition may be better under low interdependence (Miller & Hamblin, 1963).

In addition to these moderators, it is worth noting that researchers have largely relied on experimental paradigms in which participants are induced to compete with people they have never met before and may see little reason to compete against. Indeed, to the extent that people feel coerced to compete, self-determination theory predicts a negative effect on motivation (Reeve & Deci, 1996). However, in the real world actors often choose to compete (e.g., an individual entering a political race, a firm entering a new market). Thus, the nature of naturally occurring rivalry may differ substantially from competition within the lab. In fact, recent studies linking competition to improved performance are typically based on field rather than laboratory data (e.g., Tauer & Harckiewicz, 2004; Brown, Cron, & Slocum, 1998).

All things considered, we predict a positive link between rivalry and motivation: real-world contests against known rivals will push competitors to succeed. Given our conceptualization of rivalry as a relationship that magnifies the subjective valence of competitive outcomes, this prediction also follows from established theories of work motivation, such as expectancy theory (Van Eerde & Thierry, 1996; Vroom, 1964).

How will this motivational boost manifest itself in terms of task performance? Researchers have long recognized that increased motivation and arousal can both benefit and hamper individuals' performance, depending on task characteristics such as complexity and degree of novelty (e.g., Zajonc, 1965). We therefore propose that rivalry will benefit performance on tasks for which there is a clear, positive link between motivation and performance – that is, tasks for which success is based more upon effort than precision or accuracy. Indeed, in some sense, effort-based task performance can be seen as a behavioral measure of motivation.

Hypothesis 5. Feelings of rivalry towards one's competition will lead to increased performance on effort-based tasks.

At the group and organizational levels, the rivalry to performance link may be further complicated by factors such as the extent to which members are working independently vs. interdependently. In general, however, performance on effort-based tasks should be similarly enhanced by intergroup and inter-organizational rivalry. Assuming some level of group or organizational identification on the part of individual members, these rivalries should motivate members to help their groups and organizations succeed, due once again to the increased psychological stakes of competition. In turn, greater effort on the part of individual members will generally lead to greater collective performance.

EMPIRICAL SETTING: NCAA BASKETBALL

We conduct a first test of our theory within National Collegiate Athletic Association (NCAA) Men's Basketball, examining rivalries between teams. This is an excellent setting for an initial test of our hypotheses, particularly with regard to the relational nature of rivalry and its antecedents, for several reasons. First, it is a setting in which many rivalries are known to exist, allowing us to be confident that we are studying the true phenomenon as well as providing a large enough sample for statistical analysis. Second, there is a wealth of publicly available data on teams and their histories of competition. Third, the stakes are high – NCAA basketball serves as a launching pad into professional basketball for individual players, as well as a multibillion-dollar industry with university earnings linked to team success. Fourth, NCAA basketball provides objective performance data from a controlled setting – i.e., the rules and playing field are identical across games. Finally, NCAA basketball teams are characterized by high levels of homogeneity due to intense socialization processes (Adler & Adler, 1988), thus mitigating concerns about treating them as unitary actors (Hamilton & Sherman, 1996; Klein et al, 1994).

It is also worth mentioning that sports settings have long been recognized as conducive to organizational research, given that many of the core elements of organizations, such as hierarchy, teamwork, and the importance of strategic decision-making are present (Wolfe et al., 2005). Indeed, sports studies have provided insight on wide range of organizational topics including equity theory (Harder, 1992), sunk costs (Staw & Hoang, 1995), leadership (Day, Sin, & Chen, 2004; Pfeffer & Davis-Blake, 1986), organizational status (Washington & Zajac, 2005), and risk-taking (Bothner et al., 2007). In our case, NCAA basketball involves long-standing competitors with measurable interaction histories, relative characteristics, and organizational performance, thus satisfying the key prerequisites for studying rivalry.

We draw upon three datasets in our analyses. First, we polled student sportswriters and asked them to rate the levels of rivalry that their teams felt towards opposing teams. Second, we collected archival data on each team and all pairs of teams, in order to investigate the predictors of rivalry. Third, we collected game-level statistics for analyses of the consequences of rivalry.

EMPIRICAL ANALYSES, PART I: RIVALRY AS A RELATIONSHIP

In order to systematically study rivalry between NCAA basketball teams, it was necessary to measure the strength of rivalry between teams across a sample large enough to allow for statistical analyses. To accomplish this, we surveyed sportswriters at the student newspapers of all 73 of the universities in the NCAA Division I Men's Basketball major conferences (the ACC, n = 12 schools; the Big 12, n = 12 schools; the Big East, n = 16 schools; the Big Ten, n = 11 schools; the Pac-10, n = 10 schools; and the SEC n = 12 schools; total N = 73).

Participants

Survey responses were collected from 421 student sportswriters across the 73 universities in our sample. The surveys were typically distributed via a single contact individual at each school newspaper. Although this makes it difficult to calculate an exact response rate because we do not know the number of sportswriters at each school, the average of 5.77 respondents per school (SD = 2.91) is likely to represent a large proportion of student sportswriters. Two of the schools (DePaul and South Florida of the Big East), provided only a single response and so they were dropped from further analyses.

To ensure that our respondents were knowledgeable about basketball at their schools, we asked them whether or not they covered the men's basketball team ("Do you cover the men's basketball team at X university?"; yes/no) and to indicate their level of expertise on the subject ("How closely do you follow the men's basketball team at your school and men's basketball in

the conference as a whole?"; 1 = "not closely at all" and 7 = "very closely"). Thirty-nine respondents (9.3%) who indicated that they did not cover the basketball team and that their level of expertise was less than 5 out of 7 were dropped from the sample, leaving 380 respondents with an average level of expertise of 6.34 out of 7.

Ratings of Rivalry

Ratings of rivalry were collected on a conference-by-conference basis. Each respondent was asked to "Indicate the extent to which you see the other teams in your conference as rivals to your basketball team." Respondents were provided with a list of the other teams in the conference, along with an 11-point rating scale (0 = "not a rival"; 5 = "moderate rival"; 10 = "fierce rival"). Given that we aimed to analyze naturally-occurring variation in these ratings, we did not provide a formal definition of rivalry for fear of influencing responses. For instance, had we defined rivalry as a relationship between teams, we might have biased the data towards supporting hypotheses 1A and 1B. Further, the lack of a formal definition allowed us to access respondents' lay perceptions of rivalry.

To allow for the possibility of asymmetric rivalries, participants were told that "we are only interested in how strongly your team feels the rivalry, so your ratings should not be influenced by whether or not you think the other team sees your team as a rival." The surveys were collected in September and October of 2005 – during the weeks leading up to the start of the 2005-06 basketball season – so that our measures of rivalry were as up to date as possible without being influenced by any games played during the 2005-06 season.

To assess inter-rater reliability on these rivalry ratings, we computed intraclass correlation coefficients (ICCs), using a two-way mixed effect model (McGraw & Wong, 1996; Shrout & Fleiss, 1979), which yields a total reliability statistic equivalent to Cronbach's alpha. The mean

ICC across the 71 schools was equal to .92, and all but two teams (Boston College and Penn State) had ICCs of at least .79. This indicates a high level of consensus among respondents, and mitigates concerns that different respondents may have defined rivalry differently, given that they were not provided with any formal definition. We next removed respondents whose ratings did not indicate consensus with their classmates, defined as those whose average correlation with others at their school was at least .20 below the mean agreement among other respondents at that school. 18 such respondents (4.7%) were removed, yielding a final sample of 362 respondents (5.10 per school; at least two for every school), with ICCs ranging from .74 to .99 ($M = .93$).

Despite the high levels of consensus and self-reported expertise amongst our participant sportswriters, their ratings still provide an indirect measure of rivalry between college basketball teams because sportswriters are not actual team members. Therefore, we sought to validate the sportswriter perceptions by surveying actual players and coaches. We initiated contact with athletic directors and coaches at the 30 schools in our sample for which contact information was available via the Internet, and received responses from 11[3]. Across these 11 teams, 134 players ($M = 12.2$, $SD = 1.60$) and 23 coaches ($M = 2.1$, $SD = 1.97$) returned completed surveys. Reliability on ratings of rivalry was extremely high, with ICCs ranging from .92 to .99 across the 11 teams ($M = .95$, $SD = .02$), confirming the expected homogeneity in feelings of rivalry. Furthermore, the level of agreement between team members and sportswriters was very high ($r = .89$, $p < .01$). We can therefore be confident that student sportswriters are well attuned to the feelings of rivalry held by college basketball team members.

Using the sportswriters' ratings of rivalry, we created a matrix for each of the six conferences which contained the level of rivalry felt by each team towards every other team in the

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[3] : Arizona State, California, Duke, Michigan, Nebraska, Notre Dame, Oklahoma, Oregon, Oregon State, St. John's, and Washington State

conference, calculated as the average level of rivalry reported across respondents. Table 1

contains an example of one such rivalry matrix, for the Pac-10 conference. Across the 778

unique perceiver-target pairs in our sample, the average level of rivalry was 5.02 ($SD = 2.53$).

Insert Table 1 about here

Data Analyses

In order to test Hypothesis 1A and assess the extent to which rivalry varies at the relationship

level vs. the actor level, we employed the Social Relations Model (SRM; Kenny, 1994; Kenny &

La Voie, 1984). Our dataset consisted of six conferences ranging in size from ten to fourteen

members, and employed a *round-robin* design in which every member of each conference rated

every other member of the conference. Given these round-robin ratings, SRM is able to estimate

the extent to which the variance in ratings is due to perceiver effects, target effects, relationship

effects, and measurement error.[4] Perceiver effects capture the role of rater attributes and rating

tendencies. In this setting, significant perceiver effects would indicate that certain teams feel

higher vs. lower levels of rivalry towards opponent teams in general. Target effects capture the

role of ratee attributes on ratings. Significant target effects would indicate that certain teams

tend to elicit higher vs. lower levels of rivalry from opponents in general. Finally, relationship

effects capture the role of unique relationships between raters. An example of a relationship

effect would be if Team A feels a level of rivalry towards Team B that is above and beyond the

rivalry that Team A generally feels towards others, and is above and beyond the rivalry that

Team B tends to elicit from others. Relationship effects should capture the roles of proximity,

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[4] Methodologically, in order to separate relationship effects from measurement error, the Social Relations Model requires multiple sets of ratings and uses the equivalent of split-half reliability to distinguish the extent to which dyadic ratings are systematic. Thus, estimation of variance due to relationship effects requires repeated measurements for each rater-ratee pair, which we have in this dataset because there were at least two respondents from every university.

relative attributes and prior interactions – in our example, perhaps Team A and Team B are very similar to one another or have been particularly evenly-matched over the previous few seasons.

Results

We used the software program SOREMO (Kenny, 1995) to implement the SRM analyses of rivalry ratings. Of primary interest was the partitioning of variance across the components of perceiver, target, relationship, and error. Perceiver effects accounted for 4.6% ($p < .10$) of the variance in rivalry ratings, which, although marginally significant, indicates that there was relatively little variation in the average amount of rivalry felt by teams. Target effects accounted for 26.2% ($p < .001$) of the variance in rivalry ratings, indicating that certain teams elicited higher levels of rivalry from opponents, on average, than others. In support of Hypothesis 1A, a full 50.4% ($p < .001$) of the variance in rivalry ratings was attributed to relationship effects. This indicates that the strength of rivalry between teams is to a large extent driven by their unique relationships. As an example, Oregon State rated its rivalry towards Oregon at the maximum level of 10.0; however, Oregon State does not feel abnormally high levels of rivalry in general (M = 5.50), nor does Oregon elicit unusually high levels of rivalry from opponents (M = 5.25). This intense rivalry, therefore, is particular to Oregon State's relationship with Oregon. Finally, SOREMO indicated that 18.7% of the variance in rivalry ratings was due to error, resulting from the lack of perfect consensus among raters at each university.

Next, we tested whether the variances explained by perceiver and target effects were statistically different from the variance explained by relationship effects, as follows. First, we used SOREMO to run the variance partitioning analyses separately for each conference. Then, we used these data to run a series of repeated-measure ANOVA analyses in which each conference was treated as a single participant (N = 6), and the values for perceiver, target, and

relationship variance were treated as the repeated measures. Relationship variance was found to be significantly greater than perceiver variance ($F(1, 5) = 120.77$, $p < .001$), target variance ($F(1, 5) = 32.86$, $p < .01$), and even the sum of both perceiver and target variance ($F(1, 5) = 13.37$, $p < .05$). Additionally, these results were consistent across conferences – relationship variance was larger than the sum of perceiver and target variance in every case. Therefore, we have strong support for Hypothesis 1B. That is, rivalry in NCAA basketball is driven more by the relationships between teams than by their individual attributes.

We were also able to use the rivalry ratings dataset to assess the extent to which rivalry between NCAA basketball teams is symmetric, such that feelings of rivalry are reciprocated between pairs of teams. Across our sample of 389 dyads, the correlation between the strengths of rivalry among pairs of teams was substantial ($r = .64$, $p < .001$). Furthermore, SOREMO provides an estimate of this correlation that partials out actor and target effects. This was equal to .85, indicating that once average team-level tendencies towards feeling and eliciting rivalry were controlled for, rivalry between NCAA basketball teams was largely symmetric.

Discussion

Our analyses of the rivalry networks in college basketball indicate that, at least in this setting, rivalry is largely a dyadic, relational phenomenon. Teams reliably see certain opponents as stronger rivals than others, and the attributes of individual teams only explain a fraction of this variance. This speaks to the importance of relationships in determining competitive perceptions, and suggests that conceptions of competition that do not take into account the relational context may be incomplete. Further, the high level of consensus among our respondents (both sportswriters and team members alike) indicates that rivalry is very real in the minds of these

competitors. Finally, we also found evidence for lesser, yet statistically significant, target effects, indicating that some schools are generally perceived as greater rivals than others.

EMPIRICAL ANALYSES, PART II: ANTECEDENTS OF RIVALRY

We next turned our attention to the antecedents of rivalry, with a primary focus on predicting dyad-level variance in rivalry. Our independent measures included archival data on the 71 teams and 389 team-dyads in our sample, drawn from Internet websites maintained by the teams and athletic conferences. With regard to our dependent measure, we were primarily interested in dyad-level variance in rivalry, and so we had SOREMO output rivalry relationship effects for each of the dyads in our sample. Specifically, these represent the rivalry felt by team A towards team B, controlling for the extent to which team A feels rivalry on average, the extent to which team B elicits rivalry on average, and any conference-level differences. Rivalry relationship effects within dyads were clearly not independent (r = .85, as noted above), which meant that we could not analyze them at the team level (Kenny, Kashy, & Cook, 2006). Instead, we followed the advice of Kenny et al. (2006; pg. 69) and ran separate dyad-level regression analyses of both the average rivalry relationship effect within each dyad in addition to the difference in the rivalry relationship effects of the two teams. We end with a brief analysis of target variance in rivalry.

Average Rivalry – Independent Measures

Table 2 describes all of the independent measures we used to predict rivalry. The selection of these measures was directed by Hypotheses 2 – 4, which relate to the aggregate level of rivalry felt between pairs of competitors. Table 3 displays descriptive statistics and zero-order correlations between these measures and average rivalry relationship effects.

It is worth noting that many of our measures are based on difference scores between the two teams. A number of methodological concerns have been raised in regard to using difference scores as predictor variables, most notably, the fact that they may confound the effects of their component measures (Edwards, 2002; Edwards & Parry, 1993) – in this case, the individual attributes of each team. To address this concern, we include fixed effects for individual teams in our models, in order to control for any differences between teams on the components that make up our independent measures, such as basketball status, university characteristics, etc. Therefore, significant coefficients for difference scores in our models cannot be driven by the characteristics of one team or the other. In fact, only dyadic comparison measures make sense as predictor variables in these analyses – relationship effects cannot, by definition, be predicted by actor-level variables. It is also worth noting that the component measures of our difference score variables are uncorrelated, as they come from different sources (i.e., two different teams).

Insert Tables 2 and 3 about here

Average Rivalry – Results

Table 4 summarizes the results of ordinary least-squares regression analyses of the average rivalry relationship effect within each dyad.[5] To ensure meaningful values for the measure of absolute difference in conference winning percentage, we only included pairs of teams in which both teams had played at least five seasons within their current conference. This eliminated dyads involving the teams that joined the ACC and Big East conferences prior to the 2004-05 and 2005-06 seasons (Boston College, Cincinnati, Louisville, Marquette, Miami, and Virginia Tech; a total of 66 dyads). Further, to ensure meaningful values for the index of recent

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[5] The results of these analyses are unchanged when raw average rivalry is used as the dependent measure, due to the use of team-level fixed effects.

competitiveness, we only included pairs of teams that had played each other at least three times over the three seasons prior to 2005-06 (this eliminated an additional 5 dyads). All models were run on this subsample of 318 dyads, with the exception of those that included projected conference rank. As the Big Ten conference does not publish projected rankings, models including this variable were run on a subsample of the 263 dyads across the other five conferences. Lastly, all models include team-level dummy variables, which also serves to control for conference membership – conference dummies are dropped as redundant if included in addition to the team-level dummies.

Similarity. Hypothesis 2 proposes that similarity between competitors is positively related to rivalry. We tested this in terms of geographic proximity, similarity in basketball-related status[6], and similarity in broader university characteristics. Model 1 contains the two measures of geographic proximity. As predicted, geographic distance between teams is significantly negatively related to dyad-level variance rivalry ($t = -8.80$, $p < .001$; all tests are two-tailed). In other words, the closer two teams are located to each other, the stronger their rivalry tends to be. In addition, we find that teams located within the same state have significantly stronger rivalries with one another, above and beyond the effect of geographic distance ($t = 7.26$, $p < .001$).

We looked next at similarity in basketball-related status. Models 2 and 3 indicate that rivalry between teams is negatively predicted by the absolute difference in their all-time basketball status, measured in terms of all-time conference winning percentage ($t = -3.47$, $p < .001$) or in terms of conference titles won ($t = -2.48$, $p < .05$). In other words, the more similar two teams are in terms of historic basketball status, the stronger the rivalry between them. There exists a

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[6] We use the term status loosely and interchangeably with success or reputation, while recognizing that these concepts do not always go hand-in-hand. The actors in this setting do not exhibit deference towards, or influence over, one another, nor do they differ in network position (all teams in a conference play each other and, hence, are connected).

similar relationship between rivalry and recent status, as measured by conference winning percentage over the three seasons prior to 2005-06 (Model 4; $t = -2.11$, $p < .05$), as well as between rivalry and current status, as measured by projected conference rank in the upcoming season (Model 5; $t = -2.62$, $p = .01$).

Lastly, with respect to broader university characteristics, absolute difference in academic quality was significant (Model 6; $t = -3.20$, $p < .01$) and absolute difference in enrollment was marginally significant (Model 7; $t = -1.89$, $p < .10$); however, similarity in terms of whether universities were public or private was not related to average rivalry (Model 8; $t = .98$, *ns*). Overall, we have strong support for Hypothesis 2 – similarity in terms of location, basketball-related status, and academic quality are all positively related to rivalry between teams.

Repeated competition. We next investigated the role of repeated competition, as measured by the number of games played between teams. Due to the fact that closely located teams may play each other more frequently for logistical reasons, we controlled for geographic proximity in these models. Model 9 indicates that the more games teams have played against each other, the stronger the rivalry between them ($t = 3.03$, $p < .01$), thus supporting Hypothesis 3.[7]

Competitiveness. We next looked at the competitiveness of the match-up between teams.[8] As shown in Model 10, historic competitiveness positively predicted the average rivalry relationship effect ($t = 5.00$, $p < .001$). In other words, the closer the historic match-up between teams is to a 50-50 split, the stronger the rivalry between them. Similarly, recent competitiveness, whether measured via head-to-head winning percentages (Model 11; $t = 2.06$, $p < .05$), or via average

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[7] Model 6 contains conference mean-centered number of games played. Untransformed number of games played is also a highly significant predictor of rivalry.

[8] The competitiveness indices are perfectly correlated with the absolute difference in teams' head-to-head winning percentages.

margin of victory (Model 12; t = -2.16, $p < .05$), also predicted the strength of rivalry between teams. Therefore, we have support for Hypothesis 4.

Recent vs. historic similarity and competitiveness. As an additional set of analyses, we looked at the relative predictive power of historic vs. recent status similarity and competitiveness. This allowed us to assess the extent to which rivalry is sensitive to recent trends vs. being more of a stable, long-term relationship. In Models 13 and 14, absolute difference in all-time conference winning percentage remains a significant predictor of rivalry (t = -2.88, $p < .01$; t = -1.80, $p < .10$); however, neither absolute difference in recent conference winning percentage (t = -.92, *ns*) nor absolute difference in projected conference rank (t = -1.44, *ns*) is significant. Similarly, in Model 15, all-time competitiveness of the match-up significantly predicts rivalry (t = 4.79, $p < .001$); however, recent competitiveness fails to achieves significance (t = 1.58, *ns*). Thus, rivalry seems to be driven by long-term status similarity and competitiveness, and is somewhat less responsive to recent changes in these factors.

Status similarity vs. competitiveness. We also sought to parse out the relative contributions of status similarity and competitiveness in forming rivalry. As discussed, these two constructs may often be highly correlated. Indeed, in this dataset, historic status similarity (in terms of all-time conference winning percentage) and historic competitiveness are correlated at $r = .71$, $p < .001$. We entered both of these predictors in Model 16, and found that absolute difference in historic status was not significant (t = -.90, *ns*), whereas historic competitiveness remained highly significant (t = 3.60, $p < .001$). Although these results should be interpreted with caution due to the high level of intercorrelation, it appears that the extent to which competitors have been evenly-matched across their prior contests may trump historic similarity in status or ability-level.

Full models. Lastly, we present two full models. Model 17 includes all predictor variables except for difference in projected conference rank, and Model 18 includes all predictor variables including difference in projected conference rank.

Insert Table 4 about here

Difference in Rivalry

Although the high level of reciprocity (r = .85) severely restricts variation in the difference between teams' rivalry relationship effects within dyads, we attempted to see if we could predict it nonetheless. Given that we did not have any hypotheses relating to asymmetry in rivalry, these analyses were exploratory. We created a set of difference measures that were identical to those used above to assess teams' levels of similarity, except that they were untransformed rather than absolute. This allowed us to test whether teams' relative characteristics predicted asymmetry in rivalry in addition to the aggregate strength of rivalry. None of these measures approached significance, however.

Target Effects

Finally, we decided to conduct exploratory analyses of the target effects of rivalry – i.e., which types of teams elicit stronger rivalry from opponents. SOREMO calculated a *target score* for each team in our sample, which is essentially the average level of rivalry felt towards that team, controlling for any conference differences. Visual inspection of the list of teams eliciting the highest levels of rivalry (e.g., Duke, Kentucky, Arizona, and Kansas) suggests the presence of a 'top dog' phenomenon, such that the historically high status teams elicit the highest levels of rivalry. Indeed, analyses of these target scores supports this idea. Table 5 displays the correlations between rivalry target scores and all of the team-level characteristics we collected.

Correlations with all four measures of basketball status are highly significant, indicating that high status teams elicit greater rivalry from opponents. Further, the academic quality of teams' universities was positively correlated with rivalry target scores, and enrollment was marginally significant.

Insert Table 5 about here

We then ran a full model regression analysis that included all of these measures. All-time conference winning percentage ($t = 2.10$, $p < .05$), recent conference winning percentage ($t = 4.04$, $p < .001$), projected conference rank for the upcoming season ($t = -1.83$, $p < .10$) and academic quality ($t = 2.42$, $p < .05$) were all related to rivalry target scores, and the model captured the majority of the variance (R-squared = .77). Therefore, it appears that team-level variance in rivalry is largely driven by team status, such that higher status teams attract greater rivalry. Furthermore, this suggests that asymmetric rivalry in NCAA basketball is largely the result of asymmetry in team status – lower-performing teams (such as Oregon State) tend to feel stronger rivalry towards higher-performing teams (such as Arizona) than vice versa.

Discussion

The results from the above analyses tell us a great deal about the formation of rivalry and about competition more generally. First, we found strong support for the idea that similarity fosters rivalry, in terms of geographic location, basketball-related status, and broader university status. Second, we found that prior competitive interactions play a substantial role in rivalry formation. Both the number of prior contests and the competitiveness of those contests predicted the strength of rivalry between teams. Furthermore, historic competitiveness remained a significant predictor of rivalry even when historic similarity in status was controlled for. That is,

the closer the historic match-up between teams was to a 50-50 split, the stronger the rivalry between them, even when controlling for similarity in the teams' all-time winning percentages. This indicates that prior contests between teams predicted their rivalry relationships above and beyond the effects of those contests on their relative standings within the conference. Thus, it seems that prior competitive encounters can leave a mark that endures long after they have been decided, in support of the notion that competition is path-dependent, and contrary to what rational models would predict.

Third, we found that historic similarity and competitiveness appeared to trump recent similarity and competitiveness in predicting rivalry. This is also consistent with the idea that competitive perceptions are enduring and may not necessarily reflect current conditions, and that contests are embedded within broader relational context. More broadly, the fact that we were able to reliably predict strength of rivalry via measures of teams' relationships bolsters the argument that competition is relational.

Finally, at the team level, higher status was positively related to opponents' feelings of rivalry. Although the precise mechanisms behind this finding are unclear, it may be the case that actors try to present themselves as rivals to high-status competitors in order to gain status by association, particularly if rivalry is generally perceived as symmetric. Alternatively, perhaps competing against the best is energizing due to the reputational boost that can be gained through victory, or because actors envy their high-status competitors and want to bring them down. Future work should delve further into this phenomenon.

EMPIRICAL ANALYSES, PART III: CONSEQUENCES OF RIVALRY

Measures

In order to investigate the consequences of rivalry between NCAA basketball teams, we collected game statistics from all 563 regular season conference games played between teams in our sample during the 2005-06 season, using online box scores provided by Yahoo! (http://www.yahoo.com). Although this field setting does not allow for direct measurement of motivation, it does provide a range of performance metrics. Hypothesis 5 posits that greater rivalry increases performance on effort-based tasks – for which there is a more clear association between motivation and success. In basketball, it is not clear that greater effort, above a baseline level, results in more accurate offensive performance in terms of shooting and passing; however, effort is generally believed to be associated with defensive performance. Indeed, coaches often note that although players can't control how well they shoot in a given game, they can make sure to give their all on defense (e.g., http://www.howtodothings.com/sports-recreation/how-to-play-basketball-man-to-man-defense). Given the relative importance of accuracy and effort required for success on offense and defense, respectively, we expected that rivalry between teams would be associated with increased defensive performance. The statistics we examined, along with a pair of control variables, are described in Table 6 and descriptive statistics and correlations are displayed in Table 7.

Insert Tables 6 and 7 about here

Results

Table 8 contains results from regressions on game statistics. Given that we did not have data on rivalry among individual members, we looked at team performance – that is, statistics were aggregated across all team members. Further, due to the high reciprocity in rivalry ratings, in addition to the interdependent nature of team performance in basketball (i.e., the offensive

performance of one team is confounded with the defensive performance of the other), we used

the average level of rivalry in each game as the predictor variable, and aggregate game-level

statistics as dependent measures. Team-level fixed effects for home and away teams were

included in all analyses in order to control for teams' ability levels.

In Model 1, rivalry is positively related to fan attendance ($t = 3.75$, $p < .001$), suggesting that

it has a positive effect on the interest level or motivation of those who follow the competition. In

Model 2, rivalry is negatively related to points scored per possession[9] ($t = $ -2.14, $p < .05$), which

reflects increased defensive efficiency (Pomeroy, 2005). Model 3 examined another measure of

efficiency, field goal percentage, and revealed a similar, marginally negative, association with

rivalry ($t = $ -1.81, $p = .07$). Thus, in games between fierce rivals, defensive efficiency tends to be

higher than in games between mild or non-rivals. These results, however, can also be viewed as

reflecting decreased offensive efficiency – offensive and defensive efficiency are perfectly

confounded at the game level. Therefore, we analyzed the frequency of steals and blocked shots,

which provide more distinct indicators of defensive activity. As shown in Model 4, the

coefficient for steals, although in the expected direction, did not achieve significance ($t = 1.05$,

ns). However, we did find a significant and positive association between rivalry and the number

of blocked shots ($t = 1.99$, $p < .05$; Model 5).[10]

Insert Table 8 about here

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[9]   Number of possessions is not a statistic typically included in box scores; however, it can be accurately estimated
from statistics that are included, using the following formula: possessions = field goals attempted – offensive
rebounds + turnovers + .475 * free throws attempted (Pomeroy, 2005).
[10] Game-level analyses of rebounding – or the recovery of failed attempts at scoring – were not included because
they are redundant with the analyses presented on field goal percentage (the number of rebounds in a game is
determined by the number of missed shots).

To further investigate the significant findings for points per possession and blocked shots, we calculated the effect size of each. Based upon the standard deviation of average rivalry and its coefficient in the points per possession model, a one standard deviation increase in the average rivalry between teams in a game would result in .013 fewer points scored per possession, or a 1.20% decrease, on average. The same analysis for blocked shots indicates that a one standard deviation increase in average rivalry would predict .33 more blocked shots, or a 4.47% increase.

Discussion

Overall, we found some support for Hypothesis 5, which states that rivalry is associated with increased success on effort-based tasks – in this case defense in basketball. Specifically, rivalry predicted higher defensive efficiency and greater numbers of blocked shots. The finding for blocked shots is in line with the idea that rivalry leads to increased motivation and effort. However, as mentioned, our findings for defensive efficiency conflate offensive and defensive performance and therefore deserve further scrutiny. An alternative explanation of these results is that rivalry led to decreased offensive performance instead of increased defensive prowess. Indeed, the Yerkes-Dodson Theory (Yerkes & Dodson, 1908) posits that high levels of arousal may be detrimental to performance.[11] Thus, perhaps teams involved in high rivalry games were so aroused that their performance suffered – or, in proverbial terms, they choked under pressure.

To sort out these two alternative interpretations, we analyzed free throw shooting accuracy as a test of the effort vs. choking explanations. Because free throws cannot be defended, the defensive performance of teams should be unrelated to the free throw shooting success of their opponents. From the rivalry-effort perspective, therefore, we would not expect to find a relationship between rivalry and free throw shooting accuracy. In contrast, from the choking

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[11] As an exploratory analysis, we tested for curvilinear effects of rivalry on performance, but found no significant results.

perspective, we would expect the negative effects of extreme arousal on performance to extend to free throw shooting. Indeed, we might expect excess arousal to be at its most harmful level when a player is standing alone at the free throw line with time to think about the upcoming shot. As can be seen by the results in Table 5 (Model 6), there was no significant relationship between rivalry and free throw shooting accuracy ($t = -0.59$, *ns*). Although one must always exercise caution when trying to interpret null findings, this reduces the plausibility of the choking explanation for the effects of rivalry on scoring and shooting efficiency.

The existence of a positive association between rivalry and effort has significant implications for both theory and practice. Motivation has been one the most studied topics in organizational psychology, spawning a number of theories and research programs, including the Job Characteristics Model (Hackman & Oldham, 1976), Expectancy Theory (Vroom, 1964), and Goal-setting Theory (Locke, 1968). Greater consideration of rivalries within and between organizations may add to our understanding of this fundamental topic, and – to the extent that it can be harnessed as a motivational force – rivalry may have important managerial implications as well. Lastly, it is worth noting that the positive association between rivalry and fan attendance suggests that rivalry can spread to those indirectly involved in competitions.

GENERAL DISCUSSION

Actors rarely compete in isolation; rather, they compete against other actors with whom they often have existing relationships. The present paper attempted to systematically study these relationships, specifically, the rivalries that exist between competitors. After presenting a theoretical exploration of the nature of rivalry and its antecedents and consequences, we tested our hypotheses within the empirical setting of NCAA men's basketball. Our results suggest that rivalry is largely a relational phenomenon and that it has implications for competitive behavior.

Using a statistical technique designed to model interpersonal perception (Kenny, 1994), we found that perceptions of rivalry between NCAA basketball teams are largely unexplained by team-level attributes, and instead vary at the dyad level. Rivalry was highest between teams that were similar, had a history of being evenly-matched, and had repeatedly faced off against each other. Further, rivalry was associated with increased performance on an effort-based task, i.e., defensive performance.

We believe that this paper makes several important theoretical contributions. Most notably is the idea that competition is inherently relational – to fully understand the behavior of competing individuals, groups, and organizations, one must take into account competitors' dyadic relationships. This presents a significant departure from much of the previous research on competition, which often portrays it as taking place amongst interchangeable foes and absent any relational context. Second, we provide the first detailed examination of rivalry as a psychological phenomenon, and third, we conceive of competition as path-dependent, again extending prior models.

There are also many practical implications to our theoretical framework and empirical findings. Within firms, employees who are similar to one another (in terms of demographics, tenure, expertise, position, etc.), have repeatedly competed against each other (for promotions, performance rankings, etc.), and have been evenly-matched during prior contests (e.g., sales drives) will tend see each other as rivals, and may be more motivated when competing against one another. Therefore, managers wishing to increase employee motivation might consider designing incentive systems that foster inter-employee rivalry – such as the competitive tournaments used by sales firms. Managers could also try to galvanize employees by playing up rivalries with competing firms or between workgroups.

Similarly, firms that resemble one another (in terms of geographic location, resource profile, organizational form, etc.), have a history of competing (e.g., "attacking" one another via product launches, price cuts, etc.), and have been historically evenly-matched on key performance metrics (return-on-assets, stock price, etc.) will tend to be rivals. In turn, rivalry-induced motivation among executives may have substantial implications for firm performance. Previous studies have linked managerial complacency to reduced competitive action (Ferrier, 2001), reduced strategic complexity (Miller & Chen, 1996) and greater competitive inertia (Miller & Chen, 1994), all of which generally lead to reduced firm performance (Ferrier, 2001; Ferrier, Smith, & Grimm, 1999). Managers who are motivated to outperform rival firms, however, may not fall prey to the pitfalls of complacency, and may instead strive for increased performance even in times of prosperity. For instance, the rivalry between Intel and AMD has continually pushed executives at the rival chipmakers to pursue technological innovations and seek out new markets (http://www.eetindia.co.in/ART_8800422325_1800001_NT_627eeb79.HTM).

Despite its potential motivational benefits, however, there may also be downsides to rivalry. The idea that rivalry entails psychological payoffs and involvement separate from the objective characteristics of competition opens up the possibility for irrational behavior. Examples of this could include sacrificing one's own gains in order to limit the gains of a rival, an unwillingness to cooperate with rivals even when it is instrumentally beneficial, and "win at all costs" attitudes leading to unethical behavior (such as the "Dirty Tricks" campaign launched by British Airways) or excessive risk-taking. Although the current empirical setting provided little opportunity for exploration of this topic, the irrational side of rivalry presents exciting possibilities for future research, and suggests that managers may want to exercise caution when attempting to foster feelings of rivalry within employees.

Limitations

The empirical analyses presented here were designed as a first test of our theoretical framework, and are thus qualified by a number of limitations that should be addressed in future work. First, although we believe that rivalry is not simply a reflection of increased objective stakes for the parties involved, this is a potential alternative explanation for some of our findings. For example, geographic proximity may predict rivalry simply because greater instrumental outcomes – such as local fan support, prized recruits, etc. – are at stake when nearby teams compete. Thus, future research should attempt to more fully dissect the relational vs. instrumental causes of rivalry, particularly with respect to similarity between competitors. That said, objective stakes cannot explain all of our findings – for example, the result that the historic competitiveness of the match-up predicts rivalry, even when controlling for proximity in status.

A second limitation relates to the fact that we did not provide our respondents with any definition of rivalry; rather, we relied on their own lay definitions. Although we felt this was necessary to avoid influencing responses, and found very high levels of agreement among respondents, this does leave open the question of what exactly rivalry means to competitors. Therefore, future research should seek to more fully validate the definition of rivalry. Third, given the archival design, we were unable to collect any measures of the mechanisms underlying the relationship between rivalry and performance. In the absence of direct measures of arousal and motivation, we instead relied on behavioral indicators in the form of game statistics that are most likely to reflect these processes. Future research should more carefully address the relationships between rivalry, motivation, and arousal.

Fourth, although the setting of NCAA basketball was ideal for studying the relational nature of rivalry and its antecedents, it was not as well suited for an exploration of rivalry's

consequences, as evidenced by the relatively small magnitude of our results for defensive performance. The behavior of basketball players, and athletes more generally, is constrained within a narrow set of rules, thus restricting the potential influence of rivalry on behavior, and limiting the types of behaviors we could examine. Further, there may be a ceiling effect for motivation in college basketball, given both the high stakes of the games, and the fact players at the highest level of collegiate athletics are apt to be highly competitive and motivated by nature, regardless of their opponent. Given these factors, we believe that our results, while small, are still noteworthy. Additionally, the interdependent nature of performance in basketball, combined with the high level of reciprocity in rivalry, limited our ability to look at relative outcomes between teams – e.g., whether rivalry predicts winning or losing. Future work, therefore, should examine settings that offer greater behavioral freedom to competitors, have lower baseline levels of motivation, and have greater asymmetry in rivalry. A fifth limitation relates to the cross-sectional nature of our data. With these data, we cannot authoritatively determine the causal direction of findings concerning the antecedents of rivalry. For example, although we found that repeated competition predicts greater rivalry, conferences may schedule more games between rival teams due to greater fan interest.

Lastly, it remains to be seen how our findings generalize to other empirical settings. Although anecdotal evidence suggests that rivalry is common across competitive settings, we recognize that sports organizations may differ from non-sports organizations in important ways. For example, organizational loyalty has been shown to be unusually intense among athletic teams (Adler & Adler, 1988), which might make rivalry more common and strengthen its effects. Further, rivalry might be different within the context of continual competition as compared to episodic competition. That being said, given the greater behavioral leeway offered to actors in

non-sports settings, in addition to the potentially greater significance of their decisions, rivalry may actually have greater implications outside of sports. Future work, therefore, should study rivalry within other contexts. In general, rivalry is apt to be more relevant to settings in which competitors are aware of one another and have longstanding relationships (such as oligopolies), as opposed to settings in which large numbers of anonymous actors compete.

Future Directions

There are a number of worthwhile avenues for future research on rivalry beyond those already discussed. First, in tandem with exploring the potential downsides to rivalry, future work should seek to identify the conditions under which rivalry is more beneficial vs. harmful. Rivalry may be beneficial when tasks are largely effort-based, when cooperation with rivals is unnecessary, and when there is little room for unethical or risky behavior. By contrast, rivalry may be more dangerous when tasks require greater precision, when it exists between members of the same team or organization, and when the rules governing behavior are unclear or unenforced, allowing competitors to act upon their impulses.

Second, future work should investigate how rivalry can spread across levels of analysis. For instance, an inter-individual rivalry between two members of separate groups or organizations might lead to broader rivalry between these two collectives, particularly if the individuals are high in influence and status within their groups. This seems to have been the case with Magic Johnson and Larry Bird – their respective professional teams, the Lakers and Celtics, were also fierce rivals. Similarly, intergroup or inter-organizational rivalry might foster inter-individual rivalries, particularly between members in comparable positions – e.g., CFOs at rival firms, or analysts at rival investment banks. In other cases, rivalry may fail to spread across levels – rivalries between less influential members may not be adopted by their respective groups, and

less committed or strongly identified organizational members may fail to internalize macro-level rivalries.

Third, future research should also consider level-specific moderators of rivalry. For instance, more homogeneous groups may be more likely to form rivalries and be influenced by them (Hamilton & Sherman, 1996; Klein et al., 1994), due to conformity and polarization processes (Moscovici & Zavalloni, 1969). At the firm level, the extent to which executives have discretion over organizational decisions and strategy – as determined by factors such as government regulations, firm size, and available resources (Crossland & Hambrick, 2007; Hambrick & Finkelstein, 1987) – may moderate the effects of rivalry, as executives with low levels of discretion will be less able to act upon their competitive impulses. One could also examine how rivalry at one level of analysis affects outcomes at other levels. For instance, rivalry between two group members might affect group-level outcomes such conflict and cohesion. Similarly, intergroup or inter-organizational rivalry might predict individual-level outcomes, such as job satisfaction and commitment.

Fourth, the subject of asymmetric rivalry presents an interesting avenue for research. Although rivalry was highly symmetric within NCAA basketball, this may not always be the case, and it would be interesting to explore how the effects of rivalry differ depending upon whether or not it is reciprocated by the opponent. Fifth, rivals may vary in the extent to which they feel animosity vs. respect towards one another. For example, Larry Bird and Magic Johnson appeared to respect one another, whereas executives at Virgin Atlantic and British Airways likely did not. The extent to which these brands of rivalry have different antecedents and consequences presents another avenue for research.

Sixth, although we found strong support for similarity as an antecedent of rivalry, it is possible that key differences in identity might also sometimes foster rivalry. That is, competitors with distinct or conflicting identities (e.g., companies with different business models or corporate cultures) might feel a need to validate the superiority of their identities. Indeed, some recent research suggests that people may define themselves by the groups and organizations that they are *not* a part of, in addition to those to which they belong (Elsbach & Bhattacharya, 2001). Finally, it might be interesting to examine certain questions related to the sociology of rivalry, such as how feelings of rivalry are transmitted among or shared between organizational members, and how rivalry can be felt and expressed by observers of competition in addition to the competitors themselves.

Conclusion

Although anecdotal examples of the power of rivalry abound in both the sports and business worlds, little research has been devoted to studying this psychological phenomenon. In this paper, we provided an initial investigation of rivalry, its origins, and its consequences. In doing so, we presented a conception of competition as relational and path-dependent. We hope this will serve as a starting point for additional research – rivalry is a topic rich in research possibilities and implications within and among organizations.

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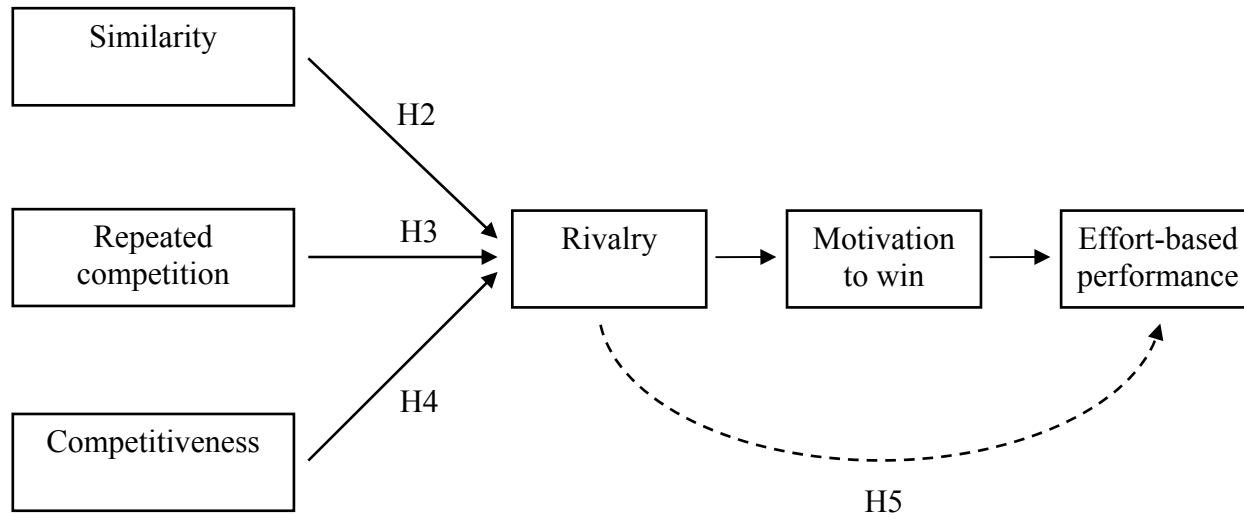
FIGURE 1
Theoretical Model

TABLE 1
Pac-10 Rivalry Matrix[a]

Targets

	Arizona	Arizona State	California	Oregon	Oregon State	Stanford	UCLA	USC	Washington	Washington State
Arizona		8.75	5.50	4.75	1.75	8.75	7.25	3.75	7.75	2.00
Arizona State	10.00		2.00	1.67	1.33	5.00	5.00	3.00	2.67	1.33
California	5.50	2.25		5.25	3.00	9.75	9.00	6.75	4.50	2.50
Oregon	7.00	4.00	4.50		10.00	7.00	6.25	3.75	10.00	5.50
Oregon State	8.00	1.50	4.00	10.00		4.00	4.50	1.50	9.50	6.50
Stanford	8.75	3.00	7.25	3.50	2.25		6.50	5.25	5.75	3.50
UCLA	8.00	1.75	6.75	4.75	1.25	8.25		9.25	5.75	1.25
USC	6.00	3.00	5.67	4.33	2.17	6.33	9.83		4.50	2.00
Washington	8.00	2.33	2.33	9.00	4.00	6.33	6.67	1.33		8.67
Washington State	6.00	5.00	5.33	4.00	4.67	6.33	6.67	6.67	9.67	

(Perceivers — row label, vertical)

[a] Rivalry ratings represent the average across all qualified respondents at a given university, on a scale from 0 to 10.

TABLE 2
Antecedents of Rivalry: Independent Measures

Variables	Description
Similarity (geographic)	
Geographic distance	Driving distance, in hundreds of miles, between the teams' stadiums as reported by Google Maps (http://maps.google.com)
Same state	Dummy variable set to 1 if teams are located in the same state (0 otherwise)
Similarity (basketball status)	
Abs. difference in all-time conference winning %	Absolute difference between teams' all-time winning percentages in intra-conference play
Abs. difference in all-time conference titles won	Absolute difference between teams' number of regular season conference titles (i.e., finishing in first place in the conference)
Absolute difference in recent conference winning %	Absolute difference between teams' winning percentages in intra-conference play over the 2002-03, 2003-04, and 2004-05 seasons
Absolute difference in preseason projected conference rank	Projected conference rank for the 2005-06 season, as voted on by coaches and members of the news media at each conference's media day
Similarity (university characteristics)	
Abs. difference in academic quality	Absolute difference between universities' academic quality, as measured by an aggregate of three metrics used in the U.S. News and World Report 2005 unergraduate university rankings: admission acceptance rate (reverse-coded), percentage of freshmen in the top 10 percent of high school class, and a "peer rating" on a scale of 1 to 5 based upon ratings made by administrators at other universities ($\alpha = .87$; measures were standardized and then averaged) (http://colleges.usnews/rankingsandreviews/com/college)
Abs. difference in enrollment	Absolute difference between universities' total enrollments, in thousands of students
Both private or public conference winning %	Dummy variable set to 1 if universities are both public or both private institutions in intra-conference play over the 2002-03, 2003-04, and 2004-05 seasons
Repeated interaction	
Number of games played	Total number of games teams have played against each other prior to the 2005-06 season, mean-centered by conference
Competitiveness	
All-time competitiveness index	Head-to-head winning percentage of the inferior team (i.e., the team that won fewer games) across the history of games played between the teams (ranges from 0, indicating a completely lopsided match-up, to 50, indicating a perfectly even match-up)
Recent competitiveness index	The head-to-head winning percentage of the inferior team during the 2002-03, 2003-04, and 2004-05 seasons
Recent margin of victory	The average margin of victory in games played between the teams during the 2002-03, 2003-04, and 2004-05 seasons

TABLE 3
Antecedents of Rivalry: Descriptive Statistics and Correlations[a]

Variables	Mean	s.d.	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Average rivalry relationship effect	0.10	1.63													
2. Distance between stadiums (in hundreds of miles)	4.64	2.96	-.48***												
3. Teams within the same state	0.10	0.30	.53***	-.33***											
4. Absolute difference in conference winning % (all-time)	13.96	11.15	-.13*	.02	.01										
5. Absolute difference in conference titles won (all-time)	6.67	8.04	-.03	-.01	-.04	.35***									
6. Absolute difference in conference winning % (prior three seasons)	21.44	14.72	-.13*	-.01	.04	.48***	.29***								
7. Absolute difference in projected conference rank	4.42	2.84	-.16**	-.11†	-.02	.38***	.18***	.43***							
8. Absolute difference in academic quality	0.94	0.79	-.15**	.11†	-.02	-.10†	.04	-.04	-.04						
9. Absolute difference in enrollment (thousands of students)	10.65	8.20	-.09	.13*	.03	-.01	-.05	-.01	.03	.26***					
10. Both public or private (dummy variable)	0.72	0.45	-.01	.14*	-.14*	.00	.02	-.09	-.09	-.27***	-.31***				
11. Number of games played (mean-centered by conference)	7.70	63.93	.50***	-.64***	.43***	-.07	-.00	-.09†	.03	-.11*	-.14**	-.01			
12. Competitiveness index (all-time)	37.89	9.45	.19***	-.14*	.09	-.71***	-.45***	-.36***	-.25***	.02	-.03	-.00	.23***		
13. Competitiveness index (prior three seasons)	25.90	16.31	.13*	.04	-.02	-.32***	-.20***	-.60***	-.20***	.04	.03	.06	.08	.22***	
14. Average margin of victory (prior three seasons)	11.35	4.00	-.12*	.05	-.03	.24***	.03	.36***	.21***	-.07	-.02	-.01	-.08	-.24***	-.21***

[a] n = 318 team dyads, except for #7, for which n = 266 team dyads

† p ≤ .10, all tests two-tailed

* p ≤ .05

** p ≤ .01

*** p ≤ .001

TABLE 4
Multivariate Regression Models of Average Rivalry
[a]

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
Distance between stadiums	-0.38***								-0.26***
(in hundreds of miles)	(0.04)								(0.05)
Teams within the same state	2.42***								1.95**
	(0.33)								(0.35)
Absolute difference in		-0.05***							
conference winning % (all-time)		(0.01)							
Absolute difference in			-0.08*						
conference titles won			(0.03)						
Absolute difference in				-0.02*					
conference winning % (prior 3 seasons)				(0.01)					
Absolute difference in					-0.12**				
projected conference rank					(0.05)				
Absolute difference in						-0.57**			
academic status						(0.18)			
Absolute difference in enrollment							-0.04†		
(in thousands of students)							(0.02)		
Both public or private								0.42	
(dummy variable)								(0.43)	
Number of games played									0.01**
(mean-centered by conference)									(0.00)
Competitiveness index									
(all-time)									
Competitiveness index									
(prior three seasons)									
Average margin of victory									
(prior three seasons)									
R^2	0.68	0.40	0.38	0.37	0.42	0.39	0.37	0.36	0.69
Adj. R^2	0.50	0.06	0.04	0.03	0.09	0.06	0.03	0.02	0.52
R^2 increase from fixed effects model	0.32	0.04	0.02	0.01	0.02	0.03	0.01	0.00	0.33
Adj. R^2 increase from fixed effects model	0.48	0.05	0.02	0.02	0.03	0.04	0.01	0.00	0.50

[a] n = 318 team dyads, except for models 5, 14, and 18, for which n = 263

[b] All models include fixed effects for teams

† $p \leq .10$, all tests two-tailed

* $p \leq .05$

** $p \leq .01$

*** $p \leq .001$

Variables	Model 10	Model 11	Model 12	Model 13	Model 14	Model 15	Model 16	Model 17	Model 18
Distance between stadiums								-0.27***	-0.19**
(in hundreds of miles)								(0.06)	(0.06)
Teams within the same state								1.65***	1.05*
								(0.38)	(0.42)
Absolute difference in				-0.04**	-0.03†		-0.01	-0.00	0.00
conference winning % (all-time)				(0.01)	(0.02)		(0.02)	(0.01)	(0.01)
Absolute difference in								-0.01	0.01
conference titles won								(0.02)	(0.03)
Absolute difference in				-0.01				-0.01	0.01
conference winning % (prior 3 seasons)				(0.01)				(0.01)	(0.01)
Absolute difference in					-0.08				-0.11**
projected conference rank					(0.05)				(0.04)
Absolute difference in								-0.11	-0.15
academic status								(0.13)	(0.13)
Absolute difference in enrollment								-0.02	-0.02†
(in thousands of students)								(0.01)	(0.01)
Both public or private								0.05	-0.05
(dummy variable)								(0.30)	(0.29)
Number of games played								0.01*	0.01***
(mean-centered by conference)								(0.00)	(0.00)
Competitiveness index	0.07***					0.07***	0.06***	0.02	0.01
(all-time)	(0.01)					(0.01)	(0.02)	(0.01)	(0.01)
Competitiveness index		0.01*				0.01		0.01†	0.02*
(prior three seasons)		(0.01)				(0.01)		(0.01)	(0.01)
Average margin of victory			-0.06*					-0.03	-0.03
(prior three seasons)			(0.03)					(0.02)	(0.02)
R^2	0.43	0.37	0.37	0.40	0.43	0.44	0.43	0.73	0.76
Adj. R^2	0.12	0.03	0.03	0.06	0.10	0.12	0.12	0.56	0.60
R^2 increase from fixed effects model	0.07	0.01	0.01	0.04	0.07	0.08	0.07	0.37	0.37
Adj. R^2 increase from fixed effects model	0.10	0.02	0.02	0.05	0.09	0.11	0.10	0.54	0.54

[a] $n = 318$ team dyads, except for models 5, 14, and 18, for which $n = 263$

[b] All models include fixed effects for teams

† p ≤ .10, all tests two-tailed

* p ≤ .05

** p ≤ .01

*** p ≤ .001

TABLE 5
Correlations with Target Scores on Rivalry [a]

Variables	Correlation
Conference winning % (all-time)	.73***
Conference titles won (all-time)	.54***
Conference winning % (prior 3 seasons)	.82***
Projected conference rank	-.68***
Academic quality	.33**
Enrollment	.20†
Private university	-.10

[a] n = 71 teams

† p ≤ .10, all tests two-tailed

* p ≤ .05

** p ≤ .01

*** p ≤ .001

TABLE 6
Consequences of Rivalry: Control Variables and Dependent Measures

Variables	Description
Control variables	
Attendance	The number of fans at the game. This variable was included in order to control for the influence of the crowd upon player motivation and arousal (Zajonc, 1965), as rivalry is likely to influence fan interest in addition to player involvement, and we were interested in the direct effects of players' feelings of rivalry on game performance, separate from any crowd effects. We also analyzed attendance as a dependent variable, to assess the effect of rivalry on fan interest.
Absolute betting line	An expert prediction about the final scoring margin. This captures how close the game is expected to be, which could influence player motivation and arousal independent of rivalry.
Defensive performance	
Points per possession	An indicator of defensive performance that is equal to the number of points scored divided by the number of possessions or scoring opportunities.
Field goal percentage	Shooting accuracy during normal play, calculated as the number of shots made divided by the number of shots attempted.
Steals	A defensive statistic in which a player intercepts a pass or otherwise takes possession of the ball from an opposing player.
Blocked shots	A defensive statistic in which a player prevents an opposing player's shot from reaching the basket.
Miscellaneous	
Free throw percentage	Shooting accuracy on free throws. Free throws are awarded after certain types of violations by the opponent. The game clock is paused and the player awarded the free throw(s) is allowed to shoot, undefended, from a designated spot.

TABLE 7
Consequences of Rivalry: Descriptive Statistics and Correlations[a]

Variables	Mean	s.d.	1	2	3	4	5	6	7
1. Average rivalry	5.31	2.33							
2. Attendance	11,775	483	.23***						
3. Absolute betting line	6.58	4.61	-.04	.14***					
4. Points per possession	1.05	0.11	-.06	.08†	-.02				
5. Field goal percentage	43.97	4.85	-.01	.03	-.01	.75***			
6. Steals	13.39	4.70	.08†	-.00	.02	-.29***	.05		
7. Blocks	7.41	3.59	.06	.02	.15***	-.17***	-.32***	.08†	
8. Free throw percentage	70.18	8.40	.04	-.02	.02	.23***	.04	-.03	.04

[a] n = 563 games

† p ≤ .10, all tests two-tailed

* p ≤ .05

** p ≤ .01

*** p ≤ .001

TABLE 8
Multivariate Regression Models of Game Statistics [a, b]

Variables	Model 1 Attendance	Model 2 Points per possession	Model 3 Field goal percentage	Model 4 Steals	Model 5 Blocked Shots	Model 6 Free throw percentage
Attendance (in thousands)		0.00	0.08	-0.11	-0.16*	0.01
		(0.00)	(0.13)	(0.11)	(0.08)	(0.22)
Absolute value of the betting line	-4.21	-0.00	-0.01	-0.03	0.12*	-0.15
	(31.43)	(0.00)	(0.08)	(0.07)	(0.05)	(0.14)
Average rivalry	155.96***	-0.01*	-0.20†	0.10	0.14*	-0.11
	(41.54)	(0.00)	(0.11)	(0.10)	(0.07)	(0.19)
R^2	0.90	0.35	0.32	0.47	0.49	0.32
Adj. R^2	0.87	0.14	0.09	0.29	0.33	0.09
R^2 increase from fixed effects model	0.00	0.01	0.01	0.00	0.00	0.00
Adj. R^2 increase from fixed effects model	0.00	0.01	0.01	0.00	0.01	0.00

[a] n = 562 regular season conference games, except for Model 1, for which n = 556

[b] All models include fixed effects for home and away teams

† $p \leq .10$, all tests two-tailed

* $p \leq .05$

** $p \leq .01$

*** $p \leq .001$

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