

# COMPETITION NETWORK THEORY<sup>†</sup>

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## **ABSTRACT**

Laying the foundation for competition network theory, this study underscores the differences between competitive and cooperative relations, and suggests that the network of competitive relations in which a firm is situated can affect its performance. The study extends established research on competition in strategic management by shifting focus from the industry or firm level to the network level of analysis, thus offering new insights into the implications of competition. Specifically, it suggests that firm performance declines with the intensity of the firm's competitive relations, yet mutual forbearance that emerges as a result of multimarket contact can mitigate this effect. In addition, firm performance is expected to be negatively related to degree centrality of the firm in its competition network. In turn, the centrality of the firm's competitors in their competition networks can enhance the firm's performance, although an increasing proportion of shared third-party relations of the firm and its competitors in their competition networks mitigate this effect. Hence, besides industry structure and the firm's resource configuration, the firm's position in its competition network and the nature of its competitive relations can shape its performance. This study advances competition research by introducing a network perspective, thus extending the literature on competitive dynamics while informing empirical research on competition networks.

## INTRODUCTION

Interfirm competition has received considerable attention in the strategic management literature. Traditionally, scholars have identified competitors based on their industry affiliation (Porter 1980), yet industry affiliation does not necessarily imply direct competition between all firms in the industry (Porac and Thomas 1990). In addition, firms may compete in multiple markets (Karnani and Wernerfelt 1985), so that the intensity of their competitive relations varies across markets. Moreover, convergence of technologies, disintegration of industries, and the emergence of ecosystems, among other trends, have blurred industry boundaries, making the standard industry classification (SIC) less relevant for studying competition (Brusoni et al. 2009). This classification falls short of accounting for competition among firms that originate from different industries. For example, in the smartphone market, Apple (computers) competes with Samsung (electronics), Sony (music and entertainment), Google (software), which acquired Motorola Mobility (communications) and sold it to Lenovo (computers), and Nokia (mobile phones), which was acquired by Microsoft (software). Recent categorization systems of firms' businesses rely on content analysis (Hoberg and Phillips 2010, 2016) or self-claimed membership in market categories (Pontikes and Barnett 2015), but have not offered a more fine-grained categorization of firms than the SIC system.

To study firms in their competitive environments, strategic management scholars have adopted frameworks anchored mostly in industrial organization economics and resource-based theory. Less attention has been paid to firms' idiosyncratic patterns of competitive relations and their implications. How do a firm's competitive relations affect its likely behavior and performance? This important question has been studied primarily at the dyad level, matching a firm's reaction to particular actions of a rival. Nevertheless, scholars have argued that "although the dyad focus and the firm-level pair-wise emphasis represent a critical first step, the proposed approach nonetheless should be complemented by the group or structural approach in which the social nature of competition is considered" (Chen 1996: 127). Studying the nature and structure of competitive relations can shed new light on the underlying forces that shape firm performance. Accordingly, this study introduces a network theory for analyzing competition. By assuming the competition network as the relevant level of analysis, this theory unpacks heterogeneity in the competitive

relations of firms and explains interfirm performance differences beyond those attributed to universal industry conditions or firms' idiosyncratic organizational characteristics.

\*\*\*\*\* Insert Table 1 and Figure 1 about here \*\*\*\*\*

A competition network is defined as the set of competitive relations in which firms are embedded. These relations can be inferred from firms' market communality, resource similarity, or perceived rivalry. To illustrate the notion of competition network and competitive relations within a well-defined industry, Table 1 reports revenue data for U.S.-based airlines in 2011. Ideally, the competition network should encompass all competitors, including foreign airlines that do not necessarily operate in the United States. This table reveals that although all listed competitors operated in the U.S. market, competition is more exclusive in the Atlantic, Latin America, and Pacific markets, where subsets of airlines operate. The intensity of competitive relations of an airline in each market segment is proportional to the relative importance of that market and to the competitors' dominance in that market (Chen 1996). The overall intensity of competition that an airline faces can be inferred by aggregating the competitive relations across market segments. Figure 1 shows the competition network in each market segment, with arrows distinguishing inbound from outbound competitive relations and arc widths indicating the intensity of competitive relations. This illustrative example reveals the complexity of the phenomenon and suggests the pitfalls of studying competition as a cumulative characteristic of an industry without accounting for its inherent relational properties (Kilduff et al. 2010). For example, the intensity of competition that American Airlines encountered in the Atlantic market was weaker than that encountered by United Airlines, even though these firms operated under similar industry conditions. Although research rooted in industrial organization economics has alluded to the intensity of competition in an industry (Caves and Porter 1977) or strategic group (Cool and Schendel 1987; Fiegenbaum and Thomas 1990), it has not studied the particular pattern of competitive relations in which each firm is situated. Figure 1 reveals that even firms that operate in the same industry vary by the network structure and nature of their competitive relations, which may account for performance heterogeneity. A theory of competition networks can elucidate the implications of a firm's pattern of competitive relations, irrespective of industry boundaries.

Emerging research on competition networks has made some strides by applying social network analysis to study the implications of competition networks for strategic behavior, rivalry and market entry (Gimeno 2004; Hsieh and Vermeulen 2014; Skilton and Bernardes 2015; Thatchenkery and Katila 2021; Tsai et al. 2011; Yamanoi 2011). However, social network theories were meant to analyze cooperative relations rather than competitive relations, which are fundamentally distinct. For instance, cooperative relations are voluntary and facilitate information exchange by partners (Uzzi 1996), whereas competitive relations entail no mutual consent and discourage resource sharing and spillover of proprietary knowledge to competitors. Hence, the framework proposed here avoids social network mechanisms that underscore social influence and information sharing (Gulati et al. 2011; Kilduff and Brass 2010). Instead, it underscores mechanisms such as awareness of competitive threats and the inclinations of firms to initiate and react to competitive actions. As recently demonstrated (Downing et al. 2019), these mechanisms explain how competitive relations and firms' positions in the competition network shape the intensity of competition.

The current study contributes to strategy research by analyzing the performance consequences of competition networks for individual firms. Instead of applying social network theories, it introduces a coherent network perspective that is anchored in industrial organization economics and strategy research. The theory advances understanding of the performance implications of competition by directly relating a firm's performance to the particular pattern of its competitive relations rather than to the industry structure or the firm's resource configuration. The theory goes beyond dyadic concerns by explaining how the structure of third-party relations shapes the performance effects of the competition network.

## **NETWORK THEORIES AND THE STUDY OF COMPETITION**

Network perspectives were introduced to the strategy literature two decades ago (Gulati et al. 2000), with the majority of research drawing from social network theories to study strategic alliances and other cooperative relations such as board interlocks. The underlying supposition has been that structural properties of the social networks in which firms are embedded shape these firms' behavior and performance (Kilduff and Brass 2010). Scholars have considered properties such as structural holes (Burt 1992), centrality (Bonacich 1987; Freeman 1979; Podolny 1993) and density (Coleman 1988) when describing the structure

of alliance networks and relating it to firm performance (Ahuja 2000a; Baum et al. 2000; Rothaermel 2001; Rowley et al. 2000; Stuart et al. 1999; Zaheer and Bell 2005). Even when studying the social structure of markets, scholars have focused on cooperative transactions between buyers and suppliers (Burt 1988). Hence, network theories have served for studying cooperation rather than competition, despite the latter's central role in strategy research. The possibility that the intensity of competition accumulates at the network rather than the industry or firm level was assumed away.

Emerging research has begun to study competition networks that emerge from the competitive relations that firms maintain among them (Chen 1996; Gimeno 2004). The notion of competition network identifies the set of competitors that each firm encounters and alludes to the competitive interactions among firms as network ties. This research borrows concepts from social network theories, such as relational and structural embeddedness (Granovetter 1985), to describe a firm's relations with its competitors and its position in the network of competitive relations. Scholars have resorted to social network theories to explain the dynamics by which information flows in competition networks. Nevertheless, such dynamics are likely to differ from those typical of alliance networks because of the inherently different nature of relations.

Competitive relations differ from cooperative relations on multiple counts. Whereas cooperative relations such as alliances serve as a platform for facilitating exchange of knowledge and other types of resources (Dyer and Singh 1998; Uzzi 1996), firms often seek to avoid the leakage of knowledge and information to their competitors (Cohen et al. 2000). Whereas in alliance networks, firms' brokerage positions are meaningful and information can flow via indirect ties, such transitivity often does not characterize competition networks, wherein a competitor's competitor does not necessarily compete with the focal firm. Further, although social network theories acknowledge that information flows in networks may affect firms' behavior and performance outcomes, they disregard the intensity of competition (Porter 1980). In a competition network, relations may convey information and firms may learn from each other, yet competitive tension or actual competitive actions of competitors are a more relevant type of flow for studying the performance implications of such a network. Thus, little insight can be gained by drawing analogies from cooperative relations to competitive relations between firms.

Partially overcoming this caveat, one stream of research on social networks has distinguished between positive and negative network ties among individuals (Emerson, 1972). This research alludes to some negative aspects of friendship ties wherein engaging with one individual may come at the expense of another. More recent research portrays negative ties as relations in which individuals dislike or intend to harm each other (Labianca and Brass 2006). Negative ties can reduce the level of trust, hinder the provision of assistance, and prevent individuals from seeking advice from other network members (Casciaro and Lobo 2008; Chua et al. 2008; Venkataramani and Dalal 2007), thus undermining their task performance (Seibert 2001). Accordingly, some scholars have considered competitive relations among firms as negative ties (Yamanoi 2011), underscoring the negative judgments, feelings, and behavioral intentions of competitors. In particular, Kilduff (2019) noted that over time, similarity, and repeated and evenly matched competition between firms can generate relational rivalry that increases the volume, aggressiveness, and complexity of competitive action. This approach, however, assumes that network effects cut across levels, so it draws analogies between interpersonal ties and interfirm ties. Whereas managers' judgments and feelings indeed reinforce competitive actions, this account is insufficient for relating the network structure of competition to performance outcomes. A theory of competition networks should scrutinize the conventions of social network theories and apply mechanisms at the interfirm level of analysis.

Despite the above caveats, early research on competition networks has drawn from established social network theories while underplaying the distinction between cooperative and competitive relations in networks: “[n]etwork theory has been applied to all different kinds of relationships (including cooperative and competitive ones) in prior research” (Tsai et al., 2011: 764). Thus, the distinction between cooperative relations and competitive relations has been blurred. For example, Ingram and Roberts (2000) examine the benefits of friendship ties to competitors, and Gnyawali et al. (2006) explain how the structure of alliance networks affects the likely response to competitive action, whereas Gimeno (2004) considers alliance formation as a competitive reaction to competitors' alliances. These studies focus on the network structure of cooperative relations rather than on the structure of the competition network. In turn, other studies examine the structure of competition networks, yet concentrate on consequences at the dyad level (Chen

1996; Downing et al. 2019; Hsieh and Vermeulen 2014; Yamanoi 2011). Few exceptions include Tsai et al. (2011), who study how competitive interactions in a dyad and across joint competitors in that dyad influence a firm's ability to accurately perceive the competition network from its competitor's standpoint. In turn, such competitor acumen with respect to a certain competitor can increase the firm's relative market share in that dyad. Downing et al. (2019) qualify that besides direct rivals, firms should be aware of indirect rivals up to the third level. Finally, Skilton and Bernardes (2015) relate a firm's product introductions to the size, density, and diversity of its competition network, whereas Thantchenkery and Katila (2021) relate it to churn, spanning structural holes, and identifying peripheral competitors in the competition network. While these studies offer important empirical insights, we still lack the theoretical foundation to relate the structure of the competition network in which a firm is embedded to its performance.

Interfirm networks encompass both cooperative and competitive relations, yet scholars have focused almost exclusively on the former type of relations. A competition network theory can contribute to competitive strategy research and advance network theorizing beyond the mere application of traditional structural reasoning in a new context. By promoting a reasoning that applies to competitive relations, the theory presented here departs from traditional social network theories, which have dealt with cooperative relations; it shifts from the dyad to the ego-network level of analysis; and it considers the implications of competition networks for firm performance rather than for corporate behavior that encompasses the assessment of competitors (Tsai et al. 2011), competitive action and reaction (Chen 1996; Downing et al. 2019; Yamanoi 2011), imitation of competitors (Hsieh and Vermeulen 2014), product market entry (Skilton and Bernardes 2015; Thantchenkery and Katila 2021), or alliance formation (Gimeno 2004). Hence, this theory contributes to emerging research on competition networks and informs research on competitive dynamics and performance heterogeneity. We proceed by laying the foundation for a theory of competition networks: offering definitions and discussing how the intensity of dyadic competitive relations affects firm performance. We then consider how the network positions of a firm and its competitors shape performance.<sup>1</sup>

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<sup>1</sup> In addition to the intensity of competitive relations and firms' network positions, firms' attributes can serve as actor characteristics that influence the behaviors of firms in the competition network and their consequent performance



## FOUNDATION OF COMPETITION NETWORK THEORY

Unlike traditional theories of competition that concentrate on the firm or industry, competition network theory identifies the network of competitive relations as the relevant level of analysis. It conceptualizes a firm (actor) as a discrete entity that forms competitive ties with other firms. The collection of competitive ties in a dyad defines the two firms' competitive relation. For example, US Airways and Delta Airlines maintained a competitive relation that encompassed their competitive ties in the United States, Atlantic, and Latin America markets (see Figure 1). A competitive tie can be defined at an even more refined level—for instance, relating to competing service that the two airlines offer on a particular route in the United States. In addition, a competitive relation can correspond to a firm and its competitor's common operation in various industries, thus cutting across industry boundaries (e.g., Downing et al. 2019). Accordingly, a competition network is defined as a confined set of firms and their competitive relations.

Competitive relations are fundamentally different from cooperative relations. Unlike a cooperative tie, such as a strategic alliance, which entails the mutual consent of partner firms to form a tie that is then formalized in an agreement, in the case of a competitive tie, a firm can unilaterally decide to form the tie by entering the market of another firm, irrespective of the latter's consent. Whereas an alliance is a bilateral arrangement that establishes mutual interdependence between partners, a competitive relation can be unilateral in that it may be initiated by one firm without the consent of another. Furthermore, a firm may perceive another as its competitor even though the reverse may not be true. For instance, in the early 20<sup>th</sup> century, Pepsi considered Coca-Cola as its main competitor, whereas Coca-Cola ignored most of the competitive actions of Pepsi until the latter gained significant market share by the 1980s. In fact, firms can maintain different levels of presence in a market, so that their competitive relation is asymmetric. To the extent that one firm's revenue in a market is significantly higher than that of its competitor in that market,

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outcomes. Such attributes include, for instance, the resources available to competitors (Barney 1986) or the scale and market share of competitors (Porter 1980). Although these attributes reflect the strengths of competitors and influence their motivation and ability to initiate competitive actions (Chen et al. 2007), organizational attributes are not considered an inherent property of the competition network, because network theories underscore the implications of the network structure and the nature of competitive relations while assuming homogenous actors.

the latter poses limited competitive threat on the firm, whereas the firm exerts substantial competitive threat on that competitor. Table 1 reveals variation in the earnings of airlines operating in the same geographical market segment, suggesting differences in the levels of competitive threats that they pose to each other. For example, in the Latin America market segment, American Airlines posed greater competitive threat to Continental Airlines than vice versa. The notion of asymmetric relations has not received much attention in the literature on cooperative networks (Labianca and Brass 2006) but is essential in competition networks.

Additionally, the notion of cooperative tie in social network theories is rather straightforward because it entails an explicit collaborative agreement, such as a joint venture contract that has a clear starting date and a set of formal clauses that defines its scope and content (Oxley 1997). In turn, there is less clarity concerning the formation and dissolution of ties in a competition network, because firms neither formalize their competitive relations nor do they necessarily interact directly by virtue of such relations. A cooperative tie entails exchange or combination of the partners' resources and their joint engagement in value chain activities. However, a firm that maintains a competitive tie with a competitor may not even be aware of the independent actions of that competitor. Engaging in ongoing competitive interaction (Baum and Korn 1999) is not necessary to defining a competitive relation between firms. Hence, it is essential to consider what constitutes a competitive relation between two firms.

### **Defining a competitive relation**

Alternative definitions have been offered for a competitive relation and its constituent ties. Common definitions are based on market communality, resource similarity, or perceived rivalry.

According to the first definition, the prevalence of a competitive tie is inferred from firms' simultaneous operations in the same market (Gimeno 2004). The formation of a competitive tie is thus associated with the entry of a firm into the market of another firm, whereas the dissolution of a competitive tie is ascribed to existing another firm's market. When studying the evolution of competition networks, one should examine a firm's motivation to enter or exit certain markets. Decisions about market entry and exit can be independent of or interdependent with other firms' decisions (Baum and Korn 1999). A competitive tie serves as a channel for conveying competitive actions of firms in the competition network. This

perspective is in line with the definition of cooperative tie as a conduit of potential resources or information flows between alliance partners (Gulati 2007). Even though a competitive tie only indicates the possibility that a firm or its competitor may take competitive actions against the other, market communality is a conservative definition of competitive tie, since it implies that such action has already taken place, so that both the firm and its competitor have established operations in the same market. Subsequently, the firm and its competitor may not necessarily take further competitive actions.

A more inclusive definition of a competitive tie assumes resource similarity. Two firms are considered competitors if they possess similar types and amounts of resource endowments (Chen, 1996). The underlying assumption here is that such firms nurture similar capabilities and pursue similar strategies that support their repertoire of competitive actions (Barney, 1991). Although this definition does not assume that firms that maintain a competitive tie have already initiated competitive action against each other, it is based on the expectation that these firms would take such action. This definition can capture a competitive tie between potential competitors who have yet to enter each other's market. However, since the theory's focus is on competition in the product market, market communality is more immediate and thus more relevant than resource similarity for defining a competitive tie in a dyad (Chen, 1996). Market communality is also more easily observed than resource similarity when seeking to measure competitive ties.

A third, more liberal approach defines a competitive tie based on managers' perceptions of competitive threat. This approach acknowledges that competition is socially constructed and that firms devise competitive actions based on perceptions of other firms' behaviors. From this standpoint, it is sufficient that a firm's managers believe that another firm poses a competitive threat (Dutton and Jackson, 1987) to consider it as the firm's competitor (Porac and Thomas, 1990; Reger and Huff, 1993). Although a perceived threat can emerge as a result of market communality or resource similarity, it can also arise as a result of a firm's aspirations, statements, or actions that elicit the competitive reaction (Ferrier, 2001). In this regard, some scholars have distinguished competition from rivalry, defined as the subjective orientation of one firm toward the other while paying increased attention to that other firm's characteristics and competitive actions (Kilduff et al., 2010; Kilduff 2019; Porac et al., 1995). Perceived rivalry motivates competitive action, but

to observe it, one needs to survey the firm's managers or follow their public announcements, which may complicate the measurement of competitive ties. Further complication may arise as a result of managers' diverse perceptions, which can limit the consistency at which the competitive tie can be defined. Even if competitive actions are driven by perceived rivalry, the performance implications of competitive ties depend on competitors' actual actions in the product market.<sup>2</sup>

Assuming that a competitive tie is defined by the simultaneous operations of two firms in the same market segment (Gimeno 2004), i.e., market communality, a remaining question is whether a competitive tie entails awareness (Smith et al. 2001).<sup>3</sup> Although it is unlikely, a dyad of firms may operate in the same product market without one firm knowing about the operations of the other. Competitive tension may prevail even if these firms are not mutually aware of each other (Park 1992). Whereas awareness of competitors' actions is not necessary in order for a firm to respond to changing market conditions, awareness does facilitate competitive action and determines the likelihood of competitive reaction. A case in point is the competitive dynamics that emerged between Coca-Cola and Pepsi in the 1980s, wherein the two firms promptly responded to each other's advertising campaigns, product packages, and new tastes once Roberto Goizueta took office as Coca-Cola's CEO and considered the competitive threat posed by Pepsi as more serious than his predecessors. Hence, awareness is not necessary for defining a competitive tie between two firms even though it can facilitate their competitive interaction.

Taking a conservative approach, let us proceed by defining a competitive tie based on market communality. Accordingly, two firms are considered competitors to the extent that both operate in the same market regardless of the information available to them on each other's operations. When two firms operate in overlapping market segments, they offer comparable products or services to a shared group of customers

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<sup>2</sup> Another approach for defining a competitive tie is based on firms' structural equivalence in the social network, i.e., two firms are considered competitors if they maintain the same pattern of cooperative relations with resource providers (Burt and Talmud 1993). The assumption here is that these firms compete by virtue of their dependence on the same set of resources, yet this logic is better captured by the resource similarity. The notion of strategic group generalizes this approach by distinguishing groups of firms in an industry that pursue similar strategies with respect to their cost structure, product differentiation, vertical integration, diversification, and formal organization (Cool and Schendel 1987). But affiliation with a business group need not imply competition in the product market.

<sup>3</sup> A competitive tie defined based on perceived rivalry suggests that the firm is aware of its competitor. That firm may perceive another firm as its competitor even though the latter has yet to enter its market (Porac and Thomas 1990).

(Aldrich et al. 1984; McPherson 1983). One caveat of relying on market communality is that the boundaries of market segments become inherent to the definition of competitive ties. Therefore, unlike a cooperative relation, which is defined based on bilateral agreements between two firms, in a competition network all firms that operate in a particular product domain or market segment maintain competitive relations with each other, and are thus structurally equivalent in that market segment (see Figure 1). The ego-network structures of firms do vary, however, once we account for their different product lines or the multiple market segments in which they operate. Furthermore, the proposed theory holds regardless of whether one defines a competitive tie based on market communality, resource similarity, or perceived rivalry.

Finally, in studying competitive relations, an important distinction should be made between the mere prevalence of a competitive relation and its corresponding intensity. Competitive relations elicit different levels of competitive threats (Chen et al. 2007; Kilduff et al. 2010). Market communality serves only for identifying competitors, but not for assessing the intensity of their competitive relations. A perceived threat from a rival or resource similarity may be considered a less intense form of competitive threat than one defined by a competitor's introduction of a product into the firm's market. The competition is likely to become more intense when that competitor introduces several products into that market.

### **The intensity of competitive relations**

The intensity of competition is a fundamental mechanism in industrial organization economics. According to that tradition, the association between competition intensity and firm performance derives from exogenous properties of the industry such as barriers to entry, industry concentration, and product differentiation (Caves and Porter 1977). In turn, competition network theory ascribes the intensity of competition to competitive relations. Whereas industry structure may relate to product attributes, information asymmetries, and firms' bargaining power relative to suppliers, among various other characteristics of the industry (Porter 1980), according to competition network theory, the intensity of competition that a firm encounters derives, in part, from the intensity of particular competitive relations in which it is embedded. Different firms operating in the same market segment would experience different levels of competitive threat based on their particular relations with competitors. Consequently, competition

network theory can explain performance heterogeneity among firms that operate in the same market and face similar industry conditions irrespective of their idiosyncratic resource endowments.

The intensity of a competitive relation is represented by the value of the constituent network ties. The value of ties has received limited attention in social network theories (Granovetter 1973), but it is central for competition networks because of its immediate performance implications. The intensity of a competitive relation in a dyad may correspond to the number of competing products that two firms offer in markets where they both operate, or to the proportion of sales that these firms generate in common markets relative to their total sales. One may also consider the extent of resource similarity in a dyad as a proxy for the intensity of a competitive relation. These alternative proxies differ with respect to the unit of accrual—e.g., products versus revenues or resources—but conceptually they all represent the intensity of a competitive relation based on the potential scope of competitive action.

According to established research in industrial organization economics, the intensity of competition can be induced by some industry conditions such as slow industry growth, a high proportion of fixed costs, lack of product differentiation or switching costs, and high exit barriers (Porter 1980). In turn, according to competition network theory, the intensity of a competitive relation between two firms is ascribed to the extent of overlap in these firms' product (or resource) portfolios in that dyad. As the proportion of overlap in the firms' products increases, competition becomes more intense, which makes the competitive threat more visible and consequential (Smith et al. 1991). The underlying logic is that similarity between competitors enhances their rivalry (Kilduff et al. 2010). Under such conditions, it is increasingly likely that the competitor initiates competitive actions against the firm or reacts to the firm's competitive actions (Chen et al. 2007). Although increased market communality enables a firm to become more familiar with its competitor and its likely behavior (Tsai et al., 2011), the indirect gain from knowing the competitor is likely to be offset by the direct loss ascribed to the competitor's actions and more intense competition. Hence, the extent of market communality (or resource similarity) contributes to the intensity of a competitive relation.

Nevertheless, the intensity of a competitive relation that each firm experiences in a dyad is asymmetric. From a focal firm's standpoint, the intensity of a competitive relation can be captured by the proportion of

its products, sales, or resources that are contested by the competitor. For example, from American Airlines' standpoint, the intensity of its competitive relation with Delta Airlines in the United States was greater than that of its relation with United Airlines, given the higher share of Delta in that market (see Table 1). More generally, the intensity of a competitive relation between a firm and its competitor in a given market is expected to be related to the importance of that market to the firm as well as to the dominance of the competitor in that market (Chen, 1996). Market importance can be captured, for instance, by the proportion of the firm's revenue in that market relative to its total revenue. The competitor's dominance can be inferred from its market share in that market. Similarly, if one relies on the number of products as a proxy, the greater the proportion of products that a firm has in a particular market relative to its total number of products, the stronger the competitive threat created by its competitors' actions in that market. In addition, the greater the share of products that a competitor has in that market out of the total number of products offered by firms in that market, the stronger the competitive threat that it poses in that market. The interplay of market importance and competitor dominance in common markets determines the intensity of their competitive relation from the firm's standpoint.

From the firm's standpoint, the greater the intensity of its competitive relation to a competitor, the more likely that competitor is to initiate competitive actions against the firm or retaliate with counteractions to competitive actions initiated by the firm. Competitive actions can take various forms such as price cuts, advertising campaigns, enhanced service offerings, or new product introductions into markets in which the firm operates. Such actions serve as purposeful and observable moves aimed at enhancing the position of the acting competitor vis-à-vis the firm and mitigating the competitive threat which that competitor experiences (Chen and MacMillan 1992). The firm's awareness of such competitive action can facilitate and intensify the firm's reaction, but it is not a necessary condition for reaction, since the competitor's action is likely to undermine the firm's market position and thus prompt its reaction regardless of the origin of the competitive threat. The firm's reaction can elicit competitive dynamics that reinforce the competitive tension as a result of the competitor's subsequent reaction to the firm's actions (Baum and Korn 1996; Weigelt and MacMillan 1988). As the perceived competitive tension intensifies, so do the severity and

volume of competitive action and reaction (Chen et al. 2007). In turn, firm performance is negatively related to the number of competitor actions (Chen and Miller 1994) and their aggressiveness (Ferrier 2001). The increased likelihood, frequency, and severity of the competitor's actions are, in turn, expected to undermine the firm's performance. Therefore, firm performance is expected to be negatively related to the intensity of the firm's competitive relations, as captured by the extent of market communality (or resource similarity) and weighted by each market's importance to the firm and the dominance of competitors in that market.<sup>4,5</sup>

### **Multimarket contact and the intensity of competitive relations**

The negative association between market communality and firm performance seems to challenge conventional wisdom in established research on multimarket contact (Baum and Korn 1996; Gimeno and Woo 1999; Karnani and Wernerfelt 1985). Such research suggests that two firms that simultaneously compete in multiple markets nurture mutual forbearance that mitigates their tendency to initiate competitive actions against each other in one market in fear of retaliation in other markets in which they both operate, thus attenuating the intensity of competition in the dyad and enhancing each firm's performance (Alexander 1985; Fienberg 1984; Gimeno 1999). This incongruence can be resolved, however, by recognizing that competition network theory ascribes the intensity of competition to the extent to which a firm's products or sales are endangered by a competitor, irrespective of the number of common markets or distribution of products or sales across common markets. Additionally, irrespective of the number of markets in which the firm and its competitor operate, forbearance would not be mutual if only a small portion of a firm's products or sales are threatened by those of the competitor. The fact that firms follow similar diversification strategies

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<sup>4</sup> Besides market importance and competitor dominance, it is reasonable to assume an equal contribution of each competitor to the intensity of competition. However, this assumption is violated when the firm's competitive relations are not independent. For instance, when two of the firm's competitors form an alliance (Gimeno 2004), they can pose a competitive threat greater than the sum of their individual threats.

<sup>5</sup> The intensity of competitive relations can be studied at the ego-network level by considering the firm's complete set of relations to immediate competitors. Nevertheless, a question remains concerning the implications of variation in the intensity of competition in the network, since that intensity may be driven by extreme values. On the one hand, high variation in the intensity of competitive relations in the firm's network can increase the probability of encountering a dominant competitor that can launch a massive attack against the firm (Chen et al. 2007). On the other hand, such variation may make it easier for the firm to identify and discern the competitive actions of its competitors (Smith et al. 1991). Studying the performance implications of variation in the intensity of the firm's competitive relations requires empirical investigation to uncover whether the threat of dominant competitors outweighs the enhanced ability to identify competitive actions of competitors.



and enter the same markets is insufficient in and of itself to establish deterrence. When a firm assesses the likelihood of retaliation by its competitor, it weighs the overall proportion of endangered products or sales across common markets, rather than focuses on the number of common markets per se.

Multimarket contact becomes relevant only when the intensity of competitive relations in a dyad is approaching symmetry, while competitors maintain asymmetric presence in each other's markets (Hsieh and Vermeulen 2014; Karnani and Wernerfelt 1985). Stated differently, mutual forbearance emerges when the overall strengths of a firm and its competitor are relatively similar yet each maintains dominance in markets where the other suffers weakness. Under such conditions forbearance is mutual, since each competitor can effectively retaliate in a market where its counterpart demonstrates weakness. For example, mutual forbearance may have emerged between American and United, which earned relatively similar revenue figures, with American revealing stronger sales in Latin America and United showing strength in the Pacific. However, mutual forbearance was less likely to prevail between Delta and US Airways, even though they overlapped in most markets, because Delta was stronger in each of these markets (see Table 1). Hence, multimarket contact can lead to collusion that attenuates competitive tension only under strict conditions (Bernheim and Whinston 1990). Multimarket contact is a necessary but insufficient condition for mutual deterrence. In most cases, market communality is expected to intensify competition rather than attenuate it, so that a firm's performance improves with reduced intensity of its competitive relations.

Therefore, mutual forbearance sets a boundary condition for the performance implications of the intensity of competitive relations. Indeed, market communality, weighted by the importance of each market and the competitors' dominance in that market, generally prompts competitive interaction that can undermine a firm's performance (Baum and Korn 1996). However, to the extent that mutual forbearance is established by virtue of the firm and its competitor's equal strengths and asymmetric presence in their multiple common markets (Bernheim and Whinston 1990), the negative performance consequences of their intense competitive relation are mitigated as a result of their efforts to restrict their competitive interaction. In particular, the asymmetric presence of the firm and its competitor in certain markets establishes reciprocity, whereby the firm would seek to defend markets in which it dominates its competitor, whereas

the inferior position of the competitor in those markets would encourage its retaliation to the firm's aggression in other markets in which it dominates the firm (Sorenson 2007). The credible threat posed by such mutual forbearance is likely to deter the firm and its competitor from taking competitive action that can elicit effective retaliation in the markets in which the firm or its competitor reveals weakness, thus attenuating the negative performance effects of their intense competitive relation. Mutual forbearance mitigates competitive tension and demotivates tendencies to increase the severity, volume, and frequency of competitive action and reaction that otherwise undermine firm performance in common markets in which the firm and its competitor maintain an intense competitive relation. Of course, the likelihood that the firm would initiate competitive action in a particular market depends not only on the intensity of its competitive relation and mutual forbearance with a particular competitor that operates in that common market, but also on its competitive relations with other competitors that it encounters in that market.

#### **A firm's network position and the intensity of competition**

Whereas relational approaches such as competitive dynamics and multimarket contact offer insights on the intensity of competition that evolves in dyads of competitors (e.g., Baum and Korn 1999; Chen 1996), competition network theory considers how the intensity of competition is shaped by both relational and structural properties of its competition network. A firm embedded in a competition network is involved in several competitive relations with multiple competitors. Thus, the intensity of competition that a focal firm faces depends not only on the intensity of a competitive relation but also on the firm's position in the competition network. Accordingly, firm performance is likely to be shaped by the interplay of the intensity of the firm's competitive relations and its position in the overall structure of the competition network.

A firm's network position defines the structural properties of the network in which it is embedded. Emerging research on competition networks has sought to analyze the implications of the structural properties of competition networks by following established social network theories. For instance, Yamanoi (2011) has adopted Freeman's (1979) concept of centrality, suggesting that competitive actions spread like information flows in a social network. Similarly, Skilton and Bernardes (2015) follow Burt (1992, 2007) in arguing that a dense network structure elicits homogenous patterns of product market entry in a competition

network, while Thatchenkery and Katila (2021) relate product introductions to spanning structural holes in the competition network. Nevertheless, the control and brokerage that serve as the underlying mechanisms of these structural properties in social networks need to be revisited when considering competition networks, wherein network relations shape competition intensity rather than induce information flows or social influence. Studying the effects of a firm's position in a competition network entails relying on distinctive mechanisms that differ from those characterizing social networks.

A fundamental structural property of a network concerns a firm's degree centrality (Freeman, 1979), which corresponds to the number of relations in which the firm is involved with other firms in its network. In a competition network, degree centrality pertains to the count of competitive relations that a firm maintains with other firms in its network, which can be standardized by dividing it by the number of possible relations in the network (Wasserman and Faust 1994). In contrast to industrial organization economics, which relates firm performance to overall industry concentration, competition network theory refers only to those competitors that maintain market communality or resource similarity with the firm. Unlike social network theories that relate degree centrality to prominent firms that can access information or influence other firms in their network (Knoke and Burt 1983), degree centrality in a competition network influences the intensity of competition faced by the focal firm. Note that when considering a firm's position in a particular market segment, its degree centrality may be similar to that of its competitors in that market segment, yet structural properties such as degree centrality are defined across the multiple market segments in which the firm operates. As argued next, degree centrality in the competition network is expected to negatively affect firm performance as a result of increased competitive threat and weaker ability of the firm to identify and react to competitive actions of its competitors.

Holding constant the intensity of competitive relations, a firm is expected to face intensifying competitive threats when its degree centrality in the competition network increases. As the number of relations in the firm's competition network increases, coordinating competitors' actions and effectively engaging in tacit collusion becomes more difficult (Porter 1980; Tirole 1988), thus increasing the intensity of competition. Additionally, degree centrality is associated with aggressive actions of competitors. For

example, the large number of competing airlines that American Airlines encountered on some routes in the United States increased the likelihood that its competitors offer discounted fares in an effort to increase their load factors on these routes, which in turn could undermine American Airlines' performance.

Besides the intense competitive threat associated with degree centrality, degree centrality in the firm's competition network increases the frequency of competitors' actions, which makes it more challenging for the focal firm to monitor, identify, and react to relevant competitive actions (Smith et al. 1991). As degree centrality increases, the firm must invest more effort in monitoring a large number of competitive relations and collecting relevant information on competitors' actions. Bounded rationality (Simon 1972) can further limit the ability of the firm's managers to process such information. Thus, because of their cognitive constraints, managers are likely to limit their attention to a relatively small number of competitive relations (Porac and Thomas 1994; White and Eccles 1987). Information overload may slow down their decision making and encourage the use of suboptimal heuristics, which can limit the firm's competitive reactions. Even though certain heuristics can facilitate decision making (Bingham and Eisenhardt 2011), when they involve responses to an increasing number of competitors, speed and effectiveness of decisions are likely to trade off. Therefore, the reduced likelihood and speed of the firm's competitive actions can impair firm performance (Young et al. 1996).

Irrespective of the intensity of competitive relations and the aggressiveness of competitors' actions, as degree centrality increases, the firm may find it more difficult to devise competitive actions that effectively neutralize competitive threats posed by an increasing number of competitive relations. Reacting to the competitive actions of one competitor may not suffice for coping with the competitive actions of another competitor, so, as degree centrality increases, the firm's competitive actions and counteractions may become ineffective. For example, to the extent that American Airlines offers a discounted fare on a particular route in response to a price cut by US Airways, this may undermine American's efforts to react to United, which may have enhanced the quality of its service and charged premium prices for its Economy Plus fares on that route. Such implications have gone unnoticed by research on competitive dynamics at the dyad level, which disregards the firm's interactions with other competitors in the network. The challenge of responding to

competitive threats posed by numerous competitive relations increases to the extent that competitors follow different strategies, thereby making it difficult for the firm to comprehend and react to their actions (Young et al. 1996). A firm may be able to devise strategies that neutralize competitive threats posed by several competitors, but degree centrality makes investment in such robust strategies exorbitant while exposing the firm to the competitive actions of competitors whose actions have been overlooked. In sum, as the firm's degree centrality in its competition network increases, its performance declines because of the firm's inability to devise and execute effective competitive actions against its competitors. Hence, firm performance is expected to be negatively related to the firm's degree centrality in its competition network.

### **A competitor's network position and the intensity of competition**

A firm's performance varies with its position in the network of relations with direct competitors. Nevertheless, this effect goes beyond direct ties and depends also on the positions of the firm's competitors in their own networks. The structure of the competition network shapes competitor behavior, which, because of competitive dynamics, influences the firm's own behavior and performance outcomes (Baum and Korn 1996; Downing et al. 2019). Increased degree centrality in its competition network limits the firm's ability to identify and react effectively to particular competitive threats. Thus, a competitor that is itself embedded in an extensive network of competitive relations is less likely to react to the firm's competitive actions. Specifically, such a competitor's attention may be distributed across many other competitors besides the firm in question (Ocasio 1997; Porac and Thomas 1994), so that it becomes more difficult for that competitor to track the firm's actions such as new product introductions, price cuts, and promotions. Furthermore, this competitor's efforts cannot be effectively allocated in response to diverse competitive actions, so that the competitor either makes limited effort to react to the competitive actions of a wide range of its competitors or concentrates its efforts in reaction to a small subset of its competitors. In any case, the competitive threat posed by the focal competitor is mitigated by either its lack of awareness or limited ability to react (Chen et al. 2007), especially when that competitor faces substantial threats from competitors other than the firm. Consequently, a firm whose competitors are central in the competition network experiences mitigated intensity of competition. Such a firm can initiate competitive action that enhances its competitive position

and performance (Ferrier et al. 1999; Young et al., 1996) with less concern about counteractions of its competitors that can offset the effectiveness of its own competitive actions (Smith et al. 2001).

According to social network theories, an individual with relations to central alters in a social network enjoys greater prestige or power (Wasserman and Faust 1994).<sup>4</sup> In a competition network, the centrality of competitors also generates a positive effect on firm performance, but for a completely different reason. A firm that competes with competitors that face many other competitors experiences mitigated competitive threats from its competitors, who must devote attention to various other competitors. Increased degree centrality of competitors also offers opportunities for new entrants that can take competitive actions with reduced risk of counteractions from such competitors. As a result, a firm that competes against other firms that are central in their competition networks is likely to witness enhanced performance. In sum, there is a positive association between firm performance and the degree centrality of the firm's competitors in their own competition networks. Such association cannot be derived from dyadic analysis of competition that does not consider the competitor's relations with other competitors besides the focal firm. And while recent research suggests that a competitor of a competitor may become a direct competitor (Downing et al., 2019), the theory presented here posits that the firm's performance is shaped by indirect competition as a result of seemingly unrelated competitive relations between the firm's competitor and its other competitors.

### **Shared third-party relations and the intensity of competition**

The argument concerning the positive performance implications of the degree centrality of competitors in the network rests on the supposition that a competitor embedded in an extensive network of competitive relations has limited ability to effectively react to the firm's competitive actions. The latent assumption here is that competitive interactions between that focal competitor and its other competitors do not adversely affect the firm. However, this assumption may not hold when that competitor's competitors also compete directly with the firm. In this case, the reactions of those competitors to the competitive actions of the focal competitor may pose competitive threats to the firm. Hence, it is essential to consider the shared third-party

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<sup>4</sup> Some scholars use eigenvector centrality to capture this notion by defining the popularity or status of an individual as a linear function of the number of relations that her alters maintain in the social network (Bonacich 1972).

relations of the firm and its competitors.

The notion of structural equivalence in social networks (Burt 1976; Lorrain and White 1971) refers to the extent to which two firms capture similar positions in the network, i.e., maintain relations with the same third-party competitor. In social networks, structural equivalence has been associated with similar patterns of behavior as a result of mutual influence or competition for favors from the same alters (Burt 1982). These mechanisms, which are valid for interpersonal relations in a social network, cannot be bluntly applied when studying competitive relations among firms. In the context of competition networks, some scholars have suggested that structural equivalence allows a firm to “stand in its competitor’s shoes” and thus gain insight into its competitive behavior (Tsai et al. 2011). Nevertheless, structural equivalence also means that the competitor stands in the firm’s shoes, and thus becomes more familiar with the firm’s competitive behavior. The greater mutual awareness and attention to the competitive actions and intentions of competitors facilitate rivalry that can increase competitive interaction (Kilduff et al. 2010).

Whereas the notion of structural equivalence suggests that the firm and its competitor occupy the exact same position in the network (Burt 1976), i.e., maintain similar relations to all other firms in the competition network, it is sufficient that they maintain some shared competitive relations to such third-party competitors in order to become familiar with each other’s competitive behavior. Another implication of maintaining shared third-party relations in the competition network arises from the fact that competitive actions of a shared third-party competitor affect the firm and its competitor in a similar manner. Thus, even if the firm’s competitor does not direct its competitive action against the firm, such as when introducing a new product or cutting prices as part of its competitive interaction with another competitor, this action may still influence the firm’s position in the market. Furthermore, the response of the targeted competitor can undermine the firm’s performance to the extent that the firm maintains competitive relations with both competitors. Competitive action in a triad of competitors can create spillover and competitive tension even if the attacker captures a central network position that otherwise limits its attention and ability to react to the firm’s particular actions. Not only do shared third-party competitive relations enhance the competitor’s awareness of the firm’s actions (Tsai et al. 2011), but also the actions of the competitor against its other competitors

are likely to spill over and influence the firm. A greater proportion of shared third-party relations in the competition network enables the competitor to react more effectively to the firm's competitive actions and better manage its competitive reaction and corresponding efforts to cope with competitors despite its central position in its competition network. Hence, an increasing proportion of shared third-party competitive relations between the firm and its competitors can reduce the firm's gain from the degree centrality of its competitors in the firm's competition network.

## **DISCUSSION**

The study of competition in strategy research has traditionally followed frameworks anchored in industrial organization economics that underscore the importance of industry boundaries for characterizing the conditions that shape the intensity of competition. Nevertheless, convergence of technologies and the emergence of ecosystems, among other recent trends, have led to the blurring of industry boundaries, thus calling for new approaches for studying competition independent of such boundaries. A network perspective is a mezzo approach that straddles the industry and firm levels of analysis.

Although network theories have gained prominence in strategy research, they have primarily informed the study of alliance networks (Gulati et al. 2000). Recent research has sought to also employ such theories for investigating the phenomenon of competition (e.g., Hsieh and Vermeulen 2014; Thantchenkery and Katila 2021; Tsai et al. 2011; Yamanoi 2011). Nevertheless, the foundation of social network theories that have originally served for studying cooperative exchange must be revisited when studying competition. The underlying mechanisms in competition networks differ from those prevalent in cooperative networks, in part because competition networks are neither transitive nor formal, yet they are unilateral and asymmetric. Features such as asymmetric relations have not received much attention in social networks, so this study offers insights about their application in competition networks. Although competitors can establish a cooperative relation and benefit from involuntary information flow or knowledge spillover, one cannot disregard the negative performance implications of their competitive relation.

The current study builds the foundation for a network theory of competition by extending prior research on dyadic competition (Chen 1996). This theory complements established theories such as industrial



organization economics (Caves 1984; Porter 1980; Scherer and Ross 1990) and resource-based theory (Barney 1991; Dierickx and Cool 1989; Wernerfelt 1984). Whereas industrial organization economics has ascribed performance differences to industry affiliation, and resource-based theory has further accounted for performance heterogeneity at the firm level, competition network theory attributes performance heterogeneity to the relational and structural properties of the competition network. This network is idiosyncratic to each firm given its unique set of competitive relations. Studying competition as a network phenomenon can thus enhance our ability to explain performance differences across firms. It can also help identify the sources of competitive threats that each firm faces.

Competition network theory complements established frameworks in strategic management that study the implications of competition without referring to particular competitive relations among firms. Competition network theory introduces a novel approach by conceiving of competition as a network and acknowledging the structure of competition emerging from competitive relations. It focuses on the web of competitive relations among firms, accounts for the intensity of competition emanating from that network as a mechanism that shapes firm performance, and underscores the roles of network structure and competitive relations irrespective of industry conditions and the resource portfolios of firms.

Competition network theory goes beyond research on competitive dynamics by shifting from the dyad to the network level of analysis. The theory suggests that besides the intensity of competitive relations, the positions of a firm and its competitors in the competition network shape the firm's performance. This theory calls for considering the complete set of a firm's competitors as well as the competitors of its competitors. It accounts for the performance effects of indirect competitive relations and similarities in the competition networks of competitors, while underscoring the structural properties of these networks, thus extending the dyadic analysis of competition (Chen 1996). The theory suggests that the implications of competitive interactions in a dyad of firms depend in part on third party relations. Accordingly, competition network theory overcomes some limitations of dyadic approaches for studying competition that may reach potentially biased conclusions. Thus, the conjectures on the performance implications of competition networks inform empirical research on competitive heterogeneity that has traditionally disregarded network

effects (McGahan and Porter 1997).

Last but not least, the proposed theory advances network research by challenging the received wisdom that network theories are agnostic to the nature of the network. Competitive relations are fundamentally different from cooperative relations, so that established measures of degree centrality, structural holes, eigenvector centrality, or structural equivalence receive a new meaning and entail distinct mechanisms in this context. This theory further contributes to network research by promoting concepts that have received limited attention in prior network studies. In particular, this theory contributes to research on negative ties (e.g., Labianca and Brass 2006; Yamanoi 2011) by shifting from the interpersonal level to the interfirm level and uncovering mechanisms that underscore the intensity of competition rather than negative sentiments and behaviors of managers that accompany these mechanisms. Similarly, competition network theory underscores the notion of asymmetry in relations, which has not received much attention in established social network theories (Labianca and Brass 2006). By demonstrating how the competition networks of competitors benefit the firm, the proposed theory further advances research on neighbor networks (Burt 2010) that has considered the spillover of network advantages. Interestingly, whereas Burt (2007) reveals that social capital in the form of brokerage benefits is limited to the immediate network of associates in a cooperative network, the theory advanced here claims that in a competition network, spillover benefits are prevalent, so that a firm does gain from relations to competitors that are central in their competition networks. Overall, the current study advances research on competition and enriches network research by extending its potential application in the field of strategy.

\*\*\*\*\* Insert Figure 2 about here \*\*\*\*\*

## **DIRECTIONS FOR FUTURE RESEARCH**

This study makes some strides toward formalizing a network theory of competition. The proposed theoretical framework is illustrated in Figure 2. The study offers new insights by using the network framing for studying competition. In particular, it has suggested ways to assess the intensity of competition, which in turn affects firm performance. It has also accounted for multimarket contact and third-party relations when assessing the performance implications of competitive relations and degree centrality in the

competition network. Future research may consider the performance implications of additional structural properties of the competition network. Indeed, scholars have tended to adopt properties such as structural holes (Thantchenkery and Katila 2021; Yamanoi, 2011), yet the distinctive nature of competitive relations casts doubt on the predictions of social network theories in this context. For instance, a firm that bridges two otherwise disconnected partners in a cooperative network gains brokerage benefits. In contrast, a firm competing with two competitors that do not compete with each other is worse off relative to a triad in which its two competitors also compete with each other, which constrains their ability to allocate sufficient attention and react to the firm's competitive actions. This example illustrates the need to rely on a distinct theory of competition networks rather than draw analogies from social network theories.

Another avenue for future research involves considering alternative outcomes, such as competitive actions that may take the form of market entry or exit. These outcomes have already received some attention in prior research on competitive dynamics (Baum and Korn, 1999; Chen, 1996). Accordingly, scholars may study the propensity of a firm to enter a particular market as a function of the structural properties of its competition network (e.g., Skilton and Bernardes 2015). For instance, a firm may avoid entering a market that is already populated by many competitors relative to less populated markets. To the extent that scholars consider how firms react to structural properties of their competition networks by entering or exiting markets, which endogenously shapes the structure of competition networks, a dynamic perspective can be introduced that does not limit concern to the immediate performance implications of competition networks.

Future research may also extend the formulation of network effects by going beyond indirect ties to consider second-order network effects. Specifically, the proposed theory has accounted for the competition networks of the focal firm's competitors and their effects on the intensity of competition faced by the firm. Thus, it has considered the competitors of the firm's competitors. Following literature on competitive dynamics (Baum and Korn 1996; Weigelt and MacMillan 1988), one may consider the network positions of the competitors of the firm's competitors in order to generate more refined predictions of firm behavior and performance (e.g., Downing et al. 2019). Nevertheless, as the path length increases, the magnitude of the network effects is expected to diminish, while the increasing complexity of the specification may inhibit

empirical analysis or require non-analytic methods such as a simulation. A more fruitful avenue, perhaps, involves examining boundary conditions. For instance, besides the immediate implications of competitors' centrality, it is possible that competitors' degree centrality in their competition networks also mitigates the effect of the intensity of their competitive relations with the firm. Hence, even if a competitor is prompted to respond to competitive actions in a market in which it is dominant, its centrality in the network may limit its motivation and ability to respond to such actions.

Another extension involves simultaneously analyzing competition networks and alliance networks. Such analysis is vital in industries that feature extensive alliance networks. Prior research has begun to consider the competitive implications of alliance formation (Gimeno 2004), yet it is worthwhile examining the structure of competitive relations of firms that are also tied to alliance partners via buyer-supplier relations, joint ventures, or other cooperative relations. For instance, in the airline industry example, many of the competitors were also affiliated with global alliance networks, such as the Star Alliance. In this case, cooperative relations can offset competitive tension, while competition among alliance networks can shape firm performance (Lazzarini, 2007). The two types of networks may be intertwined, as alliance partners may enter each other's markets, whereas competitors may decide to mitigate competitive threat by joining certain alliance networks. Future research may investigate the interplay of competition and cooperation using a network perspective. Nevertheless, before scholars can juxtapose competitive and cooperative relations in networks, they should fully understand the independent implications of the competition network.

Moreover, a theory of competition networks should study not only the consequences but also the antecedents of these networks, identifying factors that drive their emergence and evolution over time. In parallel to the study of alliance networks, scholars should examine the extent to which inducement and opportunities (Ahuja 2000b), path dependence (Gulati 1995; Gulati and Gargiulo 1999), and other strategic considerations (Chung et al. 2000) guide the formation of competitive relations and shape the structure of competition networks (e.g., Downing et al. 2019). There is also an opportunity to explore the association between competitive relations at the interfirm level and negative ties at the interpersonal level in order to test the latent assumption that the two corresponding networks are aligned (Kilduff 2019). Hence, future

research may account for endogeneity in the evolution of competition networks. Nevertheless, unlike alliance networks, in which alliance formation and partner selection are conscious decisions, competition networks can be derived from firms' independent decisions to enter certain markets irrespective of their competitors' decisions. These decisions, in turn, depend on industry structure and corresponding conditions such as product differentiation and entry barriers that have been studied in industrial organization economics. Hence, future research may relax the market homogeneity assumption of competition network theory and account for market heterogeneity when studying the formation and performance effects of competition networks. Furthermore, industry conditions and firms' resource configurations may explain market entry decisions, and thus shape the structure of competition networks. It is possible that competition networks partially mediate the performance implications of industry conditions and resource positions. Still, competition network theory offers important insights, since competitive relations have remained latent in industrial organization economics despite their more immediate performance implications relative to industry conditions that may shape the structure of competition networks.

Another latent assumption in competition networks theory is that the markets in which the firm operates are independent, so that competition in one market does not affect the intensity of competition in another market. However, firms often diversify into related markets, in which they can leverage similar or complementary resources and enjoy economies of scope (Nayyar and Kazanjian 1993; Rumelt 1982). The intensity of competition that a firm encounters in one market may be influenced by its competitive relations in related markets—for instance, when considering markets for substitute products. The more related the markets are, the stronger the effects of competitive relations in one market on the intensity of competition in the other market. This relatedness can be determined based on standard industry classification (Robins and Wiersema 2003) or structural equivalence of firms' product portfolios (Tanriverdi and Lee 2008). Even without considering market relatedness, competition network theory enables the juxtaposition of multiple markets in which a firm operates, whereas other analytic approaches, such as Porter's (1980) framework, concentrate on competition in a single industry or market. Finally, by adopting the resource-similarity criterion, scholars can extend competition network theory to the study of competitive relations in the factor

market, thus complementing the resource-based view (Barney 1991). Although there is ample room for future research on competition networks, this study contributes by underscoring the importance of competition networks, introducing theory that can enhance understanding of this phenomenon, and promoting an emerging field of research.

## REFERENCES

- Ahuja G. 2000a. Collaboration networks, structural holes, and innovation: a longitudinal study. *Adm. Sci. Q* **45**(3): 425–455.
- Ahuja G. 2000b. The duality of collaboration: inducements and opportunities in the formation of interfirm linkages. *Strategic Management J.* **21**(Special Issue): 317–343.
- Aldrich H, McKelvey B, Ulrich D. 1984. Design strategy from the population perspective. *J Management* **10**(1): 67–86.
- Alexander DL. 1985. An empirical test of the mutual forbearance hypothesis: the case of bank holding companies. *Southern Econ. J.* **52**(1): 122–140.
- Barney J. 1986. Strategic factor markets: expectations, luck, and business strategy. *Management Sci.* **32**: 1231–1241.
- Barney J. 1991. Firm resources and sustained competitive advantage. *J. Management* **17**(1): 99–120.
- Baum JAC, Calabrese T, Silverman BS. 2000. Don't go it alone: alliance network composition and startups' performance in Canadian biotechnology. *Strategic Management J.* **21**: 267–294.
- Baum JAC, Korn HJ. 1996. Competitive dynamics of interfirm rivalry. *Acad. Management J.* **39**(2): 255–291.
- Baum JAC, Korn HJ. 1999. Dynamics of dyadic competitive interaction. *Strategic Management J.* **20**: 251–278.
- Bernheim BD, Whinston MD. 1990. Multimarket contact and collusive behavior. *RAND J. Econ.* **21**(1): 1–26.
- Bingham CB, Eisenhardt KM. 2011. Rational heuristics: the “simple rules” that strategists learn from process experience. *Strategic Management J.* **32**(13): 1437–1464.
- Bonacich PB. 1972. Factoring and weighing approaches to status scores and clique identification. *J. Mathematical Sociol.* **2**: 113–120.
- Bonacich P. 1987. Power and centrality: a family of measures. *Am. J. Sociol.* **92**: 1170–1182.
- Brusoni S, Jacobides MG, Prencipe A. 2009. Strategic dynamics in industry architectures and the challenge of knowledge integration. *European Management J.* **6**: 209–216.
- Burt RS. 1976. Positions in networks. *Social Forces* **55**: 93–122.
- Burt RS. 1982. *Toward a Structural Theory of Action: Network Models of Social Structure.* Academic Press: New York.
- Burt RS. 1988. The stability of American markets. *Am. J. Sociol.* **94**(2): 356–395.
- Burt RS. 1992. *Structural Holes: The Social Structure of Competition.* Harvard University Press: Cambridge, MA.
- Burt RS. 2007. Secondhand brokerage: Evidence on the importance of local structure for managers, bankers, and analysts. *Acad. Management J.* **30**: 119–148.

- Burt RS. 2010. *Neighbor Networks: Competitive Advantage Local and Personal*. Oxford University Press: New York.
- Burt RS, Talmud I. 1993. Market niche. *Social Networks* **15**: 133–149.
- Casciaro T, Lobo MS. 2008. When competence is irrelevant: the role of interpersonal affect in task-related ties. *Adm. Sci. Q* **53**: 655–684.
- Caves RE. 1984. Economic analysis and the quest for competitive advantage. *Am. Econ. Rev.* **74**(2): 127–132.
- Caves RE, Porter ME. 1977. From entry barriers to mobility barriers. *Quarterly J. Econ.* **91**: 241–262.
- Chen M-J. 1996. Competitor analysis and interfirm rivalry: toward a theoretical integration. *Acad. Management Rev.* **21**(1): 100–134.
- Chen M-J, MacMillan IC. 1992. Nonresponse and delayed responses to competitive moves: the roles of competitor dependence and action irreversibility. *Acad. Management J.* **35**: 539–570.
- Chen M-J, Miller D. 1994. Competitive attack, retaliation and performance: an expectancy-valence framework. *Strategic Management J.* **15**: 85–102.
- Chen M-J, Su K-H, Tsai W. 2007. Competitive tension: the awareness-motivation-capability perspective. *Acad. Management J.* **50**(1): 101–118.
- Chua RYJ, Ingram P, Morris M. 2008. From the head and the heart: locating cognition- and affect-based trust in managers' professional networks. *Acad. Management J.* **51**(3): 436–452.
- Chung S, Singh H, Lee K. 2000. Complementarity, status similarity and social capital as drivers of alliance formation. *Strategic Management J.* **21**(1): 1–22.
- Cohen WM, Nelson RR, Walsh J. 2000. Protecting their intellectual assets: appropriability conditions and why U.S. manufacturing firms patent (or not). NBER working paper 7552, National Bureau of Economic Research, Cambridge, MA. Available at: <http://www.nber.org/papers/w7552>.
- Coleman JS. 1988. Social capital in the creation of human capital. *Am. J. Sociol.* **94**: S95–S120.
- Cool KO, Schendel D. 1987. Strategic group formation and performance: the case of the U.S. pharmaceutical industry, 1963–1982. *Management Sci.* **33**: 1102–1124.
- Dierickx I, Cool KO. 1989. Asset stock accumulation and sustainability of competitive advantage. *Management Sci.* **35**: 1504–1513.
- Downing ST, Kang J-S, Markman GD. 2019. What you don't see cannot hurt you: Awareness cues to profile indirect competitors. *Acad. Management J.* **62**(6): 1872–1900.
- Dutton JE, Jackson SB. 1987. Categorizing strategic issues: links to organizational action. *Acad. Management Rev.* **12**: 76–90.
- Dyer JH, Singh H. 1998. The relational view: cooperative strategies and sources of interorganizational competitive advantage. *Acad. Management Rev.* **23**(4): 660–679.
- Emerson R. 1972. Exchange theory, Part I: a psychological basis for social exchange. In *Sociological Theories in Progress*, Berger B, Zelditch MJ, Anderson A (eds). Houghton Mifflin: Boston.
- Ferrier W. 2001. Navigating the competitive landscape: the drivers and consequences of competitive aggressiveness. *Acad. Management J.* **44**(4): 858–877.
- Ferrier W, Smith KG, Grimm CM. 1999. The role of competitive action in market share erosion and industry dethronement: a study of industry leaders and challengers. *Acad. Management J.* **42**: 372–388.

- Fiengenbaum A, Thomas H. 1990. Strategic groups and performance: the U.S. insurance industry. *Strategic Management J.* **11**: 197–215.
- Fienberg RM. 1984. Mutual forbearance as an extension of oligopoly theory. *J. Econ. Bus.* **58**(2): 243–249.
- Freeman LC. 1979. Centrality in social networks: conceptual clarification. *Social Networks* **1**: 215–239.
- Gimeno J. 1999. Reciprocal threats in multimarket rivalry: staking out “spheres of influence” in the U.S. airline industry. *Strategic Management J.* **20**(2): 101–128.
- Gimeno J. 2004. Competition within and between networks: the contingent effect of competitive embeddedness on alliance formation. *Acad. Management J.* **47**(6): 820–842.
- Gimeno J, Woo CY. 1999. Multimarket contact, economies of scope, and firm performance. *Acad. Management J.* **42**(3): 239–259.
- Gnyawali DR, He J, Madhavan R. 2006. Impact of co-opetition on firm competitive behavior: an empirical examination. *J. Management* **32**: 507–530.
- Granovetter M. 1973. The strength of weak ties. *Am. J. Sociol.* **78**: 1360–1380.
- Granovetter M. 1985. Economic action and social structure: the problem of embeddedness. *Am. J. Sociol.* **91**: 481–510.
- Gulati R. 1995. Social structure and alliance formation patterns: a longitudinal analysis. *Adm. Sci. Q* **40**(4): 619–652.
- Gulati R. 2007. *Managing Network Resources: Alliances, Affiliations, and Other Relational Assets*. Oxford University Press: New York.-Gulati R, Gargiulo M. 1999. Where do interorganizational networks come from? *Am. J. Sociol.* **104**(5): 1439–1493.
- Gulati R, Lavie D, Madhavan R. 2011. Understanding performance effects in networks: reach, richness, and receptivity. *Res. Organ. Behavior* **31**: 207–224.
- Gulati R, Nohria N, Zaheer A. 2000. Strategic networks. *Strategic Management J.* **21**(Special Issue): 203–215.
- Hoberg G, Phillips G. 2010. Product market synergies and competition in mergers and acquisitions: A text-based analysis. *Rev. Fin. Stud.* **23**: 3773–3811.
- Hoberg G, Phillips G. 2016. Text-based network industries and endogenous product differentiation. *J. Political Econ.* **124**: 1423–1465.
- Hsieh K-Y, Vermeulen F. 2014. The structure of competition: how competition between one’s rivals influences imitative market entry. *Organ. Sci.* **25**: 299–319.
- Ingram P, Roberts PW. 2000. Friendships among competitors in the Sydney hotel industry. *Am. J. Sociol.* **106**(2): 387–423.
- Karnani A, Wernerfelt B. 1985. Multiple point competition. *Strategic Management J.* **6**: 87–96.
- Kilduff GJ. 2019. Interfirm relational rivalry: Implications for competitive strategy. *Acad. Management Rev.* **44**(4): 775–799.
- Kilduff GJ, Elfenbein HA, Staw BM. 2010. The psychology of rivalry: a relationally dependent analysis of competition. *Acad. Management J.* **53**(5): 943–969.
- Kilduff M, Brass DJ. 2010. Organizational social network research: core ideas and key debates. *Acad. Management Annals* **4**: 317–357.
- Knoke D, Burt RS. 1983. Prominence. In *Applied Network Analysis*, Burt RS, Minor MJ (eds). Newbury Park: Sage: 195–222.



- Labianca G, Brass DJ. 2006. Exploring the social ledger: negative relationships and negative asymmetry in social networks in organizations. *Acad. Management Rev.* **31**(3): 596–614.
- Lazzarini SG. 2007. The impact of membership in competing alliance constellations: evidence on the operational performance of global airlines. *Strategic Management J.* **28**(4): 345–367.
- Lorrain F, White HC. 1971. Structural equivalence of individuals in social networks. *J. Math. Sociol.* **1**: 49–80.
- McGahan AM, Porter ME. 1997. How much does industry matter, really? *Strategic Management J.* **18**(Summer Special Issue): 15–30.
- McPherson M. 1983. An ecology of affiliation. *Am. Sociol. Rev.* **48**: 519–532.
- Nayyar PR, Kazanjian RK. 1993. Organizing to attain potential benefits from information asymmetries and economies of scope in related diversified firms. *Acad. Management Rev.* **18**(4): 735–759.
- Ocasio W. 1997. Towards an attention-based view of the firm. *Strategic Management J.* **18**(Summer Special Issue): 187–206.
- Oxley JE. 1997. Appropriability hazards and governance in strategic alliances: a transaction cost approach. *J. Law, Econ. Organ.* **13**: 387–409.
- Park RE. 1992. *Human Communities*. Free Press: New York.
- Podolny JM. 1993. A status-based model of market competition. *Am. J. Sociol.* **98**: 829–872.
- Pontikes EG, Barnett WP. 2015. The persistence of lenient market categories. *Organ. Sci.* **26**: 1415–1431.
- Porac JF, Thomas H. 1990. Taxonomic mental models in competitor definition. *Acad. Management Rev.* **15**: 224–240.
- Porac, JF, Thomas H. 1994. Cognitive categorization and subjective rivalry among retailers in a small city. *J. Applied Psych.* **79**(1): 54–66.
- Porac, JF, Thomas H, Wilson F, Paton D, Kanfer A. 1995. Rivalry and the industry model of Scottish knitwear producers. *Adm. Sci. Q* **40**: 203–227.
- Porter ME. 1980. *Competitive Strategy: Techniques for Analyzing Industries and Competitors*. Free Press: New York.
- Reger RK, Huff AS. 1993. Strategic groups: a cognitive perspective. *Strategic Management J.* **14**: 103–124.
- Robins JA, Wiersema MF. 2003. The measurement of corporate portfolio strategy: analysis of the content validity of related diversification indexes. *Strategic Management J.* **24**: 39–59.
- Rothaermel FT. 2001. Incumbent's advantage through exploiting complementary assets via interfirm cooperation. *Strategic Management J.* **22**: 687–699.
- Rowley T, Behrens D, Krackhardt D. 2000. Redundant governance structures: an analysis of structural and relational embeddedness in the steel and semiconductor industries. *Strategic Management J.* **21**: 369–386.
- Rumelt RP. 1982. Diversification strategy and profitability. *Strategic Management J.* **3**(4): 359–369.
- Scherer FM, Ross D. 1990. *Industrial Market Structure and Economic Performance*. Houghton Mifflin: Boston.
- Seibert SE, Kraimer ML, Liden RC. 2001. A social capital theory of career success. *Acad. Management J.* **44**: 219–237.

- Simon HA. 1972. Theories of bounded rationality. In *Decision and Organization*. McGuire CB, Radner R (eds). North-Holland: Amsterdam.
- Skilton PF, Bernardes E. 2015. Competition network structure and product market entry. *Strategic Management J.* **36**(11): 1688-1696.
- Smith KG, Ferrier W, Ndofor H. 2001. Competitive dynamics research: critique and future directions. In *Handbook of Strategic Management*, Hitt M, Freeman R, Harrison J (eds). Blackwell: London: 315–361.
- Smith KG, Grimm CM, Gannon MJ, Chen M-J. 1991. Organizational information processing, competitive responses, and performance in the U.S. domestic airline industry. *Acad. Management J.* **34**: 1–26.
- Sorenson TL. 2007. Credible collusion in multimarket oligopoly. *Managerial Decision Econ.* **28**: 115–128.
- Stuart TE, Hoang H, Hybels R. 1999. Interorganizational endorsements and the performance of entrepreneurial ventures. *Adm. Sci. Q* **44**: 315–349.
- Tanriverdi H, Lee C-H. 2008. Within-industry diversification and firm performance in the presence of network externalities: evidence from the software industry. *Acad. Management J.* **51**(2): 381–397.
- Thatchenkery S, Katila R. 2021. Seeing what others miss: A competition network lens on product innovation. *Organ. Sci.*
- Tirole J. 1988. *The Theory of Industrial Organization*. MIT Press: Cambridge, MA.
- Tsai W, Su K-H, Chen M-J. 2011. Seeing through the eyes of a rival: competitor acumen based on rival-centric perceptions. *Acad. Management J.* **54**: 761–778.
- Uzzi B. 1996. The sources and consequences of embeddedness for the economic performance of organizations: the network effect. *Am. Sociol. Rev.* **61**: 674–698.
- Venkataramani V, Dalal RS. 2007 Who helps and harms whom? Relational antecedents of interpersonal helping and harming in organizations *J. Applied Psych.* **92**: 952–966.
- Wasserman S, Faust K. 1994. *Social Network Analysis: Methods and Applications*. Cambridge University Press: New York.
- Weigelt K, MacMillan IC. 1988. An interactive strategic analysis framework. *Strategic Management J.* **9**: 27–40.
- Wernerfelt B. 1984. A resource-based view of the firm. *Strategic Management J.* **5**(2): 171–180.
- White HC, Eccles R. 1987. Producers’ markets. In *The New Palgrave: A Dictionary of Economics*, Vol. 3. Macmillan: London.
- Yamanoi J. 2011. Competition networks: the influence of relational and structural embeddedness on competitive activity. *The 31st Annual Conference of the Strategic Management Society*, Miami, FL.
- Young G, Smith KG, Grimm CM. 1996. “Austrian” and industrial organization perspectives on firm-level competitive activity and performance. *Organ. Sci.* **7**: 243–254.
- Zaheer A, Bell GG. 2005. Benefiting from network position: firm capabilities, structural holes, and performance. *Strategic Management J.* **26**: 809–826.

**TABLES**

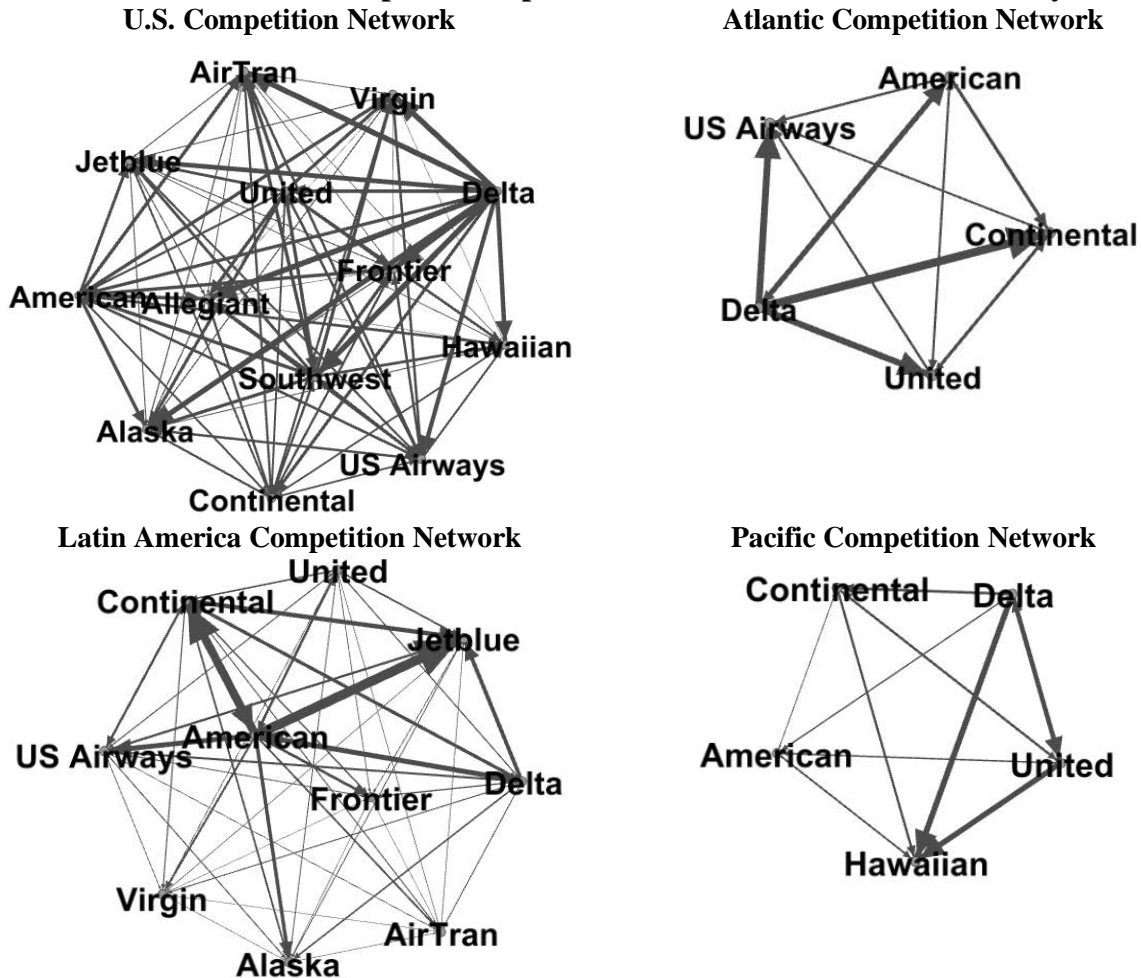
**TABLE 1: Revenue matrix for competitors in the U.S. airline industry, in million dollars**

Market Firm	United States	Atlantic	Latin America	Pacific	Total Revenue
1. American	13,783	3,499	5,460	1,216	23,958
2. Continental	8,935	3,276	2,363	1,601	16,175
3. Delta	22,492	6,625	2,030	4,084	35,230
4. United	13,048	3,483	779	3,845	21,155
5. US Airways	9,949	2,288	1,103	0	13,341
6. Southwest	13,655	0	0	0	13,655
7. JetBlue	3,742	0	767	0	4,509
8. AirTran	2,866	0	75	0	2,942
9. Frontier	1,592	0	69	0	1,662
10. Allegiant	745	0	0	0	745
11. Alaska	4,065	0	245	0	4,310
12. Hawaiian	1,274	0	0	377	1,651
13. Virgin	1,007	0	30	0	1,037
Total Revenue	97,153	19,171	12,921	11,123	140,368

Source: U.S. Department of Transportation

**FIGURES**

**FIGURE 1: An example of competition networks in the airline industry**



**FIGURE 2: A theoretical framework for competition networks and firm performance**

