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Does rivals' innovation matter? A competitive dynamics perspective on firms' product strategy☆

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ABSTRACT

We build on the awareness-motivation-capability (AMC) framework of competitive dynamics research to examine how a signal of a rival's innovation, in the form of research and development (R&D) intensity, may influence a focal firm's product actions. We argue that a rival's R&D intensity increases a focal firm's awareness of a competitive threat and thus its motivation to react by increasing its product actions. However, this competitive impact is conditional on the focal firm's size and performance relative to the rival, as well as the strategic homogeneity of the two. We use the AMC framework to analyze such moderating effects.

Firms often operate in industries characterized by hyper-competition (Chen, Lin, & Michel, 2010; Gimeno & Woo, 1996), in which they must closely gauge the competitive signals sent out by rivals and incorporate such information when planning their own actions, so as to defend their positions. In view of such competitive dynamics, some researchers have argued that rivals' competitive signals create awareness and motivation in a focal firm (Chen, 1996), which must then assess its capabilities as to whether and how to respond to the rivals (Chen & Miller, 2014). This logic has inspired researchers to identify factors related to a focal firm's awareness, motivation, and capabilities, and to use these factors in predicting its competitive behavior (Marcel, Barr, & Duhaime, 2010). For example, empirical studies have offered ample evidence that factors such as rivals' action characteristics (e.g., potential impact, visibility, action volume) (Chen & Miller, 1994; Chen, Smith, & Grimm, 1992; Derfus, Maggitti, Grimm, & Smith, 2008), the geographic distance between rivals and focal firms (Yu & Cannella, 2007), and rivals' competitive success (Hsieh, Tsai, & Chen, 2015), may determine focal firms' competitive behavior.

However, researchers have not yet studied the competitive signals embedded in rivals' financial statements, although these statements may contain important information about the commitments, current strategies, and future plans of rivals, which provide key information for focal firms to use in analyzing the potential threats the rivals are likely to pose (Porter, 1980). For example, a given rival's financial statements, by revealing its resource allocations, may signal to a focal firm the rival's strategic intent and upcoming competitiveness (Porter, 1980). As a result, the focal firm may use this competitive information to develop knowledge about the rival (awareness), gauge the need to react (motivation), and assess the abilities required to compete successfully (capability). Thus, understanding the implications of firms' financial statements is critically important to competitive dynamics research.

In this study, we build on competitive dynamics research to develop an integrative model that links the competitive cues contained in a rival's financial statements to a focal firm's subsequent competitive actions. We focus on a particular form of competitive cue in the financial statements, namely, research and development (R&D) intensity, and use it to explain the focal firm's subsequent product actions. A firm's R&D intensity represents an important aspect of its absorptive capacity (Cohen & Levinthal, 1990) and is directly related to its learning and innovation outputs (Acs & Audretsch, 1988). Although the innovation and learning literature has reported investigations of this concept, few studies have considered its competitive implications. Researchers recognize that in technology industries, constant technological change threatens firms' competitive profile and may rapidly render firms' market advantage obsolete (Tushman & Anderson, 1986). The emergence of innovative ideas and ever-changing technology allow most products to enjoy only a short span and no matter how innovative a product is when introduced, its technological and functional superiority will decline over

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time and be surpassed by more innovative products introduced later by rivals (Tushman & Anderson, 1986). To remain competitive, a focal firm needs to constantly gauge rivals' R&D efforts and plan its subsequent actions accordingly (Katila & Chen, 2008; Smith, Collins, & Clark, 2005); therefore, competitive signals indicating rivals' learning and absorptive capability, such as R&D intensity, are likely to influence a focal firm's product strategy.

On the basis of these ideas, we address the following research question: *How will a given rival's R&D intensity influence a focal firm's subsequent product action*? We propose that in technology industries, a rival's R&D efforts may increase a focal firm's awareness of future competitive threats and the need to react, driving it to more product actions. However, this competitive impact depends on several factors that influence the focal firm's awareness, motivation, and capability. We argue that the focal firm's size relative to the rival influences its awareness, its performance relative to the rival influences its motivation to react, and the strategic homogeneity between the two determines its capability to act. We test our hypotheses with a sample of 235 firm-rival pairs in the computer software sector and 9838 observations between 1987 and 2010.

1. Theory and hypotheses

Research on competitive dynamics conceptualizes competition as a dynamic process of firms' actions and responses (Chen, 1996). This logic highlights the interdependence between the payoff to a firm and to its rival such that the competitive position of a focal firm will be threatened if the rival undertakes offensive or defensive actions (Rindova, Becerra, & Contardo, 2004). In view of this interdependence, competitive dynamics researchers have conceptualized awareness, motivation and capability (AMC) as the key behavioral drivers of firms' competitive actions (Chen, 1996). Awareness refers to a firm's knowledge of competitive signals, motivation captures a firm's logic and intention to take an action, and capability reflects a firm's internal strengths that make its actions possible. "Simply stated, a competitor will not be able to respond to an action unless it is aware of the action, motivated to react, and capable of responding" (Chen & Miller, 2014: 2). A logical sequence is apparent in the AMC framework; awareness is the prerequisite in that a firm must be aware of a rival's action before it can consider motivation and capability and then needs to judge whether an action is advisable (motivation) before determining if it has the capability to carry out the action (Chen & Miller, 2014; Derfus et al., 2008; Ndofor, Sirmon, & He, 2011; Yu, Subramaniam, & Cannella, 2009).

Competitive dynamics research, especially the AMC framework, offers a particularly useful perspective for examining firms' innovation and product strategy in technology industries (Katila & Chen, 2008), in which firms must aggressively invest in innovation and constantly introduce new products. Even then, the competitive advantage associated with any new product may be quickly eroded by rivals' innovation efforts; as a result, a focal firm must closely follow signals indicating rivals' innovation efforts so as to predict their actions. This logic has inspired some researchers to examine firms' innovation strategy on the basis of a "competitive view." Bowman and Gatignon (1995) have documented that firms tend to react to rivals' new products and Katila and Chen (2008) found that rivals' exploration and exploitation can influence the frequency and innovativeness of a focal firm's new product introductions.

A key source of competitive intelligence indicating a rival's innovation efforts is its R&D intensity, as shown in its financial statements. Indeed, management researchers have long recognized the significance of the competitive information contained in financial statements (Healy & Palepu, 1993; Porter, 1980). For example, information in financial statements may indicate current performance, motivation to change or maintain current strategies, or plans managers have made regarding resource allocations (Fombrun & Shanley, 1990). In competitive situations, a particularly important piece of information to be obtained from a rival's financial statements is R&D intensity, defined as the ratio of the rival's R&D expenditure to its total revenue (Greve, 2003). Because R&D transforms basic knowledge into "codified outputs" such as patents or commercialized products (Coff, 2003), a rival's R&D intensity represents its absorptive capacity, which is related to its innovation outputs and future competitive advantage (Cohen & Levinthal, 1990), which implies future threats to a focal firm.

In this paper, we build on the AMC framework to examine how a given rival's R&D intensity, as reflected in its financial statements, may influence a focal firm's subsequent product actions. Our premise is that in pair-wise competitive relationships, firms are highly interdependent in that if one gets ahead, the other falls behind (Rindova et al., 2004). We argue that a rival's R&D intensity as shown in financial statements provides the awareness and motivation for a focal firm to engage in product actions but that this relationship can be constrained or enhanced by factors that influence the focal firm's awareness, motivation and capability. Competitive dynamics scholars have shown that rival firms' size, past performance, and strategic homogeneity influence their competitive engagements (Chen, Su, & Tsai, 2007). Following prior research (Chen et al., 2007), we conceptualize a focal firm's size relative to that of the rival as a proxy for awareness; its performance relative to that of the rival as motivation; and the two firms' strategic homogeneity as capability. We argue that the impact of a rival's R&D intensity on a focal firm's subsequent product action will be moderated by these variables.

1.1. Direct effects of rival's R&D intensity

Increases in a firm's R&D intensity can be an effective response to the challenges the firm encounters in the competitive market (Gentry & Shen, 2013). By investing heavily in R&D, a rival may generate new knowledge to advance new products, develop new approaches to improve existing products, and enhance its overall innovation capability (Cohen & Levinthal, 1990; Gentry & Shen, 2013). The R&D intensity of a rival can thus be understood by a focal firm as an important component of the rival's repository of technological competencies (Coff, 2003; Ndofor et al., 2011). In particular, firm performance is often interdependent in competitive markets such that more innovative products of a rival necessarily put a focal firm at a competitive disadvantage. Thus, the focal firm tends to follow closely information about the innovation strategy of rivals, and awareness of such information greatly influences its own competitive strategy. Indeed, by investing heavily in R&D, a rival shows its intention to move forward with innovative products and its determination to compete hard in the impending rivalry. In addition, a rival with strong R&D intensity may be able to introduce radically improved products, thereby destroying the focal firm's current core competence (Tushman & Anderson, 1986). These competitive implications are likely to capture the focal firm's attention (awareness) and give it the incentive to react (motivation), both of which often lead to aggressive reactions on the part of the focal firm (Chen et al., 1992; Marcel et al., 2010; Porter, 1980). Additionally, since information about a rival's R&D intensity is publicly available, this competitive signal tends to trigger the focal firm's alertness so as to drive it into aggressive defense, the most effective defense of which is perhaps an immediate increase in product actions.

H1. A rival's R&D intensity will be positively related to a focal firm's frequency of product actions.

1.2. Moderating effects

Although a rival's R&D intensity poses a direct threat, the strength of this influence may depend on other factors influencing the focal firm's awareness, motivation, and capabilities. In this paper, we use relative