An Analysis of Decision-making under the Conditions of Direct Competition

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A dissertation submitted to the Faculty of Economics of the Università della Svizzera italiana in partial fulfillment of the requirements for the degree of Doctor of Philosophy under the direction of Prof. Nikolaus Beck

Lugano, October, 2022

ACKNOWLEDGMENT

I would love to write many words here, but sometimes it is better to limit yourself. I want to express my gratitude on a very long number of pages, but then I realize that words, although powerful in their essence, are not always able to convey sensations and emotions—words convey images and forms better. Hopefully, I will be able to adequately convey my feelings of gratitude using words.

First of all, I am grateful to my parents for always motivating me to become better every day and for their strong desire to participate in this process. Without their help and faith in me, none of this (including this dissertation) would have been possible. I am grateful to Professor Beck for getting me interested in research, the world of statistics, and the topic of organizational learning. Thanks to his course, I first thought about starting a doctoral program. I am also grateful to him for his faith in me, patience, and desire to support me in writing papers. I would like to express my special gratitude to Professor David Lehman for taking the time to listen to my ideas thoroughly, and not superficially, during the CSOL conference in 2019 and subsequently helping to improve and polish the ideas for the first article in his role as its co-author. Professor Wezel showed me what it means to love what you do—to give it all your heart and devote all your time. Only in this way can you achieve mastery. When you love what you do, you don't feel the heaviness and pain of doing it too hard. So, I am grateful to him for these important thoughts. Professor Bettinazzi has become for me a symbol of energy and motivation. Conversations with him always inspire and motivate me to work even harder and to plan not just for the next year, but for several years ahead. Separately, I would like to thank Professor Martignoni for teaching me not to hesitate to ask the question "Why?" during his Simulations course. There can be no research where this question does not exist. Lastly, I would like to express my gratitude to all my colleagues for their continued support, and willingness to communicate and share thoughts, ideas, and suggestions. Specifically, I am grateful to Thorsten, Carla, and Manos (who are now professors and who were senior PhDs back then when I started) for helping me to navigate the massive ocean of information that I faced as a new PhD student. Also, thanks to Ana, Raquel, Ali, Guang, Shuang, Maxi, Mariya, Angelo, Merve, and Ilkyaz for the interesting conversations and willingness to listen and support.

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1. INTRODUCTION

Organization and management studies are predicated on the presence of distinct organizational aspirations. Almost 60 years have passed since Cyert and March's (1963) study on the behavioral theory of the firm, and almost 40 years have passed since Fama and Jensen's (1983a, b) research on the impact of variances in organizational objectives resulting from ownership and control diversity. Firm goals continue to play a significant role in management research (e.g., Argote and Greve, 2007; Fiegenbaum et al., 1996; Greve, 2003; Shinkle, 2012) and practice (e.g., Collins, 2017; Kaplan and Norton, 2007; Levinson, 2003) decades after the publication of these important works. Organization theory focuses on the fundamental problems of why organizations evolve and what causes larger or fewer changes. Organizational change, according to the organizational learning tradition, is driven by the gap between an organization's aspiration level and the performance feedback it gets (Cyert and March, 1963; Huber, 1991; Levitt and March, 1988).

However, the roots of the concept of aspiration levels, as well as organizational reactions to discrepancies between level of aspiration and actual performance, are derived from the psychological literature. From the 1930s to the 1950s, psychologists focused on the experimental exploration of many elements of goal-setting behavior and devoted a substantial amount of research to the analysis of the so-called "level of aspiration." Tamara Dembo (1931) introduced the notion of "level of aspiration" into psychology or, more broadly, social sciences literature in Germany (see, for example, Lewin, Dembo, Festinger, and Sears, 1944) in conjunction with her research on the dynamics of anger. Hoppe (1930) conducted an empirical investigation of this idea based on Dembo's hypothesis that the existence of a specific "level of aspiration" impacted whether or not her participants felt content or unsatisfied with themselves after doing a task. Similarly, he found that sentiments of success or failure after performance feedback depend not only on the perception of the performance but also on whether the performance outcome has achieved or failed to achieve the desired level of aspiration. Hoppe's study was mostly qualitative, and the subject's aspiration level was deduced by observing whether the performance seemed to be followed by emotions of success or thoughts of failure. Frank (Frank, 1935(a, b, c), Frank, 1937, and Frank, 1938) documented the invention of a quantitative method for the experimental examination of aspiration levels a few years later in the United States. Frank's approach, which was in some ways foreshadowed by the research of Hausmann (1933), provided the subject with a series of exercises of about equivalent difficulty on a specific task. After each performance, participants were notified of their score and asked "how well he intended to do" on the subsequent trial. This assertion of future performance was operationally characterized as the subject's aspirational level, and it was considered that achieving this objective represented success, and failing to do so signified failure. The average difference between the aspiration level and the corresponding previous performance (referred to as the "Goal Discrepancy score") was seen as a measurement of the subject's inclination to set their goals high or low relative to their past performance. The excitement with which researchers examined the application of this quantitative approach to analyze a crucial component of human behavior, namely how a person modifies their objectives in response to success and failure, grew dramatically following the publication of Frank's work. As a result, an impressive number of studies have been gathered, addressing several stages of goal-setting behavior and using numerous variants of the fundamental process devised by Frank and Hausmann, all of which fall under the umbrella term of aspiration research. In 1944, Lewin et al. devised the first conceptual framework for the level of aspiration theory, or, as Michalos (1986, p. 66) called it, "goal-achievement gap theory," which incorporated theoretical ideas on goal setting as well as ideas about the consequences for the individual of not achieving the goals. According to this theory, each positive or negative disparity between a goal and its attainment or non-achievement results in two emotional categories: "success" (achieving one's objective) and "failure" (not reaching one's goal). In addition, a theory of decision-making was proposed in which goals are consciously established via a probabilistic process of active selection. Individuals are thus expected to assess each attainable level of aspiration based on how they would feel if they achieved it (valence of success) and how they would feel if they did not (valence of failure). After giving each level of attainment a subjective likelihood of success and a counter-probability of failure, the real level of aspiration is chosen to maximize the probability-weighted net valence. This is similar to how the expected utility theory works.

The aspiration level research conducted by the abovementioned psychologists influenced later the research in the field of economics and management specifically. The first attempt to use the aspiration level in economic theory was made by Starbuck in 1963. In his paper on the level of aspiration theory, he builds a model of an "economic man which is more realistic from the viewpoint of the behavioral scientist", based on the works of Dembo and Frank. Additionally, he acknowledges the satisficing principles described by Simon (1957), which contribute to the idea of a more adequate decision-maker. The ideas from the theory of the level of aspiration and Simon's "Administrative Behavior" (1947) also form the basis for the behavioral theory of the firm (Cyert and March, 1963).

Organization theory focuses on the fundamental problems of why organizations evolve and what causes larger or fewer changes. Organizational change, according to the organizational learning tradition, is driven by the gap between an organization's aspiration level and the performance feedback it gets (Cyert and March, 1963; Huber, 1991; Levitt and March, 1988). Unsatisfactory performance is the most influential experience for driving changes in organizational objectives, procedures, and structures. Organizational learning research has predominantly studied the issue of organizational transformation via these aspiration-feedback models (e.g., Baum and Dahlin, 2007; Bromiley, 1991; March and Shapira, 1992; Greve, 2003). While Cyert and March (1963: 124) made it clear that aspirations are subjective, researchers today often compare an organization's performance to the average performance of all firms in an entire industry or subindustry (e.g., Baum and Dahlin, 2007, Greve, 1998, 2003).

Performance feedback theory indicates that organizations judge their performance in relative terms (as a function of goals) rather than in absolute ones (outcomes), and that feedback concerning whether performance falls short of these aspirations is a precursor to organizational change (Greve, 2003a). Carnegie School research reveals that when performance falls short of expectations, decision-makers engage in "problemistic search" to enhance performance (e.g., Cyert and March, 1963, p. 169). It's necessary to mention, however, that the performance feedback theory did not emerge until the 1990s (Lounsbury and Beckman, 2015). Extensive empirical research has explored performance feedback theory, developed its central ideas and widened its applicability over the last few decades (Posen et al., 2018; Shinkle, 2012). While this research has considerably advanced performance feedback theory, several of its findings have yielded contradictory results that are not always straightforward to understand. For example, the vast majority of empirical investigations demonstrate that performance exceeding aspirations reduces the intensity of organizational activities. Several reports, on the other hand, indicate that exceeding aspirations might increase R&D spending (Chen and Miller, 2007) and firm risk-taking (Baum et al., 2005). Likewise, most studies show that companies do not differentiate between historical and social performance feedback (Kotiloglu et al., 2021). However, some research suggests that organizations may respond differently to historical and social performance feedback (e.g., Audia and Greve, 2006; Kacperczyk et al., 2014). A few empirical studies show that organizations' reactions to performance feedback may vary depending on a wide range of internal and external variables, including company size (Audia and Greve, 2006), age (Delmar and Wennberg, 2007), ownership (O'Brien and David, 2014), slack (Greve, 2003b), sector (Desai, 2013), and country (Lewellyn and Bao, 2015).

The previous discussion leads us to the following conclusion: when organizations evaluate their present performance against their desired goal, they are driven to take action. However, the picture alters if we take into account cases in which past success provides a weaker incentive for taking action. In this dissertation, I propose that the context of direct rivalry is just such a setting. Competition may be "diffuse" or "direct," as Hannan and Freeman (1988) explain. Market structure and groups fighting "for a limited common pool of resources" are central to the concept of diffuse competition (Baum and Korn, 1996). In contrast, the emphasis of direct competition lies in the actions of competing firms; here, organizations choose and compete head-to-head with particular competitors (Hannan and Freeman, 1988). Empirical research has tended to look at generalized rivalry and industry averages as the driving force behind organizational behavior. This dissertation is an effort to draw attention to non-traditional forms of motivation that emerge in the context of intense rivalry. I contend that 1) in head-to-head competition, when an opponent is really close, one's focus shifts from their own performance to trying to outperform their rival no matter what the current performance level is. 2) the opportunity window to outperform the opponent during a direct competition is usually time-bound; those who search for solutions faster tend to feel more in control of the direct competition. 3) actual decisions directed towards the outperformance of the competitor can have opposite effects on the performance of the focal actor; choices aimed at attacking are beneficial only up to a certain extent, whereas solutions that are aimed at defending against a competitor gradually degrade the performance of the focal actor.

The purpose of this dissertation is to show that when firms compete head-on, analyzing their nearest rival instead of the market as a whole reveals a distinct "shark-like" pattern of behavior. Furthermore, as it is difficult to apply prior experience to tumultuous inter-firm tournaments, the actors are forced to shift their attention away from past performance and toward something more salient and immediate in such conditions, i.e., something that can be easily assessed: the time it takes to discover the solutions. Last but not least, strategies that are aimed at attacking in direct competition only help the focal actor to a certain extent. Given the huge importance of behavioral psychology for the emergence and development of organizational theory I want to combine organizational theories with theories from behavioral psychology when developing the hypotheses in this dissertation.

To examine how various aspects of competition affect competitors, I utilize original data from Formula 1 racing and the Counter-Strike video game.

In Chapter 2 (first study, co-authored by Nikolaus Beck and David Lehman), I investigate how the focal actor's willingness to take risks in a direct rivalry changes as its distance from its nearest rival changes. One striking aspect of this research that sets it apart from the majority of the performance feedback literature is its portrayal of an aspirational level as the primary rival rather than a concrete performance benchmark. Previous studies of socially-motivated performance feedback have assumed, implicitly, that firms concentrate on a single performance aim - industry average (Greve, 2003a; Baum and Dahlin, 2007; Harris and Bromiley, 2007). This means that social aspiration may be defined as the average performance of a certain industry (Greve, 2008; Short and Palmer, 2003; Audia and Greve, 2006; Baum et al., 2005; Greve, 1998; Shimizu, 2007; Iyer and Miller, 2008). We argue that social aspirations are multifaceted. When rankings are used as a metric of success, it takes on added significance. These days, ranking systems are used in a wide range of industries, and they play a crucial role in fostering competition and facilitating informed decision-making (Hazelkorn, 2014). Every ranking system groups firms and people based on a variety of established metrics of success. In this paper, we look at the differences between the two types of social aspirations and how they affect the decision-maker. Aspirations can be broken down into two categories: aspirational targets, which are the desired position in a ranking system an organization strives to achieve, and intermediate aspirations, which are the next-highest ranked competitor relative to the focal firm that must be outperformed as part of a larger tournament. We believe that in direct competition, each of these aspirations will serve as a useful reference point. Given this, we anticipate that aspirational targets will elicit a distinct set of risk-taking behaviors from those associated with intermediate aspirations. The aspirational target is a standard way of showing the desired organizational performance level in the literature on performance feedback. In keeping with this hypothesis, we propose that as one moves further away from the aspiration point, the willingness to take risks grows. For intermediate aspirations, we provide an alternative scenario in which risk-taking rises as the distance to the goal decreases. The hypothesis of the "goal gradient effect" explains this variation in behavior (Hull, 1934). Having a more formidable rival close at hand motivates the focal actor to take more risks (the actor behaves like a shark chasing its prey). Furthermore, we argue, based on attention and time theories, that the strength of each effect shifts as deadlines get nearer (the timeline when the final rankings are announced). We put these theories to the test using the 2018 Bahrain Grand Prix data set for Formula One Racing. With data from all 57 laps of the race and the actions of 19 different drivers, the dataset has 1839 observations. To measure the distance to the aspirational target, we use the focal driver's current rank, and the distance to the intermediate target is quantified as the current time distance (in seconds) between the focal driver and the opponent directly ahead. Risk-taking is measured by driving speed at the track curves. The risk-taking measure is the speed of the driver at the track curvatures.

In this study, we attempt to broaden our understanding of organizational risk-taking and the complexities of social aspirations. Firstly, by delineating between two types of social aspiration levels, we demonstrate that the "social aspiration" notion is richer and more complicated than is widely believed. Second, we extend performance feedback theory by introducing a new setting: direct rivalry, which prompts organizational actors to shift their emphasis and take more risks than is often assumed by the theory. Third, by combining a behavioral theory of the firm with more traditional theories of motivation, we are able to bring together two different but related bodies of literature.

In Chapter 3 (second study, co-authored by Nikolaus Beck), I contend that the search process becomes a predictor of the inclination of the focal actor to take risks when the prior experience is insufficient to inform the present decision-making. The main premise is that in an inter-firm competition, players may seldom depend on their prior expertise to help them solve problems. This is simply because the focal actor is unaware of the possible moves of the competitor and the potential negative effects of such moves. Hence, the uncertainty caused by these circumstances complicates the application of the previous knowledge. Because of the uncertainty, they have to get knowledge not from their prior experiences but through the act of searching. As the time required to find a solution increases, trust in the decision-making process declines, leading to the selection of safer options after they have been created. There are three major factors of organizational risk-taking identified in the performance feedback literature. These are threat-rigidity (Staw et al., 1981), performance deficit (Cyert and March, 1963), and slack (Chen and Miller, 2007). Each degree of deviation from a baseline is used to calibrate the level of risk associated with the final set of solutions (March and Shapira, 1987; March and Shapira, 1992; Greve, 2003; Chen and Miller, 2007). As part of this procedure, organizational search serves as a bridge between the organizational performance level and any subsequent risk-taking (Greve, 2003a; Baum et al., 2005; Chen and Miller, 2007; Posen et al., 2018; Gaba and Joseph, 2013; Kacperczyk et al., 2015; Chen, 2008). The theories of risk-taking, however, focus directly on the interaction between firm performance and risk. The potential effect of the search process itself on risk-taking is usually ignored. This paper aims to fill this vacuum by exploring the effect of the duration of organizational search on risk-taking. When an organizational search is initiated in the absence of existing performance indicators, the length of the search is essential for decision-making. Literature on searches often suggests that search initiation occurs after performance aberrations. On the other hand, there are situations when a search could begin without any prior input. Certain situations are rather infrequent, which makes it difficult for organizations to gather a decent amount of data to learn from; consequently, organizations learn while making decisions (March et al., 1991). They attend to several aspects of the decision-making process. Competitions between organizations are sometimes tense and fraught with uncertainty about who will make what moves. In these situations, it would be impossible to just depend on historical performance data for guidance in making decisions (Audia, Brion, and Greve, 2015; Miller and Shamsie, 1999). I contend that the change in organizational focus and subsequent reaction to the process of searching for solutions may be attributed to a lack of a robust learning basis that can be quickly applied in an uncertain environment (March, 1994). I propose that the threatening uncertainty tied to direct competition, rather than the performance gap, is what causes the organization to go into search mode.

Uncertainty created by inter-firm competitions necessitates quick decision-making; in particular, the time available for completing a search is often restricted under such circumstances (Radford, 1978; Elenkov, 1997). Organizations participating in a tournament are unaware of one another's intentions, allowing speedier decision-makers to attain higher performance levels in a competition (Fredrickson, 1984; Judge and Miller, 1991; Baum and Wally, 2003). Those organizational members who seek and provide alternatives quickly would feel secure about their ability to function in the current environmental conditions (March and Shapira 1992), which leads to higher risk-taking (Mitchell, 1999).

For this study, I collected data on the competitive behavior of professional esports teams in the Counter-Strike: Global Offensive video game during the IEM Katowice 2019 esports tournament. There are 140,290 observations based on 5 matches played between 6 teams of 5 players each. One of the benefits of this setting is that it allows observers to see how each player searches for information and the player’s tendencies to take risks. I operationalize risk-taking as the amount of virtual money spent on in-game equipment acquisition relative to the overall available money.

There are several ways in which this study could contribute to the ongoing literature discussion on organizational learning and risk-taking. In particular, this research takes into account the role that the act of searching plays in determining participants' propensity to take risks. Furthermore, it connects the literature on self-confidence and risk-taking to clarify why people take different risks in direct competition. The paper considers an alternative method of learning, one in which knowledge is gained not from studying the past but through participating in the present.

In Chapter 4 (the last study), the focus is on the post-search process, with an emphasis on more practical consequences for the organization. Decisions made in direct competition to harm the opponent organization or defend against assaults launched by the opponent organization are studied for their potential outcomes. The primary finding of this study is that, so long as they are not overdone, solutions that are selected to hurt the opponent's performance tend to help the actor. Instead, measures that are geared towards ensuring the protection of the focal firm often have a negative impact on the overall performance of the organization. The connection between organizational action and performance is one of the main foci of competitive dynamics theory (Ferrier et al., 1999; Smith et al., 1992; Young, Smith, and Grimm, 1996). Organizational action is a positioning tool - firms change their position within the industry and exploit various market gaps through their actions (Porter, 1980; Barney, 1991; Grimm and Smith, 1997). Studies of competitive dynamics often analyze how different factors—including the amount and kind of actions taken by the focal actors—influence organizational performance (Ferrier et al., 1999; Smith et al., 1992).

However, past studies on competitive dynamics did not take into account that attacking and defensive moves of the same focal actor might have quite different effects on their performance. At any point in time, any organization can both attack one firm and defend itself against the other firm's attacks (Grimm, Lee, and Smith, 2006). The relevant question is then whether organizations would benefit more from more aggressive strategies or, on the contrary, defensive strategies. The more aggressive strategies are used, the more the actors feel they are in control of the competition. On the other hand, being forced to defend oneself entails giving up some environmental control and facing greater degrees of uncertainty as a result of having to guess at the opponent's next move. Making offensive and defensive maneuvers requires different amounts of cognitive and organizational resources. It takes more time and resources to implement an aggressive strategy, and those resources will inevitably be depleted as time goes on. As a result, the gains made by the organization as a result of the offensive measures begin to diminish as cognitive and financial resources are depleted. Defensive strategies, on the other hand, require fewer cognitive resources but put the organization under intense pressure, which translates into a performance decrease over time.

To put these hypotheses to the test, we looked at the strategies used by the various teams competing in the esports championship IEM Katowice 2019. There are 140,290 observations in all, from five games played by six teams (with five players per side). In this setting, we were able to closely monitor the actions of each player on both teams and accurately categorize them as either offensive or defensive. Specifically, we quantify performance as the number of times a player was eliminated by the other team's players throughout a match. The predicted effects of the number of attacking moves and of defensive moves on performance are generally supported.

In general, this dissertation represents an analysis of how an organization interacts with the competitive environment at two different levels. On the one hand, I consider a more voluminous component of the competition, where the actor has to take into account two types of levels of social aspiration. Each of them provokes a specific behavioral pattern and, accordingly, different risk dynamics. The main idea is that such patterns are typical in tournament contexts. On the other hand, the need to take into account the complex nature of the social aspirations on the actor disappears when it comes to a long and intense clash between two organizations, during which they are forced to look for ways to overcome the opposite side and protect themselves. In this context, the concept of the level of aspiration fades into the background, and behavioral patterns are regulated by the time of search for solutions and the nature of the chosen competitive strategy. Accordingly, this dissertation presents an analysis of the decision-making process, both from a more general position, which is closest to modern realities, and from a more granular position, which involves a focus on the clash of two organizations. This approach allows to fully study the overall impact of competition on an actor in a tournament context with a large number of participating organizations, where the differences between the desire to reach a specific rank eventually and to win each specific opponent are important. On the other hand, this approach also allows us to explore the nuances and differences between a tournament (with two types of social aspiration) and a specific competition between two organizations, where the eventual goal is to directly defeat one opponent.

2. ORGANIZATIONAL RISK TAKING DURING DIRECT COMPETITION: INTRODUCING THE SHARK MODEL

Abstract

Studies of organizational learning generally agree that risk taking is shaped by performance relative to aspirations. Recent research suggests that these aspirations are informed in different ways by the performance levels of different sets of peers. This multi-dimensional nature of social aspirations is increasingly important given the growing prevalence of organizational ranking systems. This study considers the unique effects of two different types of social aspiration levels particularly germane to such ranking systems: (a) *aspirational targets*, defined as the position within a ranking system to which the organization eventually wishes to achieve, and (b) *intermediate targets*, defined as the next-higher-ranked competitor relative to the focal organization that must be overtaken in pursuit of an aspirational target. For aspirational targets, we posit that risk taking *increases* with increasing distance below the target, consistent with the behavioral theory. For intermediate targets, however, we posit that risk-taking *increases* with decreasing distance below the target, much like a shark chasing its prey. The proposed hypotheses were tested and largely supported using data from Formula 1 Racing during the Bahrain Grand Prix 2018 race. Implications for theory and practice are discussed.

INTRODUCTION

Current research on organizational learning consists to a large degree of studies that examine the effects of performance feedback on risk taking (Greve 2003, Posen et al. 2018). Studies within this research stream combine theories of risk taking (Bowman 1980, Kahneman and Tversky 1979) and search (Cyert and March 1963), which together suggest that risk taking is contingent upon performance relative to aspirations. Aspiration levels were initially conceptualized as a combination of a firm's past performance (i.e., historical aspirations) and that of other organizations in the same industry (i.e., social aspirations) (Cyert and March 1963). Many studies later conceived that historical and social aspirations influence organizational action independently rather than jointly (Greve 2003c). Most empirical studies have thus distinguished between feedback from performance relative to historical versus social aspirations. Because both types of performance feedback are expected to trigger similar behavioral responses (see Baum et al. 2005, Baum and Dahlin 2007, Greve 2003c, Greve 1998, Harris and Bromiley 2007), however, it is difficult to determine which aspirations dominate organizational action.

Prior research on performance feedback relative to social aspirations, in particular, has implicitly assumed that organizations maintain a *single* performance target (Greve 2003a, Baum and Dahlin 2007, Harris and Bromiley 2007). Scholars have often conceptualized social aspirations as average industry performance (Greve 2008, Short and Palmer 2003, Audia and Greve 2006, Baum et al. 2005, Greve 1998, Shimizu 2007, Iyer and Miller 2008). However, such a construction of social aspirations has been criticized in recent years as researchers suggest that a social reference group needs to be defined more precisely (Short and Palmer 2003, Washburn and Bromiley 2012, Lehner 2000). In response, a small number of studies have attempted to improve the validity of social aspiration conceptualizations by defining the social comparison group more precisely. For example, Labianca et al. (2009) differentiated between "immediate" and "inspiring" competitors. Relatedly, Moliterno et al. (2014) differentiated between lower and upper thresholds for a given reference group. These studies together suggest that social aspirations indeed represent a more complex reality that extends beyond a single dimension. We argue that this multi-dimensional nature of social aspirations is particularly relevant in situations in which performance is at least partially evaluated in terms of rankings. Ranking systems have become increasingly relevant over the last 30 years (e.g., Hazelkorn 2014). Consequently, a wide range of industries and professional activities are nowadays subject to competitive pressures created by these ranking systems. Consider the following examples: Fortune's Most Admired Companies, Forbes' Celebrity 100, Time's 100 Most Influential People, National Football League's Top 100 Players, Working Mother's 100 Best Companies for Working Moms, Human Rights Campaign's Best Places to Work, and the European Commissions U-Multirank, among others.[1] Each sorts organizations and/or individuals based on different performance metrics, many of which are published in the popular press.

Therefore, the present study contributes to the emerging body of research on multi-dimensional social aspirations by examining organizational risk taking in the context of ranking systems. Specifically, we echo others who have offered critiques of social aspirations operationalized as industry averages and, in doing so, build upon this work by considering the dynamics of risk taking during direct competition. Critically, we consider the unique effects of two different types of social aspiration levels: (a) *aspirational targets*, defined as the position within a ranking system to which the organization eventually wishes to achieve, and (b)

[1] Links to the rankings listed here:
https://fortune.com/worlds-most-admired-companies/
https://www.forbes.com/celebrities/
https://time.com/collection/100-most-influential-people-2020/
https://www.nfl.com/network/shows/nfl-top-100
https://www.workingmother.com/working-mother-100-best-companies-winners-2019
https://www.umultirank.org/about/u-multirank/the-project/

intermediate targets, defined as the next-higher-ranked competitor relative to the focal organization that must be overtaken in pursuit of an aspirational target. We suggest that organizational actors will evaluate performance relative to each type of target in unique ways.[2]

The core thesis is that organizational risk taking will vary uniquely as a function of performance relative to aspirational versus intermediate targets. For aspirational targets, we posit that risk taking *increases* with *increasing* distance below the target, consistent with behavioral theory. For intermediate targets, however, we posit that risk taking *decreases* with *increasing* distance below the target, i.e. risk taking increases as performance approaches the intermediate target. Drawing on classic work on the "goal gradient effect" (Hull 1934), we argue that proximity to the next-higher-ranked competitor results in changes in motivation, which translate to an increased intensity of risk taking. Put another way, the actor behaves like a shark chasing its prey. We additionally draw on theories of attention and time to posit that the strength of each effect depends on the proximity of deadlines, or the timeline for rankings to be determined.

The proposed hypotheses were tested using data from Formula One Racing during the Bahrain Grand Prix 2018 race. The dataset includes 1839 observations from 19 drivers and 57 racing laps. The distance to the aspirational target is operationalized as the focal driver's current rank, and the distance to the intermediate target as the current distance, measured in time, between the focal driver and the competitor directly in front. Risk taking is captured based on driving speed during critical locations on the track: curves. The hypotheses are generally supported.

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[2] Consistent with prior research on behavioral theory, we use the terms "organization" and "actor" interchangeably. The level of analysis for the conceptual framework and empirical study is the organization. However, it is individual actors who carry out the actions required to act upon performance feedback. The discussion section considers further matters of levels of analysis.

This study stands to make several contributions to our understanding of organizational risk taking in general and the role of social aspirations in particular. First, we demonstrate that the concept of social aspirations is richer and more complex than is usually presumed by differentiating between two different types of social aspirations. Second, we extend performance feedback theory by introducing a different context, namely direct competition or contests, which prompt organizational actors to focus attention and engage in risk taking in particular ways that deviate from the traditional perspective of performance feedback theory. Third, we bridge two different streams of research in productive ways: behavioral theory of the firm and classic theories of motivation. In addition, these findings point to a range of practical implications.

THEORY AND HYPOTHESES

The behavioral performance feedback literature has conceptualized performance targets in terms of historical and social aspirations (Bromiley and Harris 2014, Gavetti et al. 2012). Historical aspirations are formed by taking one's performance history as a reference, typically modelled as a weighted moving average of past performance. Social aspirations, on the other hand, usually consist of the average performance of a reference group of firms, which the focal organization uses for comparisons with its performance. Most findings show that performance relative to either type of aspiration shapes risk taking in similar ways (e.g., Baum et al. 2005, Greve 1998).

With respect to performance below an aspiration level, the literature proposes two different possible responses. On one hand, risk taking might increase as performance falls further below the aspiration level. In such situations, organizational members have a heightened need to find a satisfying solution to the performance shortfall via a "problemistic search" (Cyert and March 1963). Such search tends to result in such risky endeavors as experimentation (March 1991), change (Greve 1988), and innovation (Bolton 1993). On the other hand, risk taking might decrease as performance falls further below the aspiration level. Here, the threat of non-survival results in a sort of paralysis that reduces risk taking (Staw et al. 1981, Ocasio 1995, Cameron et al. 1987, D'Aveni 1989, McKinley 1993, Chen and Miller 2007). Whether problemistic search or threat-rigidity prevails depends on the focus of organizational attention. According to March and Shapira (1992), organizational actors focus their attention on either the aspiration level or survival point depending on whichever is closest to current performance levels.

The behavioral consequences of performance above the aspiration level have usually been found to be rather similar to the ones below the aspiration level (e.g., Moliterno et al. 2014). As performance increases above the aspiration level, risk taking decreases; however, the effect is sometimes considerably stronger because risk taking seems increasingly unnecessary when performance is above the aspiration level (Greve 1998, 2003). Some studies have reported findings consistent with the notion of a slack search (e.g. Chen and Miller 2007, Singh 1986) such that risk taking increases as performance increases above the aspiration since the slack that accumulates during periods of over-performance allows organizations to experiment with novel and risky solutions (Cyert and March 1963, March and Shapira 1992). In general, however, most findings agree that risk taking is less likely when performance exceeds aspirations.

While historical performance feedback is defined relatively unambiguously and consistently in research, our understanding of social-based targets and risk taking is still nascent for several reasons. Social aspirations are usually conceptualized using the average performance of firms, which belong to the reference group of comparable organizations (Greve 2003b), and performance is measured as the difference between the current performance level and this average (Audia and Greve 2006, Baum et al. 2005, Greve 1998, Shimizu 2007) or median performance (Iyer and Miller 2008). In addition, the literature on problemistic search tends to focus almost exclusively on financial performance as the proxy for aspiration levels. Indeed, profitability measures are the most frequent indicators for performance aspirations in prior studies (e.g., Audia et al. 2000, Bromiley 1991, Greve 2003a/b, Lant et al. 1992, Miller and Chen 2004). Relatively few studies have investigated non-financial goals such as the number of patent citations (Audia and Sorenson 2001) or network status (Baum et al. 2005).

Moreover, nearly all prior studies have conceptualized social aspirations with a single measure (Bromiley 2014). However, this convention of using a single social aspiration level has been recently contested. For example, Moliterno et al. (2014) proposed two social aspiration points: a lower-end threshold above which an organization still belongs to the same reference group and a top-performance threshold above which an organization receives further benefits. They argue that organizations take only one of these thresholds into account at a time, namely, the one closest to its prior performance. We echo these findings to argue that studies on performance feedback should be extended by accounting for multiple social aspiration levels. We maintain that this is especially important in contexts in which rankings play an important role in measuring performance.

Organizational ranking systems – "publicly available comparative orderings of organizations, based on evaluation criteria determined by a ranking organization" (Martins 2005: 701) – have gained increasing importance in the last three decades (see Hazelkorn 2014). As the prevalence and impact on access to resources of rankings grows so does the pressure caused by them, leading to competition among ranked members (de Rijcke et al. 2016, Espeland and Sauder 2016b, Hazelkorn 2016 Paradeise and Thoenig 2013, Rindova et al. 2017). There were only 183 publicly available evaluations of firms in 38 countries roughly a decade ago according to the Reputation Institute (Fombrun, 2007). Since then, the number of evaluations has been increasing at a rapid pace (Rindova et al. 2017). Specifically, there are now evaluations of over 2,000 companies publicly accessible according to the Reputation institute (RepTrak 2021).

Importantly, rankings influence perceptions of both performance as well as survival for a range of observers (Rao 1994, Cho and Pucik 2005, Porter and Miles 2013). For example, a university's ranking impacts the extent to which employers seek its graduates (Rindova et al. 2005) as well as the extent to which it receives research funding, donations, and tuition (Bastedo and Bowman 2011). Organizations that occupy high positions in rankings are benchmarked more often and maintain outsized influence over other organizations (Still and Strang 2009). In short, rankings create competitive pressures. Rankings force comparisons among organizations, which, in turn, lead to competitive behavior (Festinger 1954). For example, according to Hazelkorn (2014, p.20) "70% of university leaders desire to be among the top 10% of HEIs (higher education institutions) nationally, and 71% want to be in the top 25% internationally; more than 50% said they had a formal process for reviewing their institutional positions, as a result of which 63% took strategic, organizational, managerial, or academic action." Additionally, it is widely accepted that the current era is characterized by increasing competition (Rosa 2006, Schimank and Volkmann 2017), and rankings are a key driving force of it (Corley and Gioia 2000, Espeland and Sauder 2016a, Marginson and van der Wende 2007, Mau 2017).

Most rankings also impose a certain deadline at which they become published even though the duration of the contests varies widely. For example, MBA rankings and many "best companies to work fo" lists are published annually, Billboard music charts are updated weekly, and most sporting events last anywhere from a few minutes to a few hours. While in each case, the current position in a ranking may vary between the rankings publications, the final rankings are punctuations in time that possess great significance and serve as time-discrete manifestations of (missed) achievements (see Lehman et al. 2011). Thus, rankings provide important information for organizations and individuals about their current performance. In many cases, it is possible to achieve short-term improvements between the deadlines at which the rankings outcomes are published. Consider, for example, sports contests. Soccer or football teams are repositioned in league standings after every match (round of the season). Alpine skiers rise or fall in the world-cup standing after every world-cup race. Within motorsports, this updating of one's current position in a ranking is particularly pronounced: car or motorcycle racers in a championship series are not only informed about their changing position in the standing after each race. Even within a race, they know at which rank they currently perform. Thus, the end of a race can itself be regarded as a deadline with a final ranking. Frequent updates of performance within a ranking have two major implications. First, actors are informed of where they *would end up* in the final ranking if nothing changes between the current situation and the deadline. Second, these updates also inform them of the current distance in performance to their closest competitors – those currently performing just ahead of or just behind them.

We maintain that this twofold information of ranking updates should result in two different types of social aspiration levels. First, ranking updates create *aspirational targets*, which we define as the position within a ranking scheme to which the actor hopes to attain by the deadline. Second, ranking updates create *intermediate targets*, which we define as the closest "front competitor" of the focal actor, i.e., the next-higher-ranked competitor. These targets represent the intermediate steps that must be surpassed to progress toward the aspirational target. This makes each front competitor a salient goal of high priority according to the sequential attention principle (Cyert and March 1963, Greve 2008). During the activity of surpassing competitors, attention is focused more on operational decision-making rather than on long-term strategic decision-making. Therefore, intermediate targets contribute (operationally) to the achievement of the higher-order aspirational targets. Interestingly, existing theories on organizational risk taking usually do not take such intermediate social targets into account but propose a single social aspiration level.

Moreover, we argue that rankings create an environment in which social aspirations will be more important than historical aspirations with respect to weighting in decision making. This is especially true in competitive contexts, which are often characterized by frequent changes in relative standings. Unlike historical aspirations, social aspirations are more informative under highly dynamic environmental conditions (Audia et al. 2015, Greve 2003), i.e., high levels of organizational and/or environmental changes than historical aspirations: past performance becomes an infirm indicator of actor's performance possibilities in such conditions because feedback from past performance might become obsolete under high levels of organizational and environmental changes.

Taken together, we posit that risk taking will vary as a function of performance relative to both aspirational and intermediate targets. Each type of target, however, will generate different types of search behavior, namely, forward-looking versus backward-looking search (Gavetti and Levinthal 2000). We discuss each in turn below as they relate to intermediate and aspirational targets.

The Shark: Intermediate Targets and Risk taking

We argue that the performance feedback process with respect to intermediate targets can be characterized as forward-looking search behavior. That is, the behavioral consequences are based on perceptions of the near future and the perceived probabilities of specific outcomes. Most prior studies typically conceptualize performance feedback in terms of long-term goals, such as yearly ROA (Greve 2003, Audia and Greve 2006) or the final ranking for a season in a football league (Moliterno et al. 2014). Competition is thus only accounted for as diffuse competition that determines the social aspiration level. However, intermediate targets represent aspiration levels in a context of direct competition between individual competitors: the intermediate target is the competitor currently performing directly ahead of the focal actor. This competitor must be surpassed in order to advance in the ranking.[3] This is a goal that is highly relevant in the usual life course of organizational (and individual) ranked competitions. Moreover, this also implies that the focus here is on operational decision-making rather than more long-term strategic decision-making: reaching intermediate targets contributes to the achievement of the more complex aspirational targets.

Intermediate targets can therefore be regarded as sequential goals (Cyert and March 1963, Greve 2008). In the context of direct competition or contests, actors aim to surpass the next-higher-ranked competitor. Once they have outcompeted this rival, the next goal is to outperform the next front competitor, and so on. Festinger (1954: p.120) speaks to the likely role of attention in such direct competitions: “Given a range of possible persons for comparison, someone close to one's own ability or opinion will be chosen for comparison.” Hence, the closer an actor gets to a front competitor, the higher the salience of the comparison with this competitor. Each of these sub-competitions is characterized by intermediate targets but also contributes to the final aspirational target of improving one's position in the overall, diffuse, competition. Thus, while trying to achieve an intermediate target, actors are never above the aspirational target because each new sub-competition introduces a new intermediate target: the next competitor in line. Each sub-competition is thus a stepping stone that might improve an actor's position relative to the aspirational target.

As long as the focal actor is still far away from the front competitor, this distance does not stimulate risk taking because the current performance gap might be too broad to justify it. However, the consequences for risk-taking behavior when the front competitor is closer can be understood in light of the goal gradient effect (Hull 1934, Lewin 1935, Brown 1948, Kivetz et

[3] Of course, this is only possible in contexts where information on rankings is available between the publication of final ranking outcomes. With increasing regularity, however, such information is indeed readily available.

al. 2006). Simply put, actors are increasingly motivated to achieve a goal as they get closer to it. For example, Kivetz, et al. (2006) reports that café customers provided with an incentive – a free coffee after purchasing *n* coffees – accelerate purchasing behavior the closer they are to earning the free coffee. However, the goal gradient effect produces not only an affective and motivational state, it transforms emotions and motivations into action. Several other studies have shown that emotions indeed have an immediate and strong effect on goal-oriented behavior (e.g., Forgas and Laham 2005, Heath et al 1999). Generally, the goal gradient effect and the effect of goals that loom larger (Brendl & Higgins, 1996; Förster, Higgins & Idson, 1998) lead to the conclusion that motivation and, thus, the effort towards an intermediate target will increase as the distance to it decreases.

The discussion above points to the importance of emotions in risk taking. Proximity to aspirations should be perceived as positive feedback on goal progress and should cause an immediate positive affect, which will be triggered fast and automatically (Smith et al. 1993, Locke 2009). Such positive affect has been shown, both in the lab and in real-world investigations, to elicit risk taking (e.g., Au et al. 2003, Isen and Patrick 1983, Moore and Chater 2003). The proximity of the goal also makes it seem more attainable, further eliciting risky behaviors (Anderson and Galinsky 2006). As March and Shapira (1987, p.1413) argue, when a decision-maker is not far away from the aspiration point, motivation for gains dominates the perceptions of hazards, and thus a readjustment of the focus of attention takes place, which in turn leads to risk taking. Potential adverse consequences of risk taking are then seen as improbable and thus neglected. Such an affective state of an actor prevails whenever environmental signals suggest the possession of advantage or power (Chen et al. 2001, Galinsky et al. 2003). Such a signal arises in the case of the proximity of the intermediate target: the front competitor.

Increasing risk taking in the proximity of intermediate targets is a manifestation of the forward-looking search because the decision-maker acts based on the expectation of the near future. According to Gavetti and Levinthal (2000), forward-looking behavior is dependent on the cognitive perception of various prospects related to the different courses of action. Hence, risk taking is influenced by the positive outcome expectation in the future. Therefore, rather than being connected to past performance, the decision-making process in such a context (when the next competitor's position is salient) is more oriented towards potential gains in the future. In sum, the forward-looking logic with its focus on the near future dominates in the context of direct competition and is heightened in the neighborhood of intermediate targets.

Just as sharks tend to get more aggressive and motivated to reach their prey the closer they get to it, we argue that decision-makers will demonstrate riskier behavior as they approach the intermediate target, which of course means that they display less risky behavior when they are further away from it. We, therefore, formulate:

Hypothesis 1: *Risk taking increases as the distance to the intermediate target decreases*.

Aspirational Targets and Risk taking

While we argue that the performance feedback process with respect to intermediate targets can be characterized as forward-looking, we assume that risk taking in response to performance feedback from aspirational targets follows a backward-looking pattern. Even though aspirational targets, unlike historical aspirations, are not formed by the idiosyncratic performance history of an actor, they can be characterized as backward-looking search behaviors (see Chen 2008). That is, actors will change risk taking behavior according to the most recent comparison of their performance with the performance of the target group. Such a backward-looking decision model is largely based on the trial-error learning principle, which means it relies on experience (Greve 2003b). According to this search model, actors react to the various processes encouraging or discouraging a certain pattern of behavior related to prior choices (Levitt and March 1988, Nelson and Winter 1982). The assessment of the actor's performance is based on its comparison with aspirations and this subsequently influences behavior (Milliken and Lant 1991). When such past performance is unsatisfactory, actors tend to engage in a problemistic search and are inclined towards risky behaviors in an effort to improve performance (Cyert and March 1963, Greve 2003, 1998). This behavioral response should, however, only be prevalent as long as the actors have an aspiration focus (March and Shapira 1992). The rank at which an actor or competitor is currently performing informs the actor of the distance between current performance and the aspirational target. If an actor moves down in the ranking, then one can expect an increase in risk taking since the position relative to the aspirational target worsens. We therefore formulate:

Hypothesis 2: *Risk taking increases as performance worsens relative to the aspirational target*.

Deadline Proximity

As noted above, one vital element of ranking systems is timing. Regular and repeated publication of the rankings makes them effective (Brankovic et al. 2018, Werron and Ringel 2017) because these frequent updates break the ordered stable status system and turn it into a dynamic competitive environment (Brankovic et al. 2018). Thus, rankings create some sort of deadline pressure, which organizations must take into account.

Much of the literature has assumed that the effect of performance feedback on risk taking is the same within a given performance evaluation period (e.g., Baum et al. 2005, Greve 1998, 2003a, Ref and Shapira 2017). However, attention is sensitive to salient events, and decision-makers "vary their focus of attention depending on the characteristics of the situation" (Ocasio 1997, p. 190). Indeed, some research shows that the effects of performance feedback on risk taking are quite fluid throughout an evaluation period (e.g., Lehman et al. 2011, Lehman and Hahn 2013). The publication of rankings represents particularly salient events that we suggest should operate as a deadline. Therefore, changes and adjustments must be executed before this deadline in order to make an impact on the ranking. Because the assessment of current performance and expectations of future performance (Humphrey et al. 2004, Waller et al. 2002, Chen 2008), as well as behavioral patterns (Chen et al. 2008, Gersick 1988, Staudenmayer et al. 2002), depend on the temporal proximity to the deadline, we expect that such proximity will moderate the performance–risk relationship within a given time period (see also Jinwon 2018).

The principle of sequential attention to goals is based on the notion that decision makers attend to one goal at a time and switch to the next goal when performance on the previous one is above the aspiration point (Cyert and March 1963, pp. 117-119). Thus, each goal is assigned a priority and goals are ordered based on priority (Greve 2008). This eases the decision-making process because it reduces the cognitive effort required. In light of a deadline, the response to performance feedback will thus differ depending on the specific goal on which attention is focused and on the point in time when the performance is evaluated. Quite a number of psychological studies have shown that deadlines serve as a motivational force to expend more effort on a task in order to complete it within the time allotted (e.g., Gersick 1988, 1989, Kelly and McGrath 1985, Waller et al. 2001, Karau and Kelly 1992, Lim and Murnighan 1994, Okhuysen 2001, Parks and Cowlin 1995). These findings agree with similar effects at the organization level (e.g., Lehman et al. 2011).

We argue that the proximity of a deadline leads to an increased salience of the intermediate target. Such targets are easy to assess and become increasingly salient the closer the focal actor approaches the front competitor. Moreover, the subjective likelihood of achieving it increases with the decreasing distance. As the distance to the front competitor decreases, the intermediate target becomes the primary goal for the focal actor that absorbs to an increasing extent the actor's attention. What is more, it might appear especially attractive to overtake the front competitor when the deadline is close because it is the last chance to improve one's position in the ranking, which has a high probability to be the final position in the ranking. We therefore formulate:

Hypothesis 3: *The effect of performance relative to intermediate targets on risk taking increases with the proximity of the deadline*.

On the other hand, attention is much more likely to be focused on the aspirational target at the beginning of the performance period. The aspirational target is a more general goal that focuses on the experience yet tied to the relative positions of other decision-makers has significant volatility in terms of outcome probabilities. When deadlines are distal, it is harder to predict the final result (Lehman et al. 2011). However, it is easier to achieve a highly ranked position towards the end of the competition when the performer is well situated already at the beginning of the evaluation period. It will require much more effort to achieve a high rank at the deadline if the positional advantage was not acquired at the initial stages of the competition. Generally, immediacy and certainty are favored by decision makers (Keren and Roelofsma 1995). This then, we propose, combines with the sequential attention to goals principle, according to which decision makers assign the highest priority to the performance goals. Therefore, the aspirational target gets the highest priority early on.

Consequently, decision-makers will be more prone to take risks to gain an advantage at the beginning of the competition. As the end of the performance period looms larger, however, the certainty about the final rank increases, and the possibility to largely improve the rank decreases. The effect of the aspirational target on risk-taking behavior should thus be weaker towards the end of the evaluation period. Therefore:

Hypothesis 4: *The effect of performance relative to aspirational targets on risk taking reduces with the proximity of the deadline*.

METHOD

Research Setting

We chose as our research setting Formula 1 (F1) car racing and study the risk taking of drivers as they approach the competitor in front of them during a race. F1 racing is one of the most popular worldwide racing competitions, with tournaments (called "Grand Prix") taking place in many different countries. It is characterized by ultra-fast cars, high budgets and earnings, large attendance numbers, and worldwide coverage. We tested our hypotheses with data on individual actors who represent different car producers and make on-track decisions based on the information they receive from their team via radio communication.

In recent years, an increasing number of studies on learning and performance feedback investigated the behavior of individual contestants in tournaments or contests. Tournaments are not just imaginary representation of the competition, they are common and widespread. Salespeople are in a competition between each other for bonuses which are exclusively awarded to those who have the biggest sales (Mantrala et al., 2000). Competitions in job promotion tournaments to achieve a higher position within a company have also been studied before (e.g. Baker et al., 1994a, 1994b). Tournaments can also be observed in various sports settings, like for instance golf tournaments (Ehrenberg and Bognanno, 1990a, 1990b; Orszag, 1994) or car racing (Becker and Huselid, 1992; Bothner et al. 2007) and weight lifting (Genakos and Pagliero 2012). Additionally, some studies focus on behavior of individuals in tournament settings like TV quiz shows (Boyle and Shapira 2009) or even broiler production (Knoeber, 1989; Knoeber and Thurman, 1994). Moreover, due to relative performance remuneration, managers within the same industry frequently compete against one another in tournaments (Antle and Smith, 1986; Gibbons and Murphy, 1990; Eriksson, 1999).

A key advantage of using this kind of data is that the settings of contests are usually much more observable than decisions in organizations. This means that we can analyze much more directly the derivatives of psychological patterns and natural human reactions known from the psychology literature. Indeed, risky responses to over- and underperformance relative to a certain aspiration level, which are at the center of performance feedback theory, were initially formulated for individual actors (Dembo 1931, Frank 1935, Hoppe 1930). The term "aspiration level" was introduced by Dembo (1931) to explain behavior of individuals. Research conducted by Dembo (1930) and Jucknat (1937) was a breakthrough - they were first to demonstrate the effect of aspiration levels on individual decision makers. At a more general level, the distance between aspiration and performance induces satisfaction (when positive discrepancy) or dissatisfaction (when negative discrepancy) (Cron, Slocum, VandeWalle & Fu, 2005; Ilies & Judge, 2005; Ilies et al., 2010). These ideas were later transferred to economics and management literature to explain the behaviour of firms (Cyert and March, 1963). This historical and solemn transmission gives us confidence that what we infer from individual level can also be applied to organizational level. Specifically, Human agency is a crucial factor in competition as well as in the organizational strategy development (Hambrick & Mason, 1984; Montgomery, 2008).

Moreover, at first glance, our F1 context might seem to be a purely individual level setting - individuals drive the cars. However, it possesses in fact the benefit of being both individual as well as organizational level setting. On-track strategy, choice of tires, pit stops and other crucial factors are not determined solely by one person. Drivers are decision-makers who are guided by engineers, instructors, directors, sponsors, and the audience. No wonder that constant radio communication of every driver with their team via headsets during a race is a crucial component of the Formula 1 race. For example, drivers can inform their team about the problems (strange engine sounds, abnormal temperatures, unusual car behavior) they face while they drive their F1 car via headset. That information is then used by the team during the race to make some decisions. During the Grand Prix, Race Engineers communicate with the driver when they are on track. The F1 race engineer is responsible for calling the driver in for pit stops, informing them of the race situation, and informing them of what is necessary at certain phases of the race, including overtakes. Eventual race performance of the F1 drivers is a reflection not only of their own capabilities but also of the competence and ability of their team to devise smart race strategies and of the car producer to build effective engines and auto systems.

The F1 setting further suits our research needs for three additional reasons. First, given the wide variety of tournaments explored in the literature presented above, we are confident that F1 race also represents a tournament setting. The mechanism of a tournament (sub-competitions) and intermediate aspiration levels is clearly observable within each race. There is a focal driver who wants to finish the race at the best possible rank. However, to achieve such a goal, the driver must overtake the opponents in front of him consecutively, unless he leads the race. Thus, each of the other racers becomes an intermediate target for a given driver. Second, the distance to this aspiration point and risk taking can be approximated with reasonable precision. Third, risk taking can be observed and measured. Tracks are long and dangerous and require a great deal of expertise and knowledge. Curves have different shapes, angles, and structures; many are very dangerous, requiring drivers to brake a lot in order to avoid getting off the track or colliding with others. Within this research, we are particularly interested in the overtaking behaviors given that these are the moments during a race at which drivers have to particularly engage in risk taking. A great deal of overtaking happens on the track corners or curves. Therefore, we examine such risk taking in curves.

Data

The data included detailed information from the Bahrain Grand Prix 2018 race. This particular race included 57 laps and 19 drivers. (One additional driver took part in the race but the car malfunctioned after the first lap, forcing the driver to withdraw.) This particular race was especially well suited for this present study because it was sunny and clear, thereby excluding any potential effect of weather conditions on the drivers' behavior. Data was collected using the official F1 application ("Formula 1" for iOS and Android devices). This application provides a range of features, such as tracking each driver separately and accessing his speed and timing information during a race. For example, users of this application can see the speed that the focal driver had at a particular corner on the track and the time in seconds between the focal driver and the front (and back) competitors.

The data is structured at an "episodic" level of analysis. Specifically, the course includes multiple opportunities for risk taking (see below); each episode is encountered 57 times (i.e., once per lap). This data structure allows for a focus on operational risk taking and dynamics across time. Since the F1 application did not always provide data on the speed and time for some curves in all of the 57 laps, we had observations with missing values of speed or time in our data. We removed such observations from the data. Additionally, we exclude those moments from the data when the distance between the two drivers is less than one second. This is useful, as when the drivers are too close to each other (the focal driver is right behind the front competitor) the focal driver does not speed anymore, as this would almost certainly cause a crash thereby blocking the focal driver. The final data set included 1839 observations of the 19 drivers. OLS fixed-effects regression models were used to analyze the data.

Measures

Dependent Variable. *Risk taking* was measured according to behaviors taken during particularly dangerous positions on the course: curves. These corners are particularly prone to crashes and thus require drivers to slow down. At the same time, however, these locations on the course are also opportunities to overtake the front opponents. Such action "requires an enormous amount of skill from the overtaking driver – not only is he likely to have had to move off the line on to a more slippery part of the track, he must also judge how late he can leave his braking. Get it wrong and he could overshoot the corner, spin off or – worse – make contact with the car he's trying to overtake" (www.formula1.com). In short, overtaking on corners entails significant risk. Specifically, a driver seeking to overtake a front competitor must ensure that his corner speed is higher than the speed of his front competitor by breaking less, thereby putting himself (and his sponsoring organization) at greater risk. Risk taking is, therefore, measured according to the speed (km/h) of a driver at the center of each curve. Consistent with our theoretical arguments, this conceptualization of risk focuses on operational rather than strategic risk taking.

Independent Variables. The key independent variable is performance relative to two types of social aspirations: aspirational targets and intermediate targets. In addition, the moderator variable of interest is deadline proximity. Each is discussed in turn below.

Aspirational targets are not directly observable in our context because the rank a certain driver wants to achieve at the end of the race is unknown. However, it is reasonable to assume that drivers wish to win the race; in this way, the context creates a "natural" aspiration level (see Greve 2003c). The distance to aspirational targets are thus captured as the current rank of the focal driver at any given point in time. Because we include driver fixed-effects (see below), any change in the current rank of the focal driver can be understood as an improvement or decline in performance relative to the aspirational target. If the driver improves in the ranking, the value for the current rank decreases, and vice versa.

Intermediate targets were conceptualized as the driver directly in front of the focal driver. That is, a driver must first overtake the driver in front of him in order to come closer to the aspirational target. The distance to this target is captured as the distance in seconds (with 3 decimal places) between the focal driver and the front competitor, as captured by the F1 application.

Deadline proximity was conceptualized as the lap number. That is, the higher the number of laps, the closer the deadline for the final ranking of the race and the determination of the winner.

Control Variables. A key control variable was *threat rigidity*. The proposed hypotheses assume that risk taking increases with decreasing distance from the intermediate target. Similarly, the threat-rigidity hypothesis assumes reduced risk taking with increasing distance below the aspiration point. This means that, empirically, the risk-taking pattern of the shark model is the same as the one of threat rigidity even though the behavioral mechanisms behind these two patterns are opposite. We controlled for this possibility by accounting for the distance (in seconds) to the "back competitor," that is, the distance between the focal driver and the nearest-trailing driver. Drivers who are in danger to be overtaken use certain strategies to prevent the competitors from behind to pass. "A driver trying to fend off an overtaking move from an opponent must rely on his ability to pick the correct braking points and cornering lines. Typically, this means reducing the angle available for the car behind to use going into corners where there is a substantial risk of being passed. A side-effect of this defensive driving is that it tends to slow both drivers down." (www.formula1.com). Therefore, controlling for the distance to the back competitor helps distinguish between the threat-rigidity pattern and the proposed hypotheses: A lower speed of the focal driver when the front competitor is far away might simply be due to the back competitor coming closer to the focal driver. Thus, lowering speed in curves to prevent overtaking – a kind of threat rigidity – can coincide with increasing distance to the front competitor. Therefore, if the distance to the front competitor still displays a negative effect on risk taking after controlling for the distance to the back competitor, one can reasonably conclude that there is, in fact, risky behaviors consistent with the shark model at work.

In addition, we control for the following: (1) current *lap number* of the race, which accounts for whether risk taking changes as a race progresses; (2) the *time* (in seconds) it took the driver to finish the current lap; (3) the *teammate*[4] rank and lap time; (4) the *risky choice opportunities* as dummy variables for each of the five different corners where the speed of the driver was measured; and, (5) a *fixed effects estimator* for each driver to account for inherent factors, such as talent, experience, risk propensity, and most importantly, *idiosyncratic aspiration levels*.

Table 1 the descriptive statistics and correlations of the variables.

Insert Table 1

Results

Table 2 shows the fixed effects OLS models used to test the proposed hypotheses. Model 1 contains only the control variables. The lap time and performance of the teammate expressed as the lap time and the rank of the teammate do not seem to influence the driving behavior as their coefficients are nonsignificant.

Insert Table 2 here

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[4] Every driver had one teammate.

Hypothesis 1 proposed that risk taking increases as the distance to the intermediate target decreases. Models 2-4 introduce the key independent variable: distance to the front competitor. It also includes the key control variable: distance to the back competitor. The coefficient for the former is significant and negative in all three models. This suggests that the focal driver takes lower risks when he is further away from the front competitor and increases risk taking the closer he comes to the front competitor. Interestingly, the distance to the back competitor does not influence risk taking behaviour, suggesting that a focal driver is unconcerned with the back competitor so long as they do not manage to perform an overtake, in which case, the former back competitor turns into an intermediate target of the focal driver, which is very close, and consequently, the motivation to take risks prevails. Taken together, these findings suggest that actors act as a shark when it comes to intermediate targets, thereby lending strong and robust support for Hypothesis 1.

Hypothesis 2 proposed that risk taking increases as performance worsens relative to the aspirational target. Models 3 and 4 introduce the coefficient for current rank, which is positive and, in the full model, significant. This suggests that the focal driver takes greater risks when his position deteriorates, even after controlling for the distance to the front and back competitors. Risky behaviors are more pronounced for higher ranked drivers (i.e., for worse positions) during the early phase of the race. Taken together, these findings are consistent with classical arguments of behavioral theory, thereby lending support for Hypothesis 2.

Hypotheses 3 and 4 proposed that the effect of performance relative to intermediate and aspirational targets on risk taking varies as a function of proximity of the deadline. Models 3 and 4 introduce the lap number. The first-order effect of the lap number is positive and significant in the full model, indicating that the drivers, on average, take greater risks in later phases of a race. This result indicates that the approaching deadline, i.e. the end of the race, becomes especially important for racers who are currently situated at better positions in the ranking, i.e. when the current rank variable has low values. This makes sense insofar as only the first ten racers at the end of a race receive championship points. If a driver is far behind without chances of reaching this threshold, increased risk taking towards the end seems completely unnecessary. The interaction between the lap number and the distance to the intermediate target (i.e., the front competitor) is nonsignificant, suggesting that the shark effect is unaffected by deadline proximity. Hypothesis 3 is thus not supported. The interaction between the lap number and the distance to the aspirational target, however, is negative and significant, suggesting that the classic behavioural theory arguments are indeed affected by deadline proximity. Hypothesis 4 is thus supported.

To show the interaction effect of the deadline proximity and aspirational target we created a graph and plotted the effect of the aspirational target on risk taking depending on the closeness of the deadline (Figure 1). As predicted, drivers strive hard to gain an advantageous position at the beginning, because this guarantees them more possibilities for achieving a high rank towards the end (the higher is the rank the lower is number of competitors in front). Therefore, the graph shows a strong positive influence of the rank on driver's risk-taking behavior for the second lap. (Note that a high rank number indicates low performance.) As the race progresses (lap number increases), ranks tend to become less volatile and more stable, and significant rank improvement becomes less probable. Thus, the graph shows increasingly weaker effects of the rank on risk taking; at lap 34, we see no effect of the rank on risk taking and a negative effect afterwards for later laps. Lap 34 is the turning point from which we start to see the effect of the rank change to opposite effect. For the last laps (on the graph we plotted the line for the lap 55) we see the opposite, i.e. negative effect of the rank on risk taking.

Insert Figure 1 here

DISCUSSION

In this paper, we offer a reconceptualization of social aspirations by suggesting that two different social aspiration levels should be considered in the context of direct competition: intermediate and aspirational targets. The influence of the intermediate target is exerted by the increased closeness to the front competitors, which motivates a decision maker to compete more intensely and to gradually improve one's own standing. Hence, we argue that actors do not only consider the current (average) performance of their competitors but also focus on the most salient opponent, i.e., the competitor just in front of them. For any actor, the distance to that competitor turns into a highly important influence factor on risk taking with the competitor becoming the intermediate target within a sub-competition. At the same time, however, the general standing (rank) is important, too, as the actor's overall position gradually changes throughout the competition. We show that the problemistic search argument within performance feedback theory, namely increasing risk with increasing distance from the aspirational target when performance is below it, also holds.

Generally, we take a different perspective on the relationship between risk taking and performance by investigating risk-taking behavior in the context of direct competition or contests. These contests consist of sets of sub-competitions that provoke participating actors to set the intermediate targets that reflect the sequential character of aspirations. It is precisely these intermediate targets, we argue, that represent a missing component of performance feedback theory. We use classic theories of motivation to explain the changing behavioral patterns that deviate from the traditional managerial behaviour described in the behavioural theory of the firm.

Importantly, direct competition is oftentimes time-bounded; as such, we also showed that deadline proximity also influences risk taking. Indeed, we find that, as competition gradually comes to its end, the aspirational target no longer has such a strong influence on risk taking behavior while we find no significant interaction effect between time and the distance to the intermediate target. Thus, our hypothesis that the intermediate target exerts an even stronger influence on risk taking with approach of the deadline receives no support. It seems that a front competitor represents a constant trigger for increased risk taking, no matter the current progress of the race.

Taken together, our empirical results strongly support what we have referred to as "the shark model" of organizational risk taking. That is, actors are inclined to engage in *increased* risk taking as they approach an intermediate, competitive goal, much like a shark chasing its prey. These findings not only expand the way that social aspirations are conceptualized, they also reshape the way that the impact of performance feedback on risk taking is understood.

Despite its merits, the present study context is not without its limitations. One such limitation is the uneven spreading of the risk-taking consequences among the team members. Such aftermath in firms is much more equally distributed among employees than in Formula 1 racing. In more traditional organizational contexts, the recoil from the risky decisions directly affects many or all members of a group, department, or unit, whereas in Formula 1 the immediate effects of risk taking (damages, injuries, and emotional or physical exhaustion) are largely or exclusively born by the driver. Another limitation pertains to the difficulty of observing the Shark effect in traditional organizational settings. The Formula 1 setting is characterized by high transparency in terms of the drivers' positions, speeds, rankings, and distances. More traditional organizational settings may be much harder to observe and study because a lot of elements related to the performance of the decision makers, their risk-taking tendencies, and performance relative to intermediate and aspirational targets may not be directly observable, or even hidden from the public.

Nonetheless, these findings have clear implications beyond auto races. The described pattern is applicable in real-life situations of direct competitions that are subject to ordered change. Thus, whenever managers, teams, or organizations are confronted with a type of contest for which official rankings exist, such a shark pattern of risk taking might apply. In the introductory section, we mentioned examples of rankings in different industries in which intermediate and aspirational targets might exist. One particularly interesting example is rankings of investment funds that are frequently updated. Fund managers might take more risks when they clearly see the chance to overtake a competitor that is currently ranked just above their own fund (Liwei and Peng 2012, Rao et al. 2013). Moreover, participants in job tournaments within labor markets that consist of several rounds might also follow a risk-taking pattern similar to the shark model (Baker et al. 1994a, 1994b). Public requests for bids or proposals with multiple stages prior to selection may likewise follow a similar pattern (Ngai et al., 2002). In each of these examples, a ranking exists and may be re-ordered prior to the final ranking of consequence.

With respect to internal management situations, a potential implication of our results can be that managers will become increasingly excited the closer they come to reaching their goals in the context of direct competition or contest and increase risk taking. Therefore, fostering competition among peers together with the availability of the information on the performance of the peers together with a final reward for outperforming others might increase the number of risky choices, especially when everybody performs more or less at the same level. Hence, too much internal competition, or too much information about others' performances might lead to a situation in which managers who are competing against each other might decide to take unacceptably high risks. Therefore, it is a difficult task for top management to keep the right balance between fostering internal competition between employees and preventing toxic outcomes of such a competition.

For scholars and practitioners alike, the reported findings point to a new insight about the effect of underperformance on risk taking: An actor may behave like a shark chasing its prey. Such findings have implications not only for risk taking but also, as noted above, how contests are structured and rankings information is provided.

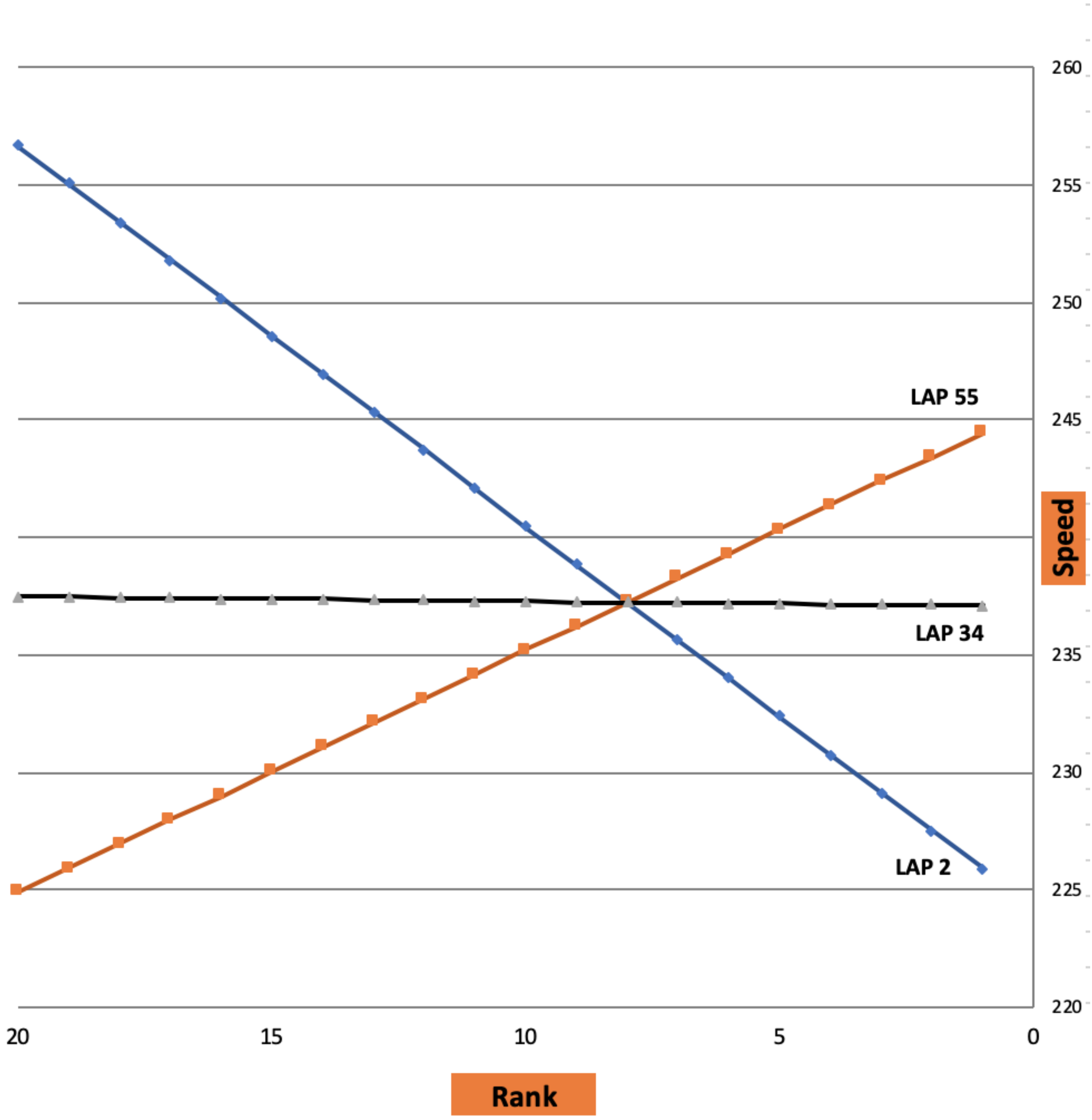
Table 1. Descriptive statistics

Variables	Mean	Std. Dev.	1	2	3	4	5	6	7	8	9	10	11	12
(1) Driver speed	203.742	50.891	1											
(2) Distance to front competitor	7.616	9.36	-0.069	1										
(3) Distance to back opponent	7.405	11.72	0	0.136	1									
(4) Lap number	29.32	16.25	-0.022	0.287	0.136	1								
(5) Current rank	10.179	11.166	0.004	-0.202	-0.134	-0.002	1							
(6) Lap time	98.456	6.494	-0.015	-0.062	-0.008	-0.253	0.205	1						
(7) Teammate rank	9.412	5.097	-0.002	0.115	-0.231	-0.002	0.404	0.106	1					
(8) Teammate lap time	98.678	7.343	-0.008	-0.035	-0.076	-0.282	0.072	0.184	0.241	1				
(9) Curve 2	0.195	0.396	-0.068	0.019	0.021	0.028	0.01	-0.022	0.01	0.009	1			
(10) Curve 3	0.199	0.399	-0.285	-0.024	0.005	-0.001	-0.035	0.001	-0.04	-0.015	-0.331	1		
(11) Curve 4	0.206	0.405	0.123	-0.012	-0.006	-0.047	-0.001	0.005	0.021	0.026	-0.214	-0.214	1	
(12) Curve 5	0.201	0.401	0.236	-0.007	-0.027	-0.011	0.013	0.033	0.014	0.001	-0.279	-0.279	-0.181	1

Table 2. Fixed effects OLS regression results for likelihood of risk-taking

Variables	**Model 1**	**Model 2**	**Model 3**	**Model 4**
Distance to front competitor (**H1**)		-0.44***	-0.44***	-1.03***
		(0.151)	(0.161)	(0.383)
Distance to back competitor		0.05	0.04	-0.02
		(0.109)	(0.115)	(0.126)
LAP number			0.02	0.40*
			(0.094)	(0.214)
Current Rank (**H2**)			0.14	1.72*
			(0.728)	(0.932)
Lap number X Distance to front competitor (**H3**)				0.01
				(0.009)
Lap number X Current rank (**H4**)				-0.05***
				(0.019)
Lap time	-0.26	-0.28	-0.27	-0.23
	(0.308)	(0.308)	(0.321)	(0.321)
Teammate rank	0.43	0.72	0.75	0.67
	(0.652)	(0.658)	(0.671)	(0.669)
Teammate lap time	-0.06	-0.15	-0.13	-0.16
	(0.278)	(0.279)	(0.285)	(0.284)
Curve 2	-11.08***	-11.01***	-11.00***	-11.08***
	(3.392)	(3.386)	(3.388)	(3.378)
Curve 3	-30.32***	-30.46***	-30.44***	-30.76***
	(3.391)	(3.385)	(3.388)	(3.380)
Curve 4	11.10***	11.12***	11.17***	11.04***
	(4.093)	(4.087)	(4.093)	(4.082)
Curve 5	19.46***	19.41***	19.42***	19.24***
	(3.607)	(3.602)	(3.604)	(3.594)
Constant	227.32***	238.55***	234.65***	223.48***
	(36.407)	(36.547)	(40.582)	(40.663)
Driver fixed effects	Yes	Yes	Yes	Yes
Observations	1,839	1,839	1,839	1,839
R-squared	0.12	0.13	0.13	0.13
ll	-9702	-9698	-9698	-9692
rho	0.0118	0.0125	0.0143	0.0150

Figure 1. Risk taking as a function of lap number and driver rank



Note: This figure is based on results from Table 2 Model 4.

3. ORGANIZATIONAL SEARCH AND RISK-TAKING IN TOURNAMENTS

Abstract

The majority of research on search processes relies on a broad idea of organizational search with no clear difference between the various forms of search (Posen et al., 2018; Afuah and Tucci, 2012; Katila and Ahuja, 2002; Rosenkopf and Nerkar, 2001; Levinthal, 1997). Typically, an actor's shift in risk-taking proclivity as a result of performance deviations from a reference point is taken into account (March and Shapira, 1992; Greve, 2003; Chen and Miller, 2007). Within this process, organizational search serves as a "black box," acting as a bridge between a firm's performance level and eventual risk-taking (Greve, 2003a; Chen and Miller, 2007; Posen et al., 2017; Gaba and Joseph, 2013; Kacperczyk et al., 2015). I attempt to address this void by highlighting the influence of organizational search length on risk-taking. In the case of inter-firm rivalry, the search is begun in reaction to uncertainty rather than performance deviation, and I suggest that the pace of organizational search implies risk-taking adjustment through a change in the actor's self-confidence level. I investigate this idea by analyzing professional esports teams' competitive behavior in the Counter-Strike video game during the IEM Katowice 2019 cybersports competition. The anticipated effect of search length on risk-taking is supported.

INTRODUCTION

While the previous chapter focuses on a broader tournament context where actors consider two types of social aspiration levels (intermediate and aspirational), this chapter explores the behavioural patterns inherent in the more specific context, namely an intense direct competition in which the focus is on defeating one specific opponent. The uncertainty manifested in the lack of knowledge about the potential competitive strategy of the opponent makes the search process especially salient for the focal actor in such context.

Search is a common event in firms, and it is driven by several processes (March 1981). There are three main types of these processes known in the behavioral literature - slack search (Chen, 2008; Cyert and March, 1963), institutionalized search (Chen and Miller, 2007; Greve, 2003c), and problemistic search (Cyert and March, 1963). While slack search and problemistic search are both performance-sensitive, i.e. depend on the position of the current performance relative to the aspiration level, the institutionalized search can run in the background independently from the current performance level. The research on search processes, however, is more frequently focused on a more general concept of organizational search, without a clear distinction between the types of search (Posen et al., 2018; Afuah and Tucci, 2012; Katila and Ahuja, 2002; Rosenkopf and Nerkar, 2001; Levinthal, 1997). On the one hand, this is because it is quite difficult to differentiate empirically between different types of search processes that organizations perform throughout their life cycle (Posen et al., 2018). On the other hand, some search processes do not explicitly and easily fall into one of these three categories because they might represent combinations of several search types. Specifically, in environments that are highly uncertain organizations routinely use a search process, which essentially represents a combination of problemistic search and institutionalized search. Such search is enacted on a regular basis in response to a problem which is not necessarily a performance downfall and it is upheld as long as there is a specific environmental uncertainty (Kazmi, 2015; Ansoff et al., 2019). This search for information and subsequent solutions to better adapt to the uncertain environment represents the mechanism by which organizations maintain their competitiveness when their interpretative schemata lose precision (Bhardwaj and Kumar, 2014; Larkin, 1983; Van Lehn, 1993; Wilensky, 1967).

Decision-making in uncertain environments is naturally linked with certain risks (Park and Shapira, 2017). When such uncertainty is caused by intense inter-firm competition the time for conducting a search is limited (Radford, 1978; Elenkov, 1997; Fredrickson, 1984; Judge and Miller, 1991; Baum and Wally, 2003). I argue that in such a context the duration of organizational search directly influences the subsequent risk-taking. Specifically, a longer duration of search decreases the riskiness of the subsequent alternatives picked. This argument can complement the extant literature on search for the following reasons:

Literature on organizational learning and decision-making is rich with various perspectives on the effects of the firm performance on its risk-taking behavior (March and Shapira, 1987; March and Shapira, 1992; Greve, 2003; Chen and Miller, 2007). However, this stream of research views organizational search only as an intermediary between performance and risk-taking (Slattery and Ganster, 2002; Greve, 2003a; Baum et al., 2005; Chen and Miller, 2007; Posen et al., 2018; Gaba and Joseph, 2013; Kacperczyk et al., 2015; Chen, 2008) and does not take it into account as a direct determinant of risk-taking. Additionally, the branch of literature on decision-making processes under uncertainty mainly focuses on the effects of the uncertain environment on risk-taking (usually, in the form of firm innovation), thereby neglecting the effect of the search process itself on organizational innovation (Damanpour, 1996; Haptuar and Hirji, 1999; Pierce and Delbecq, 1977; Souder et al., 1999). In this paper, I try to fill this gap by demonstrating the effect of the duration of organizational search on risk-taking.

In an uncertain environment, particularly in the context of a direct competition, it is impossible to entirely rely on historical performance data to inform the decision-making process, and it is difficult to produce accurate performance expectations (Audia, Brion, and Greve, 2015; Miller and Shamsie, 1999). In the absence of lessons acquired from the past as a result of the uncertain environment, it is possible that organizations will react to the process of search (March, 1994). The search process in uncertain environments consists of finding and interpreting data, and ultimately taking action, which is the learning stage (Aguilar, 1967; Hambrick and Mason, 1984; Daft and Weick, 1984). Specifically, in this paper, the baseline argumentation is that organizations react to the speed of finding and interpreting the data which serves as the support for generating the solutions in an uncertain environment. One important peculiarity of the uncertain environment induced by the fierce inter-firm competition is that the search process should be fast (Radford, 1978; Elenkov, 1997). Finding and interpreting the relevant information quickly enhances the self-confidence of those organizational members that took part in the search process (March and Shapira 1992), which in turn lowers their perception of risk (Mitchell, 1999). Therefore, I argue that the speed of organizational search entails the subsequent risk-taking adjustment through a shift in the decision-maker's self-confidence level.

In an uncertain environment, the duration of the search process and performance level can both be perceived as measures of performance since both can influence the eventual organizational outcome. When actors consider both the search process and performance, the interaction of these two elements creates an interesting dynamic - a feeling of full control over the uncertain competitive environment emerges, once the decision-maker notices that both the search process and performance level related indicators are good. This results in lower risk-taking, the higher is the performance indicator, due to a lack of need to take further risks when the environment is understandable and controllable. Additionally, I argue that higher expended effort should magnify the effect of the efficient search process (low duration) on risk-taking.

I investigate these ideas by evaluating the competitive behavior of professional esports teams in Counter-Strike video game during the IEM Katowice 2019 esports tournament. The dataset contains 140'290 records based on 5 matches in which 6 teams (each with 5 players) competed. This setting allowed me to carefully observe the search conducted by each player as well as their risk-taking tendencies. I quantify risk-taking as the amount of virtual money spent relative to the overall available money. The predicted impact of the ad-hoc search duration on risk-taking is supported.

This paper stands to make several contributions to our understanding of the search and risk-taking process. The main contribution is that this paper shows the search process itself can influence the risk-taking process, namely, a longer search for solutions decreases the confidence in own abilities to cope with the environmental uncertainty. This in turn suppresses the risk-taking tendencies of the decision-maker. Additionally, past performance still plays a role in risk-taking like traditional theory predicts, but I suggest it can play also a moderating role in an uncertain environment.

THEORY AND HYPOTHESES

Organizational search as an intermediary between performance and risk-taking.

Research on risky organizational changes has been primarily directed by the behavioral approach. According to this framework, decision-makers assess performance using a reference point, and that performance relative to the reference point impacts their willingness to take risks and make changes (Cyert and March, 1963; March and Shapira, 1987, 1992; Shapira, 1986). This research stream focuses on three main triggers of organizational risk-taking:

performance shortfall (Cyert and March 1963), threat-rigidity (Staw et al. 1981), and amount of slack (Chen and Miller, 2007), and key argumentation is based on the direct link between performance and risk. However, according to the research on the behavioral theory of the firm, performance feedback is a critical driver not only of risk but also of organizational search (Argote and Greve, 2007) since decision-makers arrive at the risk-taking stage after performance deviations only through search processes. Heightened risk is typically viewed as the consequence of a greater drive to find a satisfactory solution to the performance deficiency, namely to an emerged underperformance problem, through a "problemistic search" (Cyert and March, 1963).

However, search processes are not necessarily launched because a specific problem exists. The behavioral theory of the firm and performance feedback theory acknowledge the presence of alternative search processes - slack search and institutionalized search. Institutionalized search can be executed routinely, independently from the current performance level, and run in the background (Greve, 2003). Slack search is launched as a reaction to excess organizational slack or performance above the aspiration (Greve, 2003; Cyert and March, 1963). There is however an additional type of search for information on trends and discontinuities for detecting future threats and superior courses of action in uncertain environments created by intense inter-firm competition (Heuschneider and Herstatt, 2016; Tsoukas and Shepherd, 2004; Day and Schoemaker, 2005; Schoemaker and Day, 2009). The uncertainty connected to the intense inter-firm competition is caused by the lack of knowledge of the potential moves of the competitors and the possible effects of such moves on the focal organization (Chung and Low, 2017; Rego et al., 2022). The research stream on decision-making under uncertainty often argues that uncertainty fosters firm innovation (Damanpour, 1996; Haptuar and Hirji, 1998; Pierce and Delbecq, 1977; Souder et al., 1999) because in uncertain environmental conditions managers focus on learning and innovation to avoid deterioration of the organizational position (Brown et al., 1997; Teece, Pisano and Shuen,1997). While the search process in an uncertain environment is distinct from problemistic and institutionalized search, it has some similarities with the former and the latter. It is launched in response to a problem, which is the uncertainty (and not necessarily the performance decrease) and it can run regularly and independently from the current level of performance.

In uncertain and competitive contexts it gets increasingly difficult to completely base the decision-making on prior performance data (Audia, Brion, and Greve, 2015). The reason for this is the lack of knowledge about the potential further moves of the competitors as well as the effects of such moves on the focal actor. Such cases require a more proactive rather than reactive approach to managing the environment because the information on what the opponent can undertake next is unavailable which renders the previous experiences useless. Firms are becoming increasingly conscious of the inherent limits involved with using patterns based on previous experiences, and are seeking ways to become more proactive (Woods, Branlat, Herrera, and Woltjer, 2015). Prior ways of dealing with problems might not be suitable under extremely dynamic environmental conditions, i.e., high degrees of environmental change (Audia et al., 2015; Greve, 2003). Although the organizational search concept rests on the idea that there must be a performance deficiency or it must be forecasted for the search to start, I contend that in such a setting, the search should intensify because it is activated in reaction to severe uncertainty rather than the actual or projected performance deficiency. This happens because past performance and data do not yield reliable predictions or relevant data might simply not be available (Miller and Shamsie, 1999).

In the next sections I will first develop an extended search mechanism for the uncertain environmental conditions caused by inter-firm competition and then explore the cognitive model of search adapted to the uncertain environments with the appropriate risk-taking tendencies as a consequence. Such an environment will have two effects on the behavior of the decision-maker: First, the search will be triggered by extreme uncertainty instead of prior performance deficiency; second, the search process itself will subsequently influence the risk-taking preferences and behavior separately from the past performance indicators.

A search process in uncertain conditions

A search for perspectives

Organizational search is usually conceptualized more as a reactive rather than proactive process - it activates in response to performance deviations. However, while facing extreme uncertainty organizations often take proactive steps to become aware of inconsistencies, better comprehend them, and be less constrained by past experience and performance (Sutcliffe et al., 2011; Weick et al., 2007). For example, Barton et al. (2009) discovered that frontline firefighters undertook a proactive search in the face of uncertainty (lack of knowledge on the level of severity of the fire, the main source of the fire, the total area affected, the number of people blocked within the affected area, etc.) in two ways by gathering varied perspectives on fire. First, by changing perspectives (e.g., relocating from the ground to elevation), firefighters purposefully produced several interpretations of ongoing events - a type of conflict that required a reconsideration of current assumptions and actions. Second, firefighters looked for alternative perspectives by interacting with people of varying levels of knowledge or experience. These behaviors lead to more effective performance in the face of uncertainty by providing a more accurate and fuller picture of the developing circumstances. This means that in an uncertain and competitive environment, the search turns into a process, through which "people reconsider the sense that they have already made, to question their underlying assumptions, and to re-examine their course of action" (Maitlis and Christianson, 2014, p. 69). Such a search for various perspectives, and their future ramifications, is mainly lacking in the extant literature on search, according to Heuschneider and Herstatt (2016), which is surprising, because there is an explicit search for signals in the environment, and this search is useful for detecting future threats and superior courses of action (Tsoukas and Shepherd, 2004; Day and Schoemaker, 2005; Schoemaker and Day 2009; Zha and Chen, 2009). Just as firefighters gather various information on the ongoing event of fire, intense tournaments and direct competitions that are part of them, necessitate decision-makers to launch a search process to identify possible threats or opportunities and derive possible courses of action (solutions) based on the hazards or opportunities identified in the environment (Jissink, Schweitzer, and Rohrbeck, 2019; Radford, 1978). Organizations use such a search in uncertain environments independently from the current level of performance which rules out the possibility of connecting such a search exclusively to the amount of excessive slack (slack search) or the actual performance drop (problemistic search) (Barton et al., 2009; 2015).

The search in an uncertain environment involves three major steps: search for the relevant information (find the threat or opportunity), the interpretation of the information (analyze and interpret the threat or opportunity), and the actual learning (action - risk-taking) (Aguilar, 1967; Hambrick and Mason, 1984; Wang and Chan, 1995). Thus, the organizational search in an uncertain environment is a procedure of finding and interpreting data on the current state of the environment to obtain possible future directions of action (solutions) and forecast the consequences of these (Jissink, Schweitzer, and Rohrbeck, 2019).

The interplay of the speed of the decision-making process, self-confidence, and risk-taking

As search initiates with data collection in an uncertain environment caused by actors creating or facing severe tournament pressures (specifically, during direct competitions), experiences with the search process, especially the speed of finding and interpretation of the relevant information play a key role in the riskiness of subsequent decision-making. From the literature on organizational learning, it can be inferred that past experience does not always provide enough information to learn from the actual outcomes of the decision-making process (March, 1994). Certain situations or conditions occur rarely and, thus, yield only small samples of experience and so organizations learn during the process of decision-making (March et al., 1991). This is achieved by examining different dimensions of the experience related to decision-making. Specifically, in uncertain conditions of intense inter-firm competition, it is impossible to fully rely on past performance data to guide the decision-making process as well as quite problematic to generate precise performance expectations (Audia, Brion, and Greve, 2015; Miller and Shamsie, 1999). Inevitably, tournaments then dictate that the attention should switch from learning from past experience to the exploration of the processes of finding a solution (March, 1994).

The duration of organizational search turns into its salient characteristic because it is limited in an uncertain environment (Radford, 1978; Elenkov, 1997). Since all opponents are uninformed of each other's agenda and do not possess precise knowledge of looming environmental changes, in such contexts those who make decisions faster tend to acquire larger competitive advantages (Fredrickson, 1984; Judge and Miller, 1991; Baum and Wally, 2003). I, therefore, contend that it is the duration of the search that will serve as a signal of decision-making efficiency and will be influencing the subsequent behavioral adjustment in an uncertain and competitive environment. The duration of the search will form a perception of fitness of own abilities for effective decision-making in current circumstances - self-confidence level.

Self-confidence is an individual's self-assessment of their talents and aptitude (Wilson et al., 2007), and it influences an individual's judgment of their ability to attain their goals (Kasouf et al., 2015; Druckman and Bjork, 1994; Bandura, 1977). Self-confidence has been linked to information-seeking behavior (low self-confidence leads to an increased perception of uncertainty and, thus, to a higher need for information-seeking) (Locander and Hermann, 1979), is a moderator of expectations (Yi and La, 2003), and is a driver of risk-taking behavior (Bryde and Volm, 2009; Fabricius and Büttgen, 2015). Self-confidence is concerned with abilities and also pertains to the level of certainty related to the outcome of these abilities (Gist and Mitchell, 1992; Bandura, 1986). Guennif (2002, p. 18) defines self-confidence as "a favourable opinion an individual holds about the estimation he makes under uncertainty…". Bandura (1977) defines self-confidence as the belief in one's ability to achieve a specified result. In decision-making, actors form their self-confidence by employing heuristics (Kahneman and Tversky, 1982; Pleskac and Busemeyer, 2010; Resulaj, Kiani, Wolpert, and Shadlen, 2009). One way that is used is the speed of response to a problem - reaction (decision) time gives individuals confidence in their abilities and skills connected to the task at hand, which is a reasonable heuristic in many instances (Kiani, Corthell, and Shadlen, 2014). The ability to rapidly solve a problem(s) increases the certainty about the reliability of the solution(s) and improves task-related self-confidence level (Kiani, Corthell, and Shadlen, 2014). The longer it takes to find and interpret the relevant information and data, the higher should be the perceived uncertainty of the current environmental state. Therefore, agents should feel less capable and less secure about their interactions with such an environment. Feeling more (or less) capable to resolve a certain situation or come up with a solid solution has a direct influence on an agent's subsequent risk preferences.

Past research shows that the more capable agents pursue a low-risk strategy, while the less capable agents opt for a high-risk strategy (e.g., Rosen, 1988, p. 84, mentioning Bronars, 1986; Knoeber and Thurman, 1994, p. 158). This is explained by the fact that the former does not want to jeopardize his or her advantageous position, whereas the latter can only profit by raising the risk. However, this is not always the case (Kräkel and Sliwka, 2004). There is a stream of research that demonstrates that decision-makers who believe they are very skilled at decision-making see more chances and take more risks, whereas those who feel less competent see more threats and take fewer risks (Krueger and Dickson, 1994). Also, it has been shown that an increase in self-confidence implies a reduction in perceived risk, and such assessment impacts upcoming behaviors (Mitchell, 1999). For example, project managers with high levels of confidence have low levels of risk awareness, which they typically assess favorably, and are thus more confident to accept bigger risks (Bryde and Volm, 2009; Fabricius and Büttgen, 2015). I argue that decision-makers will adjust risk-taking (i.e. choosing a riskier or less risky alternative from the ones generated) depending on how confident they feel about their competence regarding the current situation based on the duration (i.e., speed) of the search. Those actors who search fast should feel confident in their abilities to navigate in a complex and uncertain environment, and hence choose riskier alternatives (Chandler and Pronin, 2012; Krueger and Dickson, 1994).

Taking everything above into account:

Hypothesis 1: The shorter the duration of the organizational search (or the higher the efficiency of the search process), the higher the subsequent risk-taking level.

The moderating effects of past experience and effort intensity on risk-taking.

Decision makers are driven by a need for power and success (Schultheiss et al., 2008), as well as the desire to exert influence on and improve their surroundings (Bandura, 2001; deCharms, 1968; DeShon and Gillespie, 2005). The adverse effects of uncertainty on actors are mostly attributable to the sense of powerlessness and insufficient control over the environment that uncertainty induces (Bordia, Hunt, Paulsen, Tourish, and DiFonzo, 2001; DiFonzo and Bordia, 2002; Lazarus and Folkman, 1984). The concept of control is described in the literature as "an individual's beliefs, at a given point in time, in his or her ability to effect a change, in the desired direction, on the environment" (Greenberger and Strasser, 1986, p.

165). Uncertainty, or a lack of awareness about the present or future events, impairs an actor’s capacity to affect or control them (Bordia et al., 2004). In the context of this paper, it was argued before that a more efficient search process results in higher self-confidence which translates into higher subsequent risk-taking. On the other hand, one could imagine that actors do not solely focus on the search process during the competition. The actor's performance also plays a role in establishing the overall probability of success. While past experience is not a very reliable source of practices in an uncertain and competitive environment, it contributes to the overall level of self-confidence of the decision-maker. The psychological literature on cognition has stressed the importance of past data and experience in the building of confidence beliefs (Castelfranchi and Falcone, 2000, p. 3). Past performance is positively related to self-confidence since information about how one performed in the past can be used to approximately appraise one's capability to achieve in the future (Ackerman, Kanfer, and Goff, 1995; Bandura, 1997; Kozlowski et al., 2001; Mitchell, Hopper, Daniels, George-Falvy, and James, 1994). However, when the decision-maker realizes that along both important dimensions, namely the efficiency of the search process as well as the level of performance, the indicators are high, the feeling of overall control over the uncertain environment should emerge. This then should reduce the need for further risk-taking.

Hence,

Hypothesis 2: High performance paired with higher search efficiency (short duration) decreases the subsequent risk-taking.

While organizational search is primed by the availability of a problem (which in the context of this paper is uncertainty) it also entails a certain amount of effort required to conduct the search (Nickerson and Zenger, 2004; Heuschneider and Herstatt, 2016). When there is environmental uncertainty, interpretation of the environmental signals and obtained information necessitates decision-makers to apply effort. Normally, the effort required to reduce the uncertainty in the environment should be directed toward understanding the nature of the current problem and negotiating with the environment (Cyert and March, 1963). In the context of the search process, greater effort invested into the interpretation process should create higher expectations in terms of better perception of the current conditions and faster adaptability to the competitors' strategies. Hence, when these expectations materialize in the form of efficient search process, actor's motivation should rise (Koo and Fishbach, 2014). Therefore, I expect that high effort paired with an efficient search process (short duration of search) should translate into the increased level of the risk-taking.

Thus,

Hypothesis 3*:* A higher effort enhances the effect of the efficient search process on risk-taking.

METHOD

Research setting

The Intel Extreme Masters Katowice Major 2019 - the fourteenth Major championship in the computer game Counter-Strike: Global Offensive (CS: GO) - serves as the research setting for this study. This was the world championship for Season 13 of the Intel Extreme Masters (IEM), an international esports event that takes place in various countries across the world on a regular basis. Counter-Strike: Global Offensive is a multiplayer online tactical first-person shooter (FPS) computer game. It is the fourth installment in the Counter-Strike video game series and was created by Valve and Hidden Path Entertainment. Since its release in 2012, it has drawn approximately 11 million monthly players and remains one of the most popular games on Valve's Steam platform (digital distribution service for video games). For the first time on March 14, 2020, CS: GO had over one million gamers online at the same moment. The game has a thriving esports industry and builds on the series' long history of international championships. CS: GO is now one of the world's largest esports competitions. The most popular game mode can be summarized as follows: one team deploys an explosive (or attempts to do so) in a dedicated area on the virtual game map while the other team seeks to stop them. Each game match typically consists of around 30 rounds. The game involves a rigorous search process, which is manifested in players of one team searching for the players of the other team on a three-dimensional game map and engaging in combat confrontation within the virtual three-dimensional location. Every match in CS: GO takes place within a certain virtual map. The virtual map is essentially a three-dimensional virtual site, like a factory, abandoned train station, city street, a mansion, etc. For example, one of the most popular virtual game maps called "de_inferno" represents a small town with European architecture (mostly, game fans agree that this is some city in Italy). All interactions between teams take place within a virtual site. Each map is different and has its own peculiarities - architecture, landscape, size, etc. These maps are well known to professional players since they routinely train in those virtual places before the actual esports tournaments start. Each virtual place requires a different team approach and strategy. Just like in a chess game, one team develops its strategy of play while trying to figure out the strategy of the opponent team. The ability to discover the positions of the rivals comes from the deep knowledge of the virtual location (and thus of the possible strategic spots which the rival team might use to implement their own tactical plan to eliminate the focal team players) and collective and coordinated effort of the focal team to search within the given area. After a member of the opponent(s) team is found, the player(s) of the focal team try to eliminate them. If all opponent players are eliminated the focal team wins the current round. Then, the new round starts with an investment decision - both teams receive a certain amount of virtual in-game money (which varies mainly based on which team won the previous round) and need to decide how much of it to invest into the in-game arsenal. Naturally, spending all of it represents a risky decision, whereas more cautious buying decisions indicate a more risk-averse strategy for the current round.

CS: GO Major Championships (often referred to as the Majors) are esports tournaments sponsored by the game's development firm Valve. The Majors Championships are the most important and prestigious competitions in the CS: GO computer game. Teams competing in these competitions are made up of highly competent and experienced professional gamers with years of CS: GO expertise. These events are watched and attended by millions of people all around the world. The championship I collected data on, namely the IEM Katowice Major 2019, had 232 million people watching the live broadcast of the competition online, and around 175.000 individuals attending the event in person. The IEM Katowice Major 2019 is notable for drawing 1,205,103 viewers at its peak, making it the only CS: GO event in 2019 to exceed one million simultaneous viewers. The prize fund for the IEM Katowice Major 2019 event has been set at $1,000,000 USD. This means that there was a real money prize at stake for which the teams competed.

I test the hypotheses and investigate the effect of professional players' in-game speed (i.e. time) of searching on risk-taking as they compete against one another. Thus, I test the hypotheses using individual-level data - individual actors represent various esports teams and decide on in-game strategy as a team, which means they cooperate with each other and decide based not only on their own beliefs and assessments but also on information obtained from their team members during the match via headset communication.

The data I use provides a number of advantages. Contest settings are frequently considerably more easily observable than organizational decision-making processes. This implies I can conduct a more in-depth analysis of the competitive process and related decision-making. Furthermore, because competitive elements such as the position of the actors, their direction of travel, and their behaviors are clearly apparent in the CS: GO scenario, I can precisely determine the duration of the search of all the actors. Despite the fact that I use data on individual actors, our context is still organizational because players make decisions that are driven by other team members, instructors, sponsors, and viewers. Furthermore, I benefit from the absence of many additional factors that influence organizational outcomes in a competition in the typical organizational data, as I am looking at a purely competitive environment with only players, their strategies, and the game.

Data

In CS: GO competitive mode two teams of five players play against each other in a 30-round match. As a standard, the round should take 1 minute and 55 seconds to conclude, but in reality, the round can be shorter or even longer. For example, one team can eliminate the opponent team players within the first 20-30 seconds, which ends the current round prematurely. Alternatively, one team can install the timer in a dedicated area on the virtual map at the end of the round which adds additional 30 seconds to the overall duration of the round. The first team to score 16 points wins the game. If both sides score 15 points at the end of the 30th round, the game will be a tie. One method to win rounds that is similar for both teams is to eliminate all of the other team's players. As a result, the team that eliminates all of the opposing players wins the round. However, depending on the side, there is another way to win rounds. One team can win a round if one of the players installs a device with a timer on a designated site (typically two such sites, referred to as plants), and the team wins when the timer reaches zero. The opposing side wins rounds simply by not allowing the opponent team to install the timer or by removing the device before the timer hits zero.

Game strategy and search. To win a round both teams have to develop a search strategy. This means that each round both teams decide (and this is of the utmost importance for this game) on "who goes where" on the virtual map. For example, team ABCDE has player A, player B, player C, player D, and player E in it. Before the round starts, team members coordinate with each other like the following - Player A and Player C both go to one location on the map, whereas Player B remains at the current location, player D takes some specific section on the virtual map to perform a search and player E heads to some other agreed direction. While searching for the opponent represents an important part of the search strategy, another crucial element of the search is the formation of interpretative schemata of the playing style of the opponent team. In order to understand the opponent team (or in other words, analyze the threat), the focal player has to engage in direct confrontation with a rival player(s). Between such interactions (during the same round) the focal player interprets the interaction just experienced and can search for the next opponent(s). Once the current round ends, the team has to decide, based on the experience they just had, how much to invest into the in-game arsenal for the new round. All the players communicate with each other via a headset and until and unless they are eliminated, they can inform their teammates about their experiences during the current round.

Going in haphazard directions and playing without coordinating with the team is a sure way to lose in this game, that is why professional players train a lot, study the virtual maps and learn to devise search strategies quickly to effectively locate and eliminate the opponent players. Through this multi-faceted search (which is organizational, as it is coordinated and managed by a team not just by one person) one team learns the playing style, preferences, and peculiarities of the opponent team. The final destination of this search is not merely an elimination of the opponent players but the generation of possible alternatives. This search helps to establish what kind of equipment the opponent team prefers to use, and what are the distances on which the opponent team players are likely to engage in interaction. Additionally, they learn the weak spots of the opponent players, their level of accuracy and reaction, etc. The most important outcome of this search is to establish strategic patterns that emerged or *are* *about to emerge*. Thus, this search process helps to identify the potential weak points and strengths not only of the opponent team but also own.

Why this is a mixture of problemistic and institutionalized search. Problemistic search is launched in response to a problem, usually when performance is below the aspiration level. In this game, both teams have to actively and routinely engage in search activity independently of how well or how badly they performed previously; their eventual success largely depends on their ability to perform the search effectively. The search is launched at the beginning of each round, which makes it similar to the institutionalized search because it is started regularly throughout the whole match, but it also possesses the feature of the problemistic search because if we define uncertainty as a problem, then this search is initiated as a response to a problem (which is not necessarily a performance decrease). If at any point team members realize that the search is getting lengthier and opponent team players are increasingly better at detecting them (and hence have accuracy and reaction advantage - who detects first has an advantage of catching off guard the other and thus higher probability of eliminating the opponent), the tactic has to change. That means that the behavior of the opponent changes and hence the search should start again, and new alternatives must be discovered. Even if the focal team is currently performing well in terms of the amount of virtual money they have, the number of rounds won, etc., this still makes them question their current approach in response to the potential defeat in the future.

Measures

Dependent Variable. I operationalize the risk-taking in the context of the CS: GO game as the amount of virtual money invested into buying the necessary in-game equipment before each round of each match. Specifically, I measure risk-taking as a ratio of virtual money spent to the total available virtual money on a player's game balance. In the theory part, I investigate the effects of the previous search process duration, previous performance, and previous effort on subsequent risk-taking. For this reason, I regress the values of the risk-taking variable for the next round on all the independent and control variables. As I mentioned before each player receives a certain amount of virtual money before each round starts during the tournament. The amount awarded varies based on several factors - players of the team that won the previous round receive a noticeably higher amount, for example; additionally, each player can receive bonus amounts depending on the accuracy of their play style, the number of opponent team players eliminated and the type of the used equipment. Before each round starts players of both teams have around 20 seconds to purchase everything, they think might be necessary to implement their strategy for the current round. Players must save up enough money so that they can invest in a valuable arsenal. Spending all the money represents a risky choice because if the focal team loses the round, the opponent team will have significantly more money and better equipment for the next round. This situation makes it harder for the focal team to retaliate and thus win the next round due to a substantial imbalance in the number of resources between the two teams.

Independent Variables. My main independent variable is the search time (*Search duration*). In an uncertain environment, the search process consists of two main steps - finding the necessary information and interpreting the found information to generate the solutions. Thus, in the context of the CS: GO game, I operationalize the search as the amount of time (in seconds) it takes the focal player to find the opponent team player(s) on a given map from the start of the round plus the amount of time between the encounters (which can be viewed as the time the focal player interprets the experience attached to the encounter that just took place and duration of search for the next opponent(s)) within the same round. I then invert this variable, so that it represents search process efficiency (shorter duration means higher efficiency, longer duration means lower efficiency). Figure 2 demonstrates a potential search strategy of a team[5]

[5] taken from https://csgo-strats.eu/category/inferno-strats

on an in-game map for the next round and shows the process of search schematically in the form of the direction of movement of team members on the virtual map (this is a draft that is designed by an actual CS: GO team). The yellow circles represent each team member. Every player takes on a certain part of the map to conduct the search process. The bird's-eye view makes it possible to visually demonstrate exactly where the team members intend to search for opponents in this specific round. The search strategy for a round is based on the collective assumptions of the focal team about where the members of the opponent team could be. Usually, each virtual map has its own strategic spots and places that teams use to develop their game strategy for the round. As I mentioned previously, the search in this game is not a random process, which is especially true in the context of professional esports tournaments. Shorter search times indicate the correct assumptions on the side of the focal team and thus a better understanding of the rival team's game tactic.

Insert Figure 2 here

To test the second hypothesis the independent variable I use is the number of times a player was eliminated during a match (*Performance*). The term "eliminations" refers to the total number of times a player has been eliminated by a player or players from the rival team. A common performance indicator frequently used in esports to rate players is the number of in-game deaths (Kim et al., 2016; Xenopoulos et al., 2020). I inverted this independent variable to align its influence with my hypothesis because an increase in the value of the number of eliminations is regarded as a performance decline. This made it easier to interpret the results.

Finally, the last independent variable is the amount of effort for a round (*Effort*) which is operationalized as the number of times the focal player interacted with the opponent team players during a round. Since opponent players represent a threat, in order to interpret or analyze them the focal player needs to engage with them, which means *attempting* to eliminate at least one of them. These attempts are exactly what is counted in the independent variable for each round and for each player. If the number of such attempts is small, it means that the focal player had a limited number of interactions with the rival players, which I associate with little effort. The small effort combined with a short duration of searching for the opponents on the virtual map should then give the players confidence in their understanding of the playing style of the opposite team.

***Control Variables*.** Additionally, I include three main control variables, namely a dummy variable "*Round W/L*" indicating whether the previous round was won by the focal player's team; "*Round Duration*" variable which shows the overall duration (in seconds) of the previous round; and, finally, the number of times the focal player helped the team members to eliminate the opposing team player(s) (*Times helped team members*). Since I collected data on five matches, I include the match dummies in the model as well. Also, a fixed-effects estimator for each player is accounted for (intrinsic properties of the players, like risk propensity, experience, etc.). The dummy indicating the win or loss for the previous round is added to control for the possible effect of previous team success on individual risk-taking. Additionally, the duration of the previous round can have an impact on the player - longer rounds can be exhausting, for example, which, in turn, can affect risk-taking tendencies. Lastly, sometimes a player during an exchange on the virtual battlefield manages to deal a substantial amount of damage to the rival team player(s) but gets eliminated by them nevertheless or simply retreats to a safer zone on the virtual map. This leaves the in-game health level of the rival player(s) low which makes it substantially easier for the other team member(s) of the focal player to eliminate them later during the round. In such a scenario the game considers this case as an "assistance". I counted such cases for each round and included this variable in the model as well.

Table 3 shows the descriptive statistics and correlations of the variables.

Insert Table 3 here

Results

The fixed effects OLS models that I used to test the hypotheses are shown in Table 4. Model 1 only includes the control variables. If the team wins the previous round this makes the buying behavior of the focal player in the next round more risk-averse (negative and significant coefficient (Round W/L) in all models). This can be explained by the fact that after a team wins, each player is simply cautious not to get overconfident due to a recent win and maintain a reasonable amount of optimism about the next round. Additionally, the duration of the previous round (Round Duration) has a positive effect on the riskiness of the investment of the player in the subsequent round. As was described before, the round ends as soon as all of the members of one team are eliminated. When some or all of the team players survive for longer (are not eliminated early in the round), this can give the team players higher confidence in their skills and abilities, which translates into higher risk-taking. Another control variable, the number of times the focal player helped the teammates, has a negative effect on risk-taking in the next round in all models.

Insert Table 4 here

The first hypothesis states that the longer duration of the search should decrease the riskiness of the chosen solutions (lower search efficiency results in lower risk-taking). I introduce the main independent variable, the search duration (inversed to ease the interpretation), to test this hypothesis in Models 2-4. The coefficient for this variable is positive and significant in all models, which means that as the search for the opponents starts to get lengthier (less efficient), the buying behavior at the beginning of the next round becomes more and more risk-averse. That is, the player spends less on arsenal and equipment compared to the total amount of virtual money available. Thus, the coefficient supports the first hypothesis.

In the second hypothesis, I argue that a high performance level interacted with the high efficiency of the search process should result in lower risk-taking. To test this hypothesis, I interacted the performance variable with the search duration variable and introduced this interaction in Models 3 and 4. The coefficient of the search duration and performance interaction is negative and significant, which means that as performance improves, the risk-increasing impact of a shorter search duration becomes less pronounced. This is in line with and supports the second hypothesis.

Finally, the last hypothesis proposed that high amount of effort paired with the efficient search should raise actor's motivation, and hence the risk-taking. I introduce another interaction (*Effort * Search duration*) to test the last hypothesis in Model 4. The coefficient of the interaction is positive and significant which supports the argument.

Figure 3 demonstrates the interaction effect of the duration of the search and the amount of effort on the risk-taking in the next round. The risk-taking is more sharply increased by the efficient (shorter) search process for the cases of the high level of effort the actor applies to interact with the environment. Figure 4 presents the interaction effect of the search duration and performance, demonstrating the stronger risk-enhancing impact of short search time for low performance.

Insert Figure 3 here

Insert Figure 4 here

DISCUSSION

In this paper, I attempt to reconceptualize the search process to explore the consequences of decision-making in an uncertain context of inter-firm tournaments. The search process is usually viewed as a mere theoretical tunnel between the decision-makers reaction to performance deviations and subsequent tendency to opt for the riskier solutions to solve the emerged problem quickly. Though papers acknowledge that solutions do not magically appear on the manager's table (Greve, 2003) and a certain amount of effort and time is required to perform the search process, research on search and risk-taking mostly left it as the obvious, self-evident element of the decision-making process. While these details can be omitted in normal conditions, inter-firm competition can be a rather severe environment in which every small detail can play a decisive role in the determination of the winning (or at least surviving) party. To provide a framework that is better suited for such conditions I developed a complementary theory that explains the behavioral consequences of the tight time limits within the uncertain environment caused by inter-firm competition. The intense pressure caused by uncertainty in such conditions naturally should force its participants to search for solutions (to the increasingly dangerous uncertainty of not knowing the next moves of the competitors) faster than usual. This then evokes a question - what could be the consequences of reduced compared to extended search times on the subsequent risk-taking? I answer this question by using the psychological theory on self-confidence. While the theory on self-confidence states that risk-taking tendency depends on the decision-maker's belief in their own abilities it also argues that self-confidence can change depending on how fast we manage to come up with solutions. These two views once bridged provide a solid framework for decision-making in an uncertain environment.

First, I demonstrate that the short duration of the search increases the riskiness of the solutions selected in response to environmental uncertainty. Theoretically, I explain it by the increased self-confidence of the decision-maker - agents feel safer about the quality of the solutions to the existing problem when they can come up with them quickly. This simply signals to them that they understand the problem well enough so that a riskier alternative is picked. Strong comprehension of the problem lowers the risk perception of the actor and thus makes them see even the risky options as not so risky since it’s a “sure thing” anyway.

Second, the influence of past performance should still be present in the context of environmental uncertainty. An intriguing dynamic occurs when actors take into account both the search process and performance: when both are strong, the decision-maker gains a sense of mastery over the unknown competitive environment. As the performance indicator rises, the actor is less likely to take risks because they no longer see a need to be risk-seeking in a setting that they feel they have a good handle on.

Third, I acknowledge that interpretation of the found information requires a certain amount of effort. The effect of the efficient search process on the risk-taking is even more pronounced when actor invests a lot of effort into the process.

The contributions of this paper are mainly to the literature on search and risk-taking. This paper explicitly considers the search process as a factor that also can regulate the risk-taking behavior of the decision-maker. While previously search was acknowledged as an intermediary between performance level and risk-taking, this research stream mostly omitted it from the analysis or acknowledged that it exists in a broad theoretical sense. I attempt to demonstrate the direct effect of the duration of the search process on decision-making. Additionally, I bridge two streams of research within this paper, namely the literature on the search and psychological literature on self-confidence.

Limitations of this paper stem mainly from the fact that I do not examine the problemistic search within this paper. While I was able to collect very detailed data on the competitive interactions between members of the opponent teams during an esports tournament, the context of this tournament forced the participants to perform the search process independently from their current performance level. This then rendered it impossible to test specifically the effect of problemistic search on risk-taking in this setting. Some might see another limitation connected to the use of individual-level data to explain organizational phenomena of risk-taking. While this is partially justified, I tend to believe that there are many other studies that have used this level of analysis and were successful in conveying important ideas to a broad audience. Additionally, I see a limitation in the inability to explicitly consider and measure the level of self-confidence of the decision-maker before and during the tournament. Unfortunately, the esports tournaments do not provide such kind of information neither it is possible to do it deliberately during these events. Thus, while I solve one issue related to the theoretical consideration of the search process as a "black box" between performance and risk, I introduce another one which is the absence of a direct self-confidence measure. Future studies should focus specifically on the experiments involving the problemistic search and measure the self-confidence of the participants to provide a full picture of the decision-making process.

Table 3. Descriptive statistics

Variables	Mean	Std. Dev.	1	2	3	4	5	6	7	8	9	10	11
Expenditure Ratio (Spent/Total)	0.603	0.371	1										
Search efficiency (duration, inv)	51.97	25.488	-0.056	1									
Elimination Avoidance (Performance)	9.101	5.747	0.097	0.112	1								
Effort	2.038	2.685	-0.001	-0.094	-0.017	1							
Round W/L (dummy)	0.503	0.5	-0.091	0.046	0.009	0.164	1						
Round Duration	105.189	25.474	0.065	-0.987	-0.11	0.131	-0.037	1					
Assist total match	1.52	1.718	-0.046	-0.019	-0.457	0.073	0.015	0.019	1				
match2	0.221	0.415	0.157	-0.075	0.07	0.028	0.007	0.08	0.05	1			
match3	0.204	0.403	-0.031	0.057	0	0.027	-0.011	-0.065	0.075	-0.269	1		
match4	0.211	0.408	-0.033	-0.014	-0.069	-0.135	-0.003	0.018	-0.06	-0.276	-0.264	1	
match5	0.185	0.388	-0.026	0.049	0.042	0.085	0.004	-0.048	0.209	-0.255	-0.244	-0.25	1

Table 4. Fixed effects OLS regression results for likelihood of risk-taking

VARIABLES	Model 1	Model 2	Model 3	Model 4
Search efficiency (duration, inv)		0.0046***	0.0069***	0.0063***
		(0.000)	(0.000)	(0.000)
Elimination Avoidance (Performance)			0.0164***	0.0158***
			(0.000)	(0.000)
Search efficiency (duration, inv) * Elimination Avoidance (Performance)			-0.0002***	-0.0002***
			(0.000)	(0.000)
Effort				-0.0128***
				(0.001)
Effort * Search efficiency (duration, inv)				0.0002***
				(0.000)
Round W/L (dummy)	-0.0632***	-0.0618***	-0.0668***	-0.0670***
	(0.002)	(0.002)	(0.002)	(0.002)
Round Duration	0.0008***	0.0052***	0.0054***	0.0053***
	(0.000)	(0.000)	(0.000)	(0.000)
Times helped team members	-0.0244***	-0.0256***	-0.0163***	-0.0160***
	(0.001)	(0.001)	(0.001)	(0.001)
match2	0.2559***	0.2596***	0.2144***	0.2175***
	(0.005)	(0.005)	(0.005)	(0.005)
match3	-0.0406***	-0.0276***	-0.0495***	-0.0518***
	(0.004)	(0.005)	(0.005)	(0.005)
match4	0.0620***	0.0669***	0.0453***	0.0451***
	(0.004)	(0.005)	(0.005)	(0.005)
match5	0.1785***	0.1754***	0.1372***	0.1407***
	(0.006)	(0.006)	(0.007)	(0.007)
Constant	0.4957***	-0.2168***	-0.3641***	-0.3237***
	(0.005)	(0.038)	(0.038)	(0.039)
Observations	140,290	136,175	136,175	136,175
R-squared	0.0445	0.0471	0.0569	0.0588
Number of Player_id	30	30	30	30

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figure 2. Schematic representation of the team search strategy on the virtual map (top view, yellow circles represent each player of the team)

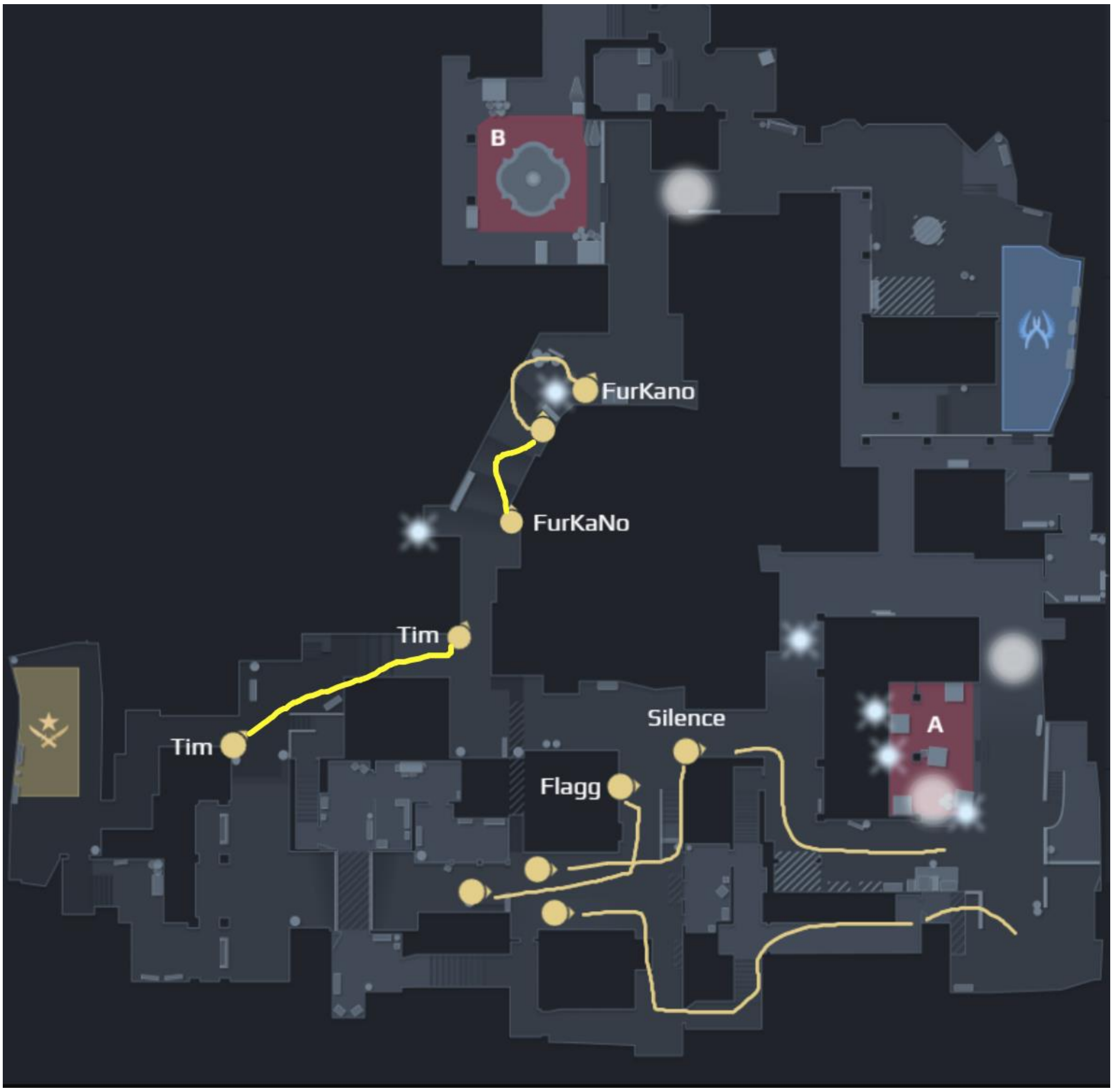


Figure 3. Interaction effect Effort * Search Time

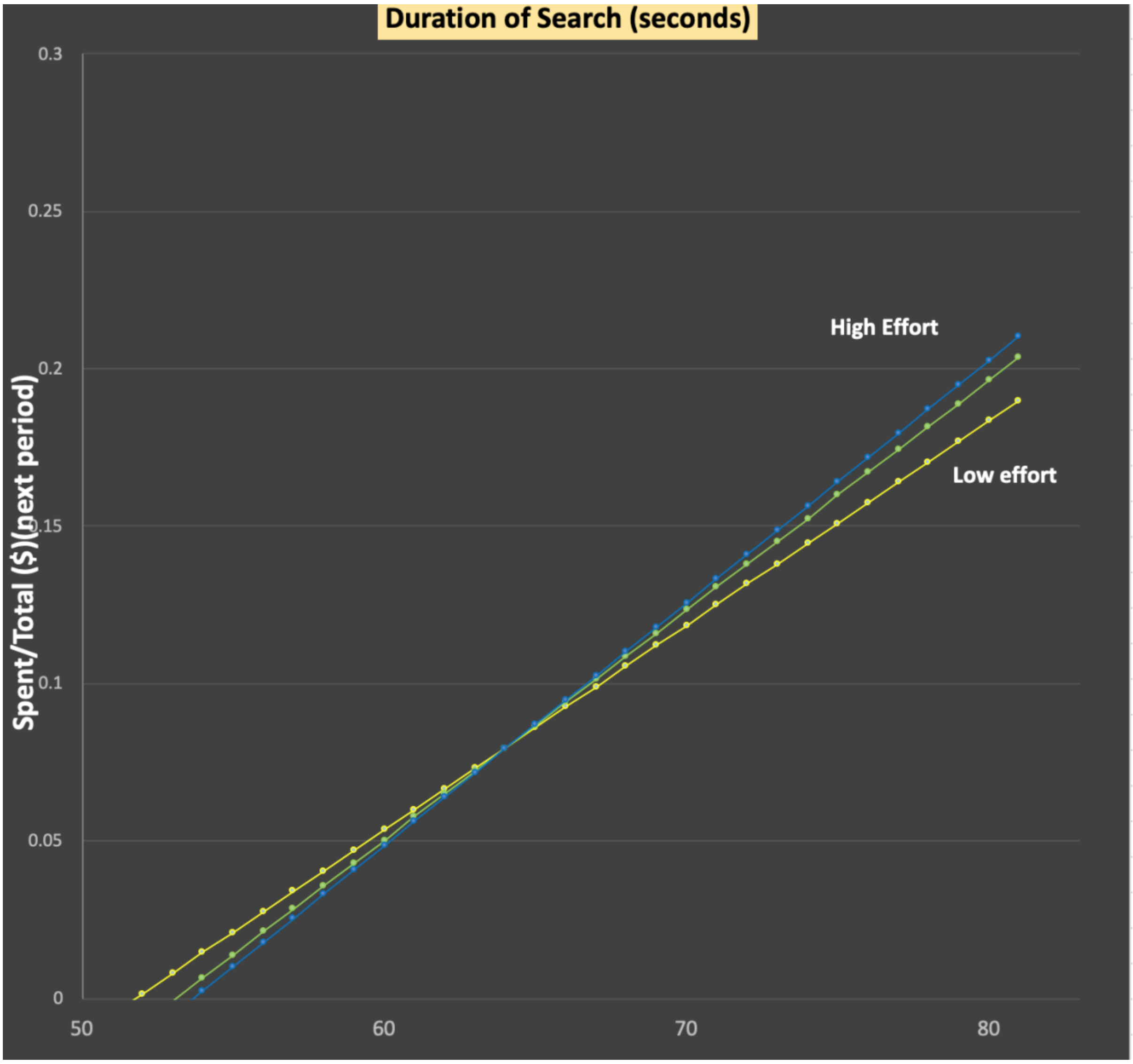
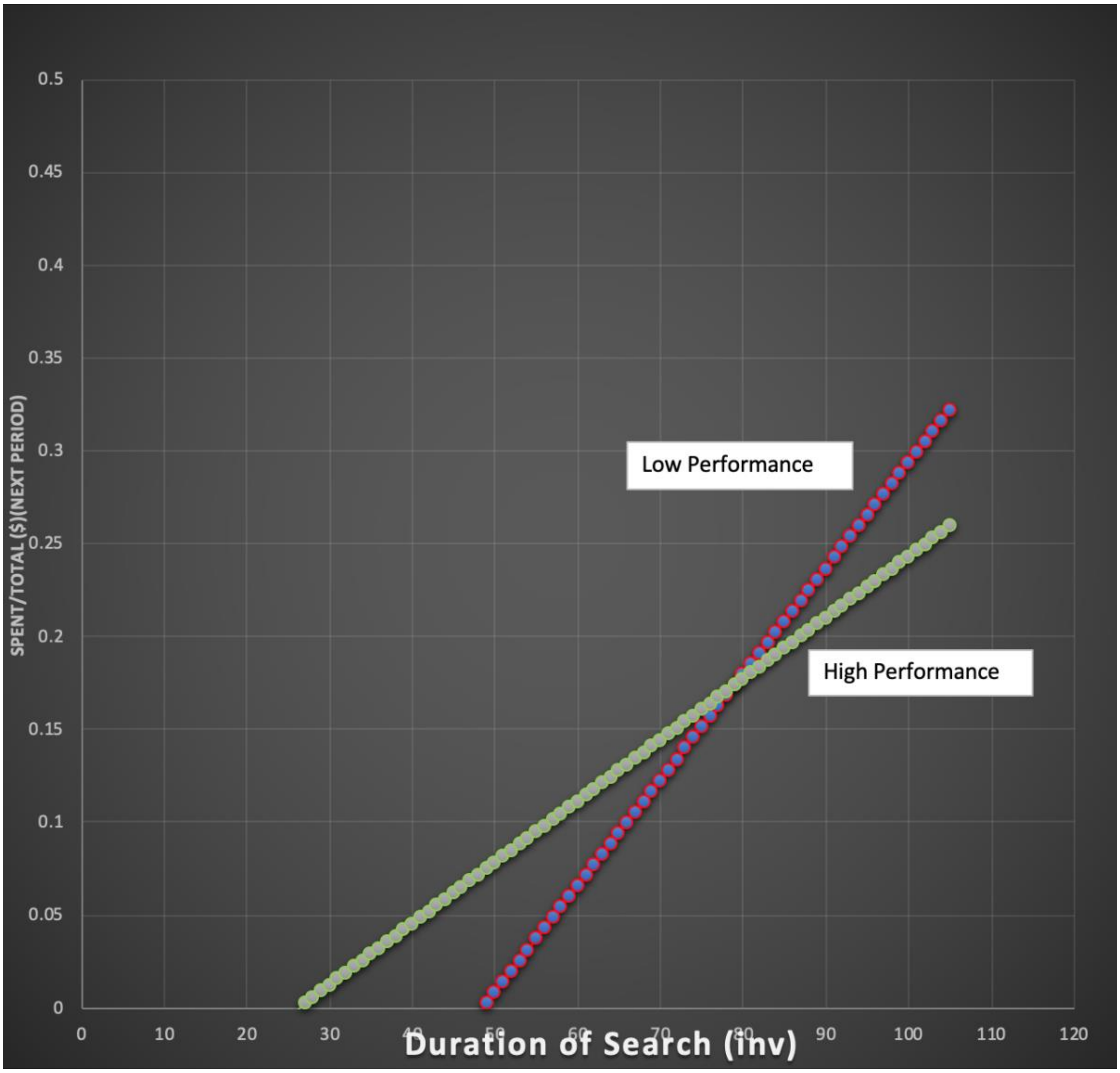


Figure 4. Interaction effect Search Duration (inv) * Elimination Avoidance (Performance)



4. ATTACK AND DEFENSE IN COMPETITIVE DYNAMICS - THE PERFORMANCE CONSEQUENCES IN DIRECT COMPETITION.

Abstract

Studies of the competitive behavior of organizations agree that performance depends on the volume of actions as well as on the number of retaliatory responses from the competitors. Recent research suggests that competitive activity positively influences performance, but excessive competitive aggressiveness harms performance due to competitors' retaliatory responses. This study considers the unique effects of two different types of competitive moves: (a) attacking moves, those that are directed specifically towards improving current position and increasing control over the environment (b) defensive moves, those that are directed specifically towards defending the current position when at risk of deterioration or survival. For attacking moves, we posit that their quantity increases the performance of the focal actor up to a certain level, consistent with the prevalent view of the competitive dynamics, but then they start to decrease performance due to accumulating costs and decreased motivation. For defensive moves, however, we posit that performance decreases with increasing intensity of the defensive strategy, due to decreasing motivation and effort. The proposed hypotheses were tested and largely supported by our data on esports.

INTRODUCTION

The previous chapter investigated the effect of the search process on risk-taking in the context of direct competition. This chapter can be viewed as the continuation of the previously discussed process, perhaps as a post-search activity in which organizations engage, a step that embodies the implementation of the solutions in the form of specific actions and their effect on organizational performance.

Research on competitive dynamics investigates, among other things, the link between organizational action and performance within a fixed time period (Ferrier et al., 1999; Smith et al., 1992; Young, Smith, & Grimm, 1996). Actions are viewed as positioning tools - firms adjust and place themselves within the industry, and create resource advantage through their actions (Porter, 1980; Barney, 1991; Grimm & Smith, 1997). There are several views on the effect of organizational actions on the performance of the firm. On the one hand, a high level of competitive activity (a large total number of actions) is associated with superior performance (Young et al., 1996). On the other hand, some authors claim that a high level of competitive aggressiveness harms performance, because of the competitors' retaliation (see for example Derfus, Maggitti, Grimm, and Smith, 2008).

Interestingly, the competitive dynamics literature looks at the effect of the number of all of the actions (total) or specific types of action (pricing, capacity, geographic, marketing, and product introductions) on firm performance (Ferrier et al., 1999; Smith et al., 1992). One drawback of this approach, however, is that the definition of action by default assumes both defensive actions and offensive actions under one concept - "specific and detectable competitive move(s)…initiated by a firm *to defend or improve* its relative competitive position” (Smith et al.,1991: p.61). Therefore, a substantial amount of research focuses on the effects of the overall competitive activity (total number of actions) on performance (Ferrier, 2001; Ferrier et al., 1999; Huff & Robinson, 1994; Young et al., 1996; Andrevski and Ferrier, 2016). The effects of the number of opponents' responses on the focal firm's performance are also investigated within competitive dynamics (Derfus, Maggitti, Grimm, and Smith, 2008). However, previous research on competitive dynamics did not take into account that attacking moves and defensive moves of the same focal actor might have quite different effects on their performance.

The timing of actions also plays an important role in this research stream (Bettis & Weeks, 1987; Lee, Smith, Grimm, & Schomberg, 2000). The competitive dynamics literature mainly focuses on the timing of actions and the competitive responses in the context of temporary competitive advantage - the earlier the action (or response) is executed the better (so-called first-mover advantage and the benefits associated with being an early responder) (Lee, Smith, Grimm, & Schomberg, 2000). However, not all actions that are executed early improve performance. The competitive context is also characterized by the presence of various regular reports that impose certain time limits on all the participants of any given competition. Given the different resource and effort requirements of the offensive and defensive strategies, their effectiveness also depends on the closeness to a deadline.

Additionally, this research stream focuses mostly on objective and structural factors related to competitive behavior, while leaving out the affective and cognitive processes that impact the decision-makers (Chen, 2007). Several calls have been made to explore these elements of the behavior and integrate them into the competitive dynamics (Smith et al., 2001; Chen, 2007; Livengood & Reger, 2010).

Additional difficulties are posed by the typical data in competitive dynamics (Smith et al., 2001; Nokelainen, 2008; Hutzschenreuter & Grove, 2009) - data are usually collected via the analysis of press or archival data, which do not include all of the moves, or are sometimes biased when identifying them (Gnyawali et al., 2008, Nokelainen, 2008).

To address these points, we argue the competitive dynamics literature can benefit from an explicit and clear distinction between competitive moves of the organization: attacking moves and defensive moves. Given the increased speed of actions in modern organizational competition (Grimm, Lee, and Smith, 2006), any organization at any point can both attack one firm and defend itself against the attacks of the other firm. Attacking moves and defensive moves each trigger different affective reactions within the decision-maker and require a different amount of cognitive resources as well as organizational resources. One specific idea that we explore is that at first attacking should be beneficial for an organization's performance. However, after a certain number of attacks, the initial positive effect should then turn into a negative one. We expect this pattern because attacking moves help to keep the environment under control, which increases the motivation and effort of the decision-makers. However, these positive effects should reduce with time once the opponent's retaliation starts to gradually exhaust the decision-maker's cognitive and financial resources.

We explore these and other ideas and address the data-related problem described above by examining the competitive behavior exhibited by teams within the cybersports championship IEM Katowice 2019. The dataset contains 140'290 observations from 5 matches in which 6 teams (with 5 players on each team) took part. This context allowed us to precisely observe the moves of each player of each team and classify moves as either attacking moves or defensive moves. We operationalize performance as the number of times a player got eliminated by the opponent team players during a match. The predicted effects of the number of attacking moves and of the defensive moves on performance are generally supported.

THEORY AND HYPOTHESES

Competition is a central element of strategic management research because it impacts the economic performance of an organization (Porter, 1980). Generally, there are two broad conceptualizations of competition. As Baum and Korn (1996: 255) argue one conception of competition is based on the structure of the market and the other one on the behavior of organizations. The first view rests on the idea that individual firms cannot control the market forces that set the structure of the market and define the general competition among firms. As a consequence, "competition occurs as largely anonymous organizations vie for a limited common pool of resources" (Baum and Korn, 1996). This form of competition is sometimes called "diffuse competition" (Hannan and Freeman 1988). The second type of competition, which is based on the behavior of organizations, can be called "direct" competition (Hannan and Freeman 1988) in which organizations can clearly define and compete against their rivals. For example, think about the long tactical battle between Pepsi and Coca-Cola for domination in the supermarket segment (Porter and Wayland, 1991), the rivalry between Amazon and Barnes & Noble over online book retailing (Ghemawat and Baird, 1998), explicit competition between BMW and Mercedes-Benz for the title of the number one maker of premium cars in (Edmondson et al., 2003), Fox News decision to outperform CNN in cable news (Kempner, 2002), and the strikingly aggressive rivalry between Adidas and Puma over the control of the sportswear market (Smit, 2008). This form of competition is captured with the competitive dynamics approach that takes its origins from the theory of creative destruction (Schumpeter, 1934).

Initially, Joseph Schumpeter described the competition as a dynamic market process (Schumpeter, 1934), contrary to the view of competition as a static market outcome by neoclassical economists (Scherer & Ross, 1990). He did so by introducing the idea of creative destruction (Schumpeter, 1942), the concept that captured the performance deterioration of the leading firms in the market caused by the competitive exchanges of actions between firms (Schumpeter, 1934, 1950). The main motivation for this is the pursuit of market opportunities. Later Young et al. (1996) and Ferrier et al. (1999) incorporated these ideas in competitive dynamics literature and they became the foundation of it. The central argument of this theory resulting from the creative destruction concept is the fact that market equilibrium or a stable state (and therefore the absence of competition) can never be achieved because of the profit forces for action.

Within competitive dynamics, an action (or move) is considered the main tool for gaining a competitive advantage, and competition is then seen as an exchange of competitive actions by organizations to improve or defend their positions (Smith et al., 1992; Smith, Ferrier & Ndofor, 2001). There are two important research directions within this stream: the connection between the characteristics and frequency of actions and firm performance (Ferrier et al., 1999; Smith et al., 1992; Young, Smith, & Grimm, 1996) and the link between the temporal property of the action and its impact on performance (Bettis & Weeks, 1987; Lee, Smith, Grimm, & Schomberg, 2000).

The dominant idea within the competitive dynamics literature is that a higher number of competitive actions results in increased performance (Ferrier, 2001; Ferrier et al., 1999; Huff & Robinson, 1994; Young et al., 1996). One of the explanations for this relation is the higher number of opportunities that the firms that execute more actions can exploit (Young et al.,1996; Ferrier et al., 1999). Once the profit opportunities are identified, actions are directed toward the pursuit of these discovered profit opportunities (D'Aveni, 1994; Kirzner, 1989, 1997). A higher number of actions allows for exploiting more of such opportunities and thereby significantly reduce the space for action to benefit from these potential profit gaps for other competitors. Another explanation for better performance caused by the larger volume of actions refers to the trial-and-error learning through which organizations learn which set of actions is preferable (Sterman et al. 2007, p.684). Some authors find a negative effect of the number of actions on performance - this is related to the consequences of excessive competitive activity which provokes a large number of retaliatory responses from the competitors and increasing costs of action which lead eventually to the decline of organizational performance (Derfus, Maggitti, Grimm, and Smith, 2008; Andrevski and Ferrier, 2016).

How attack influences decision-making and performance

The majority of the studies in competitive dynamics define action as "specific and detectable competitive move(s)…initiated by a firm *to defend or improve* its relative competitive position" (Smith et al.,1991: p.61) and response as - "a specific and detectable countermove, prompted by an initial action, that a firm takes *to defend or improve* its … position in its industry" (Chen and Hambrick, 1995: p.456). While these definitions are comprehensive enough in that they capture the essence of what a competitive move can be, they broadly encompass simultaneously the offensive (position improvement) and defensive (position defense) nature of a competitive move within both action and response constructs. However, we believe that it is necessary to separate "offensive" from "defensive" action. Only by doing so, we can focus on the exact and specific purposes of the competitive strategies.

Competitive actions are directed towards the exploitation of the identified profit opportunities, which then closes off the potential for action for the opponents and allows the focal actor to benefit from the discovered gap for a while (D'Aveni, 1994; Kirzner, 1989, 1997). However, locking up the newly discovered resource space for others basically means striving to keep the environment under one's own control at least temporarily (Smith et al., 2001) which relates to fundamental human motives: the desire for power and aspiration for achievements (McClelland, 1987; Bandura, 2001; deCharms, 1968; DeShon and Gillespie, 2005). In competition, an attack is, thus, the manifestation of the inner striving of the decision-maker for improvement.

An example of such competitive movements is the attacks that Pepsi launched against Coca-Cola starting in the 1950s. When Alfred Steele became the CEO of Pepsi in 1950, he set a goal to beat Coca-Cola, which back then was dominating the soft drinks market (around 70%). He identified their weak spot - Coca-Cola was mainly focusing on traditional retail outlets, and therefore Steele attacked them on the supermarket segment. Pepsi executed its offensive strategy which consisted of arrangements with bottlers, price reductions, and aggressive investments in advertisement. These attacks eventually resulted in Pepsi outperforming Coca-Cola in the supermarket segment in 1975. After this Pepsi launched another attack on Cola, the so-called Pepsi Challenge, which started in 1975 and was essentially a blind test offer of two different types of cola - Pepsi and Coca-Cola with customers mainly opting for Pepsi (according to their commercials).

Hence, attacks as the elements constituting the offensive strategy are tools that serve the purpose of strengthening and boosting one’s current position and therefore should be associated with feelings of satisfaction, increased motivation, and high exerted effort (Cron, Slocum, VandeWalle & Fu, 2005; Illies and Judge, 2005; Illies et al., 2010; Hull, 1934; Lewin, 1935; Brown, 1948; Brendl and Higgins, 1996; Förster, Higgins and Idson, 1998).

The decision to attack is usually a self-concordant and self-accepted act (I choose whom I will attack), where the focal actor himself/herself participates in the goal-setting process, which leads to acceptance of such goal by the actor (Erez and Kanfer, 1983). This is in line with the idea that organizations do not necessarily compete with the overall industry, in which they operate, but rather choose a rival or strategic group as an aspiration (e.g. Reger and Huff, 1993; Porac et al. 1995; Chen, 1996; Moliterno et al. 2014), and thus ignore other opponents (Zajac and Bazerman, 1991). Accepted (internalized) goals are known to increase performance since goal acceptance (i.e. congruence of personal striving with implicit motives) ensures commitment, effort, motivation towards the goal as well as positive affect (Locke, 1996; Brunstein et al., 1998; Sheldon & Kasser, 1995; Alispahic, 2013). Progress on such goals increases positive affect (Schultheiss et al., 2008). The peculiarities of the attacking strategy make it motivationally rewarding because it is directed towards a specific aspirational goal that is desired. Independently from whether an attack is successful or not, the high commitment tied to attacking will ensure continuing pressure on the chosen opponent(s). Thus, attacks that did not yet achieve the desired outcome are likely to increase the commitment of the focal actor and a more rigorous attempt to attack an opponent the next time. Since an offensive strategy bears the potential of control over the environment, it should lead to higher motivation and commitment, and more effort which eventually should increase performance. However, the concept of creative destruction and thus the main idea of competitive dynamics is that any advantage gain is only temporal in nature. Therefore, the position of complacent and inactive firms will deteriorate eventually because some of the competitors' reactions will appeal to the market (Schumpeter, 1934). To prevent this erosion, organizations must continuously seek to introduce novel offensive moves. Thus, attacks breed more attacks because competitors may usually retaliate after being attacked. A chain of attacks helps the decision-maker to achieve the chief intrinsic strivings - progress, power, and control over the environment. This is similar to the Red Queen effect which proposes that organizations face the pressure to adapt faster to the constantly evolving solutions of the competitors if they want to survive which creates a constant chase or race alike context (Barnett and Hansen, 1996). The natural striving of the decision-maker after the success of the offensive strategy is to attack the next competitor, to achieve even more power and control over the environment. However, the actor needs to (also) focus on the outperformed competitor due to their potential retaliation. After having spent resources for the attack(s), now the actor is imposed to spend additional resources on further attacks to prevent retaliating (defending) opponents from reclaiming their position back. This makes attacking risky and expensive at the same time. In general, successful attacks are known to be resource-intensive and require a lot of planning (Yannopoulos, 2011). Thus, attacking too often and attacking many competitors can rack up costs quickly and the planning and resources required to sustain the long attacking chains should weaken the position of the focal actor. This, in turn, should lead to a negative affect of the focal actor.

Generally, when the actor experiences negative affect, he or she might react with avoidance behavior (Illies and Judge, 2005). Also, the desire to achieve a goal is significantly decreased when the goal is primed in the vicinity of the domain where the negative affect is activated (Aarts, Custers, and Holland, 2007). Hence, with negative affect appended to the next goal pursuit, motivation to achieve the goal decreases (Cacioppo & Berntson, 1999; Gray, 1987; Lang, 1995; Schneirla, 1959; Watson & Clark, 1992; Watt, 1998). Attacking the next competitor, despite being an appealing possibility of improving even further the current position, will be associated with yet another accumulation of costs and an additional decrease in resources. Therefore, additional attacks will be executed with less effort and motivation. However, apart from the decrease in effort and motivation, the depletion of resources can alone have a deteriorating effect on the effectiveness of further attacks. Therefore, we argue that even though initially additional attacks will increase the performance of the actor, they will later have the opposite effect due to accumulating costs, diminishing resources, decreased effort, and motivation. We therefore formulate

Hypothesis 1: *An increase in the number of attacks performed by the focal actor increases performance first and then decreases it.*

How defense influences decision-making and performance

As was mentioned previously, the most fundamental human strivings are the desire for power and achievement (Schultheiss et al. 2008) as well as the urge to control one's environment and be effective in making changes in it (Bandura, 2001; deCharms, 1968;

DeShon and Gillespie, 2005). We argue that under these principles the accumulation of defensive actions will decrease performance for several reasons.

First, we argue that given the inherent drive of individuals to achieve goals and progress, defense as an act of protecting oneself from the attacks of competitors has low intrinsic value and meaning. Meaningfulness in such a case can be defined as the value that an activity/task has based on the individual's own standards – to what extent the individual cares intrinsically about a task (Thomas and Velthouse, 1990). Protection of the position implies one of the two possibilities - the position remains unchanged or the position deteriorates. Defensive strategies serve the purpose of safeguarding and maintaining, instead of achieving or progressing. Since an individual's aspiration for advancement and progress is the most important force, the defense goes against the internal desire to progress and to achieve, which means it must result in a negative emotional state (or negative affect) of the decision-maker. Obstacles on the way to the achievement of a goal, goal conflicts, and low progress toward a goal are known to cause impaired mood and increased negative affect and lead to a decrease in positive affect (e.g., Brunstein, 1993, 1999; Brunstein, Dangelmayer, & Schultheiss, 1996; Tam and Spanjol, 2011, Alliger & Williams, 1993; Kuhl, 2001, p.243). This, in turn, reduces performance (Lazarus, 2000). Hence, we argue that the defense component of competition hinders forward progress and achievement, because it forces the decision-maker to focus on positional protection instead of positional improvement which leads to increased negative affect. The consequence is that performance should decrease.

Another reason for the harmful effect of defense on performance is the fact that defensive actions (and resources needed for those actions) when under the attack of a competitor, are directed towards a goal that is not self-selected and is not self-concordant but rather imposed. Sometimes goal pursuits are elicited by the environment, meaning that they are not consciously triggered (Bargh, 1990; Wegner, 2002; Wilson, 2002). In a competition, such a situation is characterized by an opponent's attack. The focal actor is forced to interrupt any ongoing goal pursuit and react to (defend against) the attack, which represents the imposed objective. Certainly, any decision-maker would choose to only focus on improving their position and avoid spending resources on situations, which do not offer such an opportunity. Decision-makers need to feel that they control the events and not vice versa, otherwise, they experience tension, negative affect, and their self-esteem is reduced (Deci and Ryan, 1985). Hence, we expect that repeated attempts to protect one's own position, while simultaneously making no progress towards goals, should lead to a decrease in the meaningfulness of the defense process. Goals that are not congruent with personal strivings, interests, and values (i.e. not self-concordant), are less effective in provoking engagement and commitment (Koestner et al. 2002, 2006; Sheeran et al. 2005; Tam and Spanjol, 2011; May, 1969). This means that the overall performance should be reduced as a result of such events.

Finally, the sense of threat, which is also a component of defense, might also lead to a performance decrease. According to Lazarus (1984) threat is related to the losses that are expected, but have not yet happened. In the context of competition, an expected loss is not only limited to a worsening of the position but is also linked to a decrease in the market share, income, etc. if a competitor manages to execute a successful attack (or several successful attacks) on the focal actor. Thus, it is the impending danger and risk of deterioration of one's position as a result of the opponent's attacks that provoke a sense of threat (Bothner et al., 2007). Threatening events will have the supreme priority for the actor (e.g., Bradley, 2009; Kenrick et al., 2010; LoBue et al., 2010; Öhman & Mineka, 2001; Öhman et al., 2001; Pratto & John, 1991). This focus on the potential damage causes negative emotions (Kuhl, 2001, p. 243). As Lazarus (2000) points out, the intrusion of emotion, that is irrelevant to the current task, creates a new goal that interferes with the current task and, consequently, hurts performance related to any other goal. While reacting to the attacks of the competitors, the decision-maker must ignore all other goals (Shah, Friedman, and Kruglanski, 2002). If this condition continues for a longer time or repeats itself many times, the decision-maker will be convinced that it is impossible to achieve their own, self-selected goals and could potentially give up. Instead of focusing on goals that could potentially benefit the organization (as well as the managers), defense imposes the focus on the threat that has no real benefit, but protection of the current position. This means that after achieving the purpose of the defense, which is successful retention of the current position, the only real outcome is the avoidance of the deterioration of the position, the context assumes no gains.

Based on all the discussion above we conclude:

Hypothesis 2: Performance decreases with *the number of defense moves.*

So far, we have explored the peculiarities and performance consequences of offensive and defensive strategies. In the next section, we will examine how the characteristics of each can be utilized to the advantage of the focal actor.

Competitor retaliation and the attack efficiency

In general, the competitive dynamics literature states that as the number of opponents' actions increases, the focal actor's performance decreases (Derfus et al., 2008). Additionally, when the focal actor is the attacking side the effect of the competitors' retaliation, as many studies posit, can be negated by impeding the opponent's reaction to create a response lag, during which the focal firm can benefit from the temporary advantage gained (D'Aveni, 1994; Nelson and Winter, 1982). While the effect of the opponents' attacks (or offensive strategy) can be destructive at all times, we argue that opponent retaliation as a reaction to the focal actor's attack(s) can be used to the focal firm's advantage.

Offensive strategies expose competitors to a high amount of pressure because if they do not react, their positions deteriorate further. As we discussed before, being in a defensive state creates an unfavorable condition for the decision-maker. Using a defensive strategy essentially means attempting to get some control over the environment back. Attacking is definitely motivationally more rewarding compared to defensive actions, and hence contains enormous potential for forward movement. We also concluded that attacking is certainly more resource-intensive (costs, planning, etc.), whereas defense requires significantly fewer efforts, planning, etc. (Yannopoulos, 2011). Threat rigidity theory states, that when in danger actors tend to respond in the simplest way possible, the amount of options narrows down and the best-learned response (rigid response) is executed (Staw et al., 1981). Thus, when exposed to attacks from the focal actor repeatedly (often), the opponent feels an increasing threat and instead of counter-attacking should respond with more defensive actions, since it is less complex. However, defensive strategies still require some amount of resources and are emotionally exhaustive - as these effects accumulate defensive strategy, despite being an easier alternative than attack, starts to lose its effectiveness. As the defense starts to lose its effectiveness, attacks of the focal actor become more powerful. Pressure continues to grow, and the effect of threat rigidity intensifies even more. Therefore, the more often opponents find themselves in a situation of stress and lack control over their environments, the less effective, we believe, will be their defensive strategies, and thus the more effective will be the impact of the attacks of the focal actor.

We expect that when the number of the opponent's defense moves surpasses that of the focal actor, it means that the focal actor is less attacked oneself and is more often the initiator of the competitive action. By enforcing stronger defensive strategies on one's opponent, the focal actor should experience an increase in the efficiency of his/her attacks.

Thus, we formulate:

Hypothesis 3: *A higher number of the opponent's defense moves in comparison with the focal actor magnifies the effect of the focal actor's number of attacks on his/her performance*.

Moderating effect of time on attacks and defenses

Within the competitive dynamics approach, time is one of the central properties of performance. The competition revolves around the discovery of advantages and opportunities over time (Kirzner, 1981; Schumpeter, 1934). Organizations during the discovery process identify various unexploited gaps and take actions to benefit from them (Hayek, 1945; Kirzner, 1979). However, the competitive advantage achieved through this process is temporary and ephemeral, because competitors can eliminate such an advantage via their own actions (Smith et al., 2001). This means that profits gained by executing a specific action tend to deteriorate over time as the competitors learn how to respond to that action and thus negate the competitive advantage of the focal actor.

The time concept within the competitive dynamics research stream is mainly explored through the link between organizational actions and the competitive response time (Smith, Grimm, Gannon, & Chen, 1991; Young et al., 1996). The central argument is that the speed of actions and responses determines the effect of competitive moves on performance (e.g., Chen & Hambrick, 1995; Chen & MacMillan, 1992; Derfus et al., 2008; Ferrier, 2001; Ferrier et al., 1999; Lee, Smith, Grimm, & Schomburg, 2000). For example, it pays off to execute large quantities of actions in the shortest amount of time possible (MacMillan, 1989). Time manifests itself in the competitive dynamics literature as a pressure for the firms that want to introduce a new product into the market at the right moment as well as the pressure under which opponent organizations find themselves trying to predict the time at which the focal firm will introduce the new product to respond to this action as fast as possible to eliminate the competitive advantage. First movers and early imitators tend to receive the highest returns whereas slow and late imitators are on the losing side (Baldwin and Childs, 1969; Gal-Or, 1985; Kamien and Schwartz, 1978; Katz and Shapiro, 1987; Smith et al., 1992; Teece, 1986; Lee, Smith, Grimm,

& Schomberg, 2000). Within competitive dynamics, opponents try to precisely forecast the timeline related to the focal firm's action, because as described above only those that are the fastest to respond will gain the benefits (Chen, 2009; D’Aveni et al., 2010; Thomas & D’Aveni, 2009; Chen et al., 2002; Ferrier, 2001).

In reality, organizations are also exposed to other sources of time pressure, like for example yearly or quarterly reports that have to be filed regularly. For instance, investment funds publish performance reports on a regular basis, and potential investors value them based on these (Chevalier and Ellison, 1997; Securities, U.S., and Exchange Commission, 2004). Therefore, there is an implicit deadline until which firms can act and react and thus change their position. This is a valid argument given the fact that any competition is usually limited in time and the competitors have only a certain, fixed amount of time window to achieve the desired position. Time itself is a resource, and we know that reduction of resources forces the actors to reprioritize the goals (Audia and Greve, 2006; Desai, 2008). Additionally, behavioral patterns depend on the closeness to the deadline (Chen et al.,2008; Gersick, 1988; Staudenmayer et al., 2002). Hence, we argue that depending on the closeness of the deadline, the focal actor should focus more either on the offensive or defensive strategy. Generally, attacks are harder to execute, because they require higher amounts of resources (Stalk, 1988; Derfus et al. 2008; Yannopoulos, 2011). Exactly because of this, they are also very risky.

We argued before that defense is associated with lower motivation because it is much more tied to the retention/protection of the current position, whereas attack reflects the inner desire for progress and achievement and therefore is associated with higher motivation. From the psychology literature, it is known that decision-makers are predisposed to opt for eager/approach strategies for the distal future, whereas impending closeness of the deadline increases the motivation to avoid damage, loss and hence predisposition for the vigilant/avoidant strategies manifest itself (Pennington and Roese, 2003, Studies 1–3). We, therefore posit that the focal actor will benefit from the offensive strategy, i.e. from a higher number of attacking moves early in the performance period when the deadline is distal. In case of a failure, there will be still some time to recover and it is easier to envision the optimal outcomes when the deadline is far. On the contrary, defending a position requires fewer resources (Yannopoulos, 2011), and based on our discussion above we posit that as the deadline approaches decision-makers should prioritize more the current position preservation over improvement. Thus, defense moves should be much more effective closer to the deadline than attack moves.

Given the discussion above we formulate the following hypotheses:

> ***Hypothesis 4****: The effect of the number of attacks on performance increases when the deadline is distal and decreases when the deadline is close.*

> ***Hypothesis 5****: The effect of the number of defense-moves on performance decreases when the deadline is distal and increases when the deadline is close.*

METHOD

Research setting

The research setting we use in this paper is the Intel Extreme Masters Katowice Major 2019 - the fourteenth Major championship in the computer game called Counter-Strike: Global Offensive (CS: GO). This was the world championship within the Season 13 of the Intel Extreme Masters (IEM), which is an international esports tournament that regularly takes place in various countries all over the world. Counter-Strike: Global Offensive is a multiplayer computer game in the online tactical first-person shooter (FPS) genre. It was developed by Valve and Hidden Path Entertainment companies and is the fourth part of the Counter-Strike game series. It has attracted approximately 11 million monthly players since its release in 2012 and is still one of the most played games on Valve's Steam platform (Valve's Steam is a digital distribution service for video games). On March 14, 2020, CS: GO had more than one million players on the game simultaneously for the first time. The game features a vibrant esports scene and continues the history of international competitions from previous games in the series. Counter-Strike Global Offensive is now one of the largest esports competitions in the world. In this computer game, two teams fight each other in different mission-based game modes. There are usually two most popular game modes: 1) One team sets up an explosive while the other team attempts to prevent them from doing it. 2) One team holds a person in a secret room and the other team tries to find and free that person. Counter-Strike: Global Offensive Major Championships (usually referred to as the Majors), are esports tournaments in Counter-Strike: Global Offensive sponsored by the game's developer company Valve. The Majors Championships are the most important and prestigious tournaments in the CS: GO video game. Teams participating in these tournaments consist of highly skilled and experienced professional players with many years of experience in Counter-Strike: Global Offensive game. Millions of people all over the world watch and attend these events. Specifically, the championship we collected our data on, namely IEM Katowice Major 2019, had 232 million people watching the live broadcast of the tournament online, and around 175.000 attended the event. What makes the IEM Katowice Major 2019 especially outstanding is that it drew 1,205,103 viewers at its peak, herewith becoming the *only* CS: GO event in 2019 to surpass one million *concurrent* viewers. The prize pool of the IEM Katowice Major 2019 championship was set to US$1,000,000.

We test our hypotheses and study the impact of the volume of the attacking and defensive moves of professional players from different teams as they compete against each other. Thus, we test our hypotheses with data on individual actors, that represent different esports teams and decide on the in-game strategy as a team, which means they coordinate with each other, and make decisions based not entirely on their own opinions and evaluations but also based on the information they receive from their team members during the match via headset communication.

The data we use has several advantages over the data that is typically used in competitive dynamics research. One of the main challenges in this research stream is related to identifying rivalry, and more importantly detecting competitive behavior (Smith et al., 1992). Data quality issues associated with these challenges have been often mentioned before (Smith et al., 2001; Nokelainen, 2008; Hutzschenreuter & Grove, 2009). Actions of the focal firm and reactions of rivals are usually captured by analyzing the press or archival data. Many problems arise at this point. First of all, the media covers more often the actions of popular, well-known companies, whereas the moves of other companies do not receive that much attention (Nokelainen, 2008). Besides that, actions that are covered are not necessarily competitive, which also entails that moves identified by media as reactions of the opponents to some action are not always related to the action (Gnyawali et al., 2008; Boyd & Bresser, 2008).

Our research setting helps us circumvent the typical problems mentioned. The settings of contests are usually much better observable than decisions in organizations. This means that we can analyze more directly the competitive moves. Moreover, we can exactly identify the attacking and defensive moves of all the actors based on a precise set of rules, because competitive elements like the position of the actors, their direction of movement, and their actions are clearly visible in the setting of CS: GO. Although we use data on individual actors our setting is still organizational because players are decision-makers, guided by other team members, instructors, sponsors, and the audience. Moreover, we benefit from the fact that many additional factors that influence organizational outcomes in a competition in the typical organizational data used in competitive dynamics literature are absent here, as we are looking at the pure competitive environment where there are just players, their strategies, and the game.

Data

In competitive mode, two teams of five players compete in a 30-round match. The total time for the round is 1 minute 55 seconds. Except at halftime, it is not feasible to transfer sides throughout the game. The game approaches intermission after 15 rounds, and the two teams will switch sides. The game is won by the first side to score 16 points. The match will result in a tie if both teams score a total of 15 points by the end of the 30th round.

One way to win rounds, which is equal for both teams, is to eliminate all players of the opponent team. Thus, the team that manages to eliminate all the opponent players wins the round. Another way to win rounds, however, is different depending on the side. One team can win a round if one of the players installs a device with a timer on a special site (there are usually two of such sites, they are referred to as plants) and once the timer reaches zero the team wins. The other team wins rounds by simply not letting the opponent team install the timer or by eliminating the device before the timer reaches zero.

There were 16 matches total within IEM Katowice Major 2019 championship (each match is approximately 30 rounds long - each round can last max 2 minutes) in which 14 teams took part. Out of that, we collected individual level (for each team member separately) data on 5 matches (145 rounds) in which 6 teams (out of 14) took part. Basically, we collected second-per-second data on 30 players. We captured the actions of each player of each team for every second of each of those 5 matches. That resulted in 140.290 observations in total.

Dependent Variable. We use the number of times a player was eliminated ("fragged" in CS: GO language) during a match as our dependent variable. The number of eliminations is simply a counter of how many times a player got eliminated by a player or players of the opponent team. The number of in-game deaths is a typical performance metric widely used for valuing players in esports (Kim et al., 2016; Xenopoulos et al., 2020). Since a decrease in the value of the number of eliminations is considered a performance improvement, we reversed the dependent variable to align its effect with our hypotheses, so that improvement or deterioration of performance would be clearly seen.

Independent Variables. As our main independent variables, we use the number of all attacking moves (NumberOfAttacks), the number of the successful attacking moves (NumberOfSuccessfulAttacks), and the number of defense moves (NumberOfDefences) of the focal player. We use all attacking moves and only the successful attacking moves as separate independent variables in two separate tables (table 2 for all attacks and table 3 for successful attacks) to exclude the possibility that our theory applies only to successful attacks. These two variables are simple counters. Successful attacks are those attacks that eliminate the opponent player(s). The squared term for the number of attacks (sqr_NumberOfAttacks) and the squared term for the number of successful attacks (sqr_NumberOfSuccessfulAttacks) are also used in our data to test for the curvilinear effect. Additionally, we also have the round time variable which counts the duration of each round for each match. We use this variable to test the effect of the deadline vicinity on the effectiveness of the attacks and defenses. Two variables measuring the difference between the focal player's number of defense moves and the average number of defense moves of the opposite team player are used to test the third hypothesis. One variable (OpponentDefendsLESS) measures the absolute positive difference between the number of defensive moves of the focal actor and the number of the defensive moves of the competitor - this covers all the cases in which the focal actor had more defensive moves than the opponent. Another variable (OpponentDefendsMORE) measures the absolute negative difference between the number of defensive moves of the focal actor and the number of the defensive moves of the competitor - this covers all the cases in which the opponent had more defensive moves compared to the focal actor.

Our coding scheme for the identification of the attacks and defenses is provided in the appendix.

Control variables. Typically, CD literature controls for the effects of the total number of the opponents' moves or the total number of opponents' responses on the focal actor's performance. We, therefore, introduce two control variables: the total number of attacking moves of the opponent team and the total number of defensive moves of the opponent team. Both variables are counters of the total number of the opponent team's attacks and defenses.

Interactions. To test our hypotheses 3, 4, and 5 we also add three interactions into our models. To test the third hypothesis, we interact the difference between the focal player’s number of defense moves and the average number of defense moves of the opposite team players with the number of attacks of the focal player. We interact the round time variable with the number of the focal player's attacks (and successful attacks) and the round time variable with the number of the focal player's defenses to test the fourth and the fifth hypotheses.

Match dummies were added to each model. Since our dependent variable is a count variable, we use Poisson regression models and add player fixed-effects to control for all player inherent factors, like talent, experience, or personal willingness to play more aggressively (more attacks) or more defensively (more defenses). The final data set consisted of 140’290 observations of the 30 players.

RESULTS

In table 5 the descriptive statistics and correlations of the variables in our multivariate analysis are shown.

In table 6 (all attacks) and table 7 (successful attacks), the results of our fixed-effects Poisson regression models are presented. Bot tables reflect the same models with the same hypotheses tested with the only difference of having the variable capturing all of the attacks in table 6 and only successful attacks (that eliminated the opponent players) in table 7. The first model in both tables contains only the two control variables, namely the total number of attacks and the number of defenses of the opponent team. The second model introduces the main effects of the number of all attacks for table 6 and the number of successful attacks for table 7, of the squared term (for all attacks in table 6 and the successful attacks in table 7 respectively), and of the number of defense moves to test the first and the second hypotheses. The third model in addition to the main effects and controls mentioned before also has two variables reflecting the difference between the number of defensive moves of the focal actor and the opponent (OpponentDefendsLESS - the cases in which the focal actor has a higher number of defense moves than the opponent, and OpponentDefendsMORE - the cases in which the focal actor has a lower number of defense moves than the opponent), and the round time variable. The final model includes all of the mentioned variables and three interactions to test Hypotheses 3, 4, and 5.

The first hypothesis states that the actor will benefit from an offensive strategy, but this positive effect on performance should only be temporary as a more aggressive tactic then turns into a burden. Therefore, we expect to observe an inverse U-shaped effect. The coefficient for the number of attacks is positive in both tables for all attacks and for the successful attacks ($\beta = 0.39$ in table 2; $\beta = 0.99$ in table 3, $p<0.01$ in Model 4), which means that more attacking moves should decrease the number of times the player gets eliminated. The squared term is negative ($\beta = -0.14$ in table 2; $\beta = -1.22$ in table 3, $p<0.01$ in Model 4), which thus supports the first hypothesis.

In our second hypothesis, we posit that defensive strategies decrease performance. The negative coefficient of the number of defense moves ($\beta = -0.29$ in table 2; $\beta = -0.33$ in table 3,

$p<0.01$ in Model 4) shows support for the second hypothesis - as the number of defense moves increases so does the number of times the player is eliminated.

The third hypothesis states that the attacking moves of the player are more effective when the focal player imposes defensive strategies on the opponents. It is supported by the significant positive coefficient ($\beta = 0.13$ in table 2; $\beta = 3.29$ in table 3, $p<0.01$) in model 4.

The fourth and fifth hypotheses state that the effectiveness of attacks and defenses vary depending on the closeness to the deadline. We argue that the attacks are more efficient when the deadline is distal and the defense moves are more efficient when the deadline is close. The negative coefficient for the interaction of the round time with the number of attacks in table 6 and with the number of successful attacks in table 7 yields support for hypothesis 4. Also, the positive coefficient for the interaction of the round time with the number of defenses is in line with the fifth hypothesis. Attacks are much more efficient in reducing the number of eliminations when executed at the beginning than towards the end, and the opposite is true for the number of defensive moves.

Insert Tables 5, 6, and 7 here

DISCUSSION AND CONCLUSION

This paper studies the performance consequences of organizational behavior in a direct competition context within competitive dynamics. Based on the analysis of the esports data, this study shows that the character of the competitive strategy (offensive or defensive) determines and influences performance in different ways. This paper contributes to the research on competitive dynamics in four respects: first, by separately studying the effects of the attacking and defensive strategies, thus, differentiating explicitly between the attacking moves and defensive moves; second, by examining the effects of attacking and defense moves on performance depending on the closeness of the deadline; third, by developing a cognitive and affective framework that serves as the basis for the split performance consequences of the offensive and defensive strategies; fourth, by using the individual-level data from esports tournament.

First, the competitive dynamics literature studies the effects of the total amount of actions of the decision-maker on performance, and/or the impact of the competitive responses on the performance of the focal actor. Even though some studies categorize the moves of the focal actor based on their characteristics (like marketing moves, price cuts, etc.), and explore the influence each type of these moves has on resulting performance, we show that the competitive dynamics stream could be enriched by categorizing the actions of the decision-maker slightly more broadly as attacking actions and defensive actions. We then demonstrate how the prevalence of each of these two categories changes the performance outcome. Our results show, that the offensive strategy pays off to a certain extent - despite being motivationally rewarding and synchronous with the innate desire for achievement of the decision-maker, its risky nature, and resource-intensiveness lead to performance deterioration when excessively exploited. Each time the new competitor is attacked the retaliation causes additional resource expenditures. Even if the opponent is outperformed the focus switching (to the next new competitor) required to progress further is expensive (have to continue to spend resources on the previous competitor because of his/her retaliatory moves and on the attack on the new competitor) or impossible. The defensive strategy, as our analysis exhibits, generally harms performance. In a competition, defense generally means being attacked and/or being outperformed. After exploring the affective and cognitive effects the defensive moves have on the decision-maker, we conclude that negative expectations appended to the defensive strategy, namely risk of deterioration of the current position or sometimes risk to survival, tend to exhaust and reduce the motivation of the actor, signal lack of control over the environment, especially if the situation repeats itself many times during the competition.

Second, attacks and defenses both require a different amount of resources and planning, we, therefore, conclude that each strategy has its optimal time window of implementation. Attacks require a solid resource base, substantial planning, and effort, therefore the farther the deadline, the more effective, better planned and prepared the attacking strategy. Defending is less resource-intensive, and is easier to execute compared to attacking, so such a strategy should be appropriate when the deadline is closer. Indeed, our data supports these ideas.

Third, in this paper, we examine the missing link between the affective and cognitive processes within the decision-maker and the choice of competitive strategy. There have been several calls to elaborate on this side of the competition that hasn't been explored deeply in competitive dynamics (Smith et al.,2001; Chen, 2007; Livengood and Reger, 2010). Based on our analysis we conclude that attacking should be the preferred strategy of the decision-maker because it resonates well with the inherent need for progress, whereas defense represents forced circumstances that are unwanted. The peculiarities of these strategies can however be balanced and used to the advantage of the focal actor. The empirical analysis demonstrates when imposing defensive strategies on the opponents, the effectiveness of the actor's attacks rises. The more opponents are in a defensive situation, the more they are exposed to a threat, uncertainty, and lack of control over their environment. This makes the attacks of the focal actor more effective and, thus, improves the performance.

Finally, our data addresses the problem that many studies within competitive dynamics face - typically press or archival data do not include all of the moves, or falsely identify and categorize them (Gnyawali et al., 2008, Nokelainen, 2008). By examining the competitive behavior exhibited by the teams within the cybersports championship IEM Katowice 2019, we were able to precisely observe the moves of each player of each team and classify moves as either attacking moves or defensive moves.

Implications and Limitations

The implications of this study are practical. Managers orienting themselves towards more aggressive strategies certainly improve their chances of winning in a competitive environment. However, one has to take into account the deceptive nature of the offensive tactics and switch at the right moment to a less intense alternative. Towards the end of the performance period, defensive strategies are slightly better, because they are less costly.

The limitations of this study are mainly related to its context, namely the direct competition. While data on esports has the advantage of no extraneous factors that can influence the competition (low noise), this is also a limitation of our study. We acknowledge the fact that organizational competition and the reality of competitive interactions are much more complex and have certain elements to them that are not present and cannot be captured within our data.

Appendix

General rule for determining the attacks and defences:

If Player A strikes Player B first, then Player A's moves are considered attacks, Player B then reacts to the moves of Player A, so Player B's moves are considered defence-moves. The result of this exchange is either the retreat or elimination of one of the players. In both cases this specific sequence of the exchange of the competitive moves ceases.

2 special cases in which General Rules do not apply:

Before fuse installation on Plant (A, B):

T team:

1 - If from a T team a player or a group is heading towards the plant with the intention of installing a fuse (this can be seen as one of the players is carrying it), then they are the attacking force. Their task is to clear the way and gain a foothold on the plant.

2 - Individual players of a T team, without the intention of installing the fuse, act according to the general rule.

CT team:

1 - If a group or the entire CT team of players occupies a plant, then they want to prevent the installation of the fuse by the T team. Their task is to wait for the players of the opposite T team to come to the plant and prevent them from installing the fuse on the plant. Thus, they protect the plant. So, their actions must be interpreted as the defence.

2 - Individual players drifting around the map act according to the **general rule**.

After fuse installation on plant (A, B):

T team:

1 - T team players on the territory of the active plant will protect it from the players of the CT team (otherwise CT team will perform a defuse on the active plant and T team will then lose the round). That is, all their actions can be interpreted as protection. If a player of a T team is on an inactive plant or elsewhere, then he/she acts according to the general rule.

2 - Players freely drifting on the map act according to the general rule.

CT team:

1 - CT team players heading towards the active plant will be in the attack mode (if they do not perform a defuse within 40 seconds they lose the round).

2 - Players freely drifting on the map act according to the general rules.

Table 5. Descriptive Statistics

	Mean	Std. Dev.	1	2	3	4	5	6	7	8	9	10	11	12	13
Number of Eliminations	9.056	5.627	1												
NumberOfAttacks	2.173	2.708	-0.035	1											
sqr_NumberOfAttacks	12.054	29.072	-0.02	0.88	1										
NumberOfDefences	1.051	1.924	0.08	-0.069	-0.045	1									
Timer (seconds)	53.098	33.737	0.07	0.389	0.289	0.325	1								
OpponentDefendsLess	1.388	2.415	0.001	-0.188	-0.126	0.682	0.024	1							
OpponentDefendsMore	1.388	1.846	0.061	0.165	0.121	-0.359	0.031	-0.432	1						
OpponentTeamNumberOfAttacks	18.936	11.231	-0.096	-0.105	-0.082	0.251	0.061	0.36	-0.449	1					
OpponentTeamNumberOfDefences	10.188	9.293	0.13	0.194	0.148	-0.196	0.071	-0.382	0.861	-0.432	1				
match2	0.221	0.415	-0.053	0.003	0.006	-0.001	0.029	0.009	0.012	0.058	0.044	1			
match3	0.204	0.403	0.056	-0.051	-0.047	0.055	-0.025	0.047	0.061	-0.124	0.045	-0.27	1		
match4	0.211	0.408	-0.019	0.099	0.075	-0.105	0.007	-0.116	-0.152	0.144	-0.19	-0.276	-0.262	1	
match5	0.185	0.388	0.004	-0.037	-0.007	0.04	-0.017	0.128	0.167	-0.041	0.114	-0.254	-0.241	-0.247	1

Table 6. Regression results

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
NumberOfAttacks		0.25***	0.38***	0.39***
		(0.007)	(0.007)	(0.009)
sqr_NumberOfAttacks (**H1**)		-0.10***	-0.14***	-0.14***
		(0.006)	(0.006)	(0.007)
NumberOfDefences (**H2**)		-0.38***	-0.12***	-0.29***
		(0.005)	(0.008)	(0.014)
OpponentDefendsLESS			-0.02***	-0.01**
			(0.006)	(0.006)
OpponentDefendsMORE			0.75***	0.71***
			(0.012)	(0.013)
OpponentDefendsMORE*NumberOfAttacks (**H3**)				0.13***
				(0.017)
Timer			-0.02***	-0.02***
			(0.000)	(0.000)
Timer (deadline)*NumberOfAttacks (**H4**)				-0.00***
				(0.001)
Timer (deadline)*NumberOfDefences (**H5**)				0.02***
				(0.002)
OpponentTeamNumberOfAttacks	0.01***	0.03***	0.04***	0.04***
	(0.001)	(0.001)	(0.001)	(0.001)
OpponentTeamNumberOfDefences	-0.09***	-0.11***	-0.22***	-0.22***
	(0.001)	(0.001)	(0.002)	(0.002)
match2	0.13***	0.14***	0.13***	0.13***
	(0.004)	(0.004)	(0.004)	(0.004)
match3	-0.18***	-0.18***	-0.21***	-0.21***
	(0.004)	(0.004)	(0.004)	(0.004)
match4	0.01***	-0.01***	-0.02***	-0.02***
	(0.004)	(0.004)	(0.004)	(0.004)
match5	-0.22***	-0.19***	-0.23***	-0.24***
	(0.006)	(0.006)	(0.006)	(0.006)
Observations	140,290	140,290	140,280	140,280
Number of Player_id	30	30	30	30

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7. Regression results

VARIABLES	Model 1	Model 2	Model 3	Model 4
NumberOfSuccessfulAttacks		0.29***	0.56***	0.99***
		(0.054)	(0.055)	(0.078)
sqr_NumberOfSuccessfulAttacks (**H1**)		-0.82***	-1.58***	-1.22***
		(0.302)	(0.304)	(0.301)
NumberOfDefences (**H2**)		-0.38***	-0.18***	-0.33***
		(0.005)	(0.008)	(0.015)
OpponentDefendsLESS			-0.02***	-0.03***
			(0.006)	(0.006)
OpponentDefendsMORE			0.72***	0.67***
			(0.012)	(0.012)
OpponentDefendsMORE*NumberOfSuccAttacks (**H3**)				3.29***
				(0.132)
Timer			-0.01***	-0.01***
			(0.000)	(0.000)
Timer(deadline)*NumberOfSuccAttacks (**H4**)				-0.13***
				(0.008)
Timer (deadline)*NumberOfDefences (**H5**)				0.02***
				(0.002)
OpponentTeamNumberOfAttacks	0.01***	0.03***	0.04***	0.04***
	(0.001)	(0.001)	(0.001)	(0.001)
OpponentTeamNumberOfDefences	-0.09***	-0.10***	-0.21***	-0.21***
	(0.001)	(0.001)	(0.002)	(0.002)
match2	0.13***	0.13***	0.13***	0.13***
	(0.004)	(0.004)	(0.004)	(0.004)
match3	-0.18***	-0.18***	-0.21***	-0.21***
	(0.004)	(0.004)	(0.004)	(0.004)
match4	0.01***	-0.00	-0.01*	-0.01
	(0.004)	(0.004)	(0.004)	(0.004)
match5	-0.22***	-0.20***	-0.23***	-0.24***
	(0.006)	(0.006)	(0.006)	(0.006)
Observations	140,290	140,290	140,280	140,280
Number of Player_id	30	30	30	30

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

5. GENERAL DISCUSSION

In this dissertation, I explore the consequences of the direct competition that organizations engage in and the underlying behavioral mechanisms that guide the decision-making processes. The main attempt is directed towards demonstrating one of the possible ways of achieving harmony in the explanation of the decision-making processes under competitive conditions characterized by risks and uncertainty. Specifically, I focus on the links between management literature and psychology literature. As I mentioned before, the Behavioral Theory of the Firm has its roots in the psychological literature on the levels of aspiration. All three papers describe how psychological concepts help to discover potentially novel effects of direct competition on the actors. Generally, the competitive context is examined from two different angles - on the one hand, the broader picture is investigated where there is an overall competition in which actors have to engage in direct competition against each individual opponent in order to eventually win. This tournament-like perspective can be translated into the different effects of operational decision-making compared to more long-term strategic decision-making. On the other hand, a more detailed and isolated analysis of the participants in the direct competition helps to uncover the effects of the specific processes that represent the underpinnings of competitive decision-making. I use data from Formula 1 racing and the Counter-Strike video game to test the theoretical arguments of the studies.

The first study represents an analysis of how the focal actor's propensity to take risks in direct competition varies as the distance to the closest opponent decreases. The closest opponent represents the aspiration (intermediate target), and the changing distance to this target impacts the focal actor's tendency to take risks. Previous performance feedback research on social aspiration levels implicitly assumed that organizations focus on a single performance goal - the industry average (Greve, 2003a; Baum and Dahlin, 2007; Harris and Bromiley, 2007). However, social aspirations can be much more complex. The introduction of rankings to support the theoretical argument makes the complex nature of aspirations stand out. Ranking systems are now employed in a variety of sectors, and they serve an important role in stimulating competitiveness and supporting informed decision-making (Hazelkorn, 2014). Every ranking system categorizes businesses and individuals based on a range of defined performance factors. When the focus is on the closest competitor, the "goal gradient effect" (Hull, 1934) concept explains the increased risk-taking with decreasing distance. Whereas the focus on a more global goal (aspirational target, which is the eventually desired position in the ranking) results in risk-taking behavior according to the behavioral theory of the firm. By distinguishing between two kinds of social aspiration levels, we show that the concept of "social aspiration" is deeper and more nuanced than is often assumed and can lead to different behavioral responses within the same context. This extends the performance feedback theory on the one hand and connects two research streams (behavioral theory of the firm and theories of motivation) on the other.

The second study focuses on how the search process predicts the focal actor's propensity to take risks when past experience is not sufficient to guide current decision-making. The basic idea is that in an inter-firm rivalry, participants seldom rely on their existing experience. This is simply because the focal actor is unaware of the competitor's potential movements and the possible negative consequences of such acts. As a result, the ambiguity created by these situations hampers the application of prior knowledge. The uncertainty caused by significant inter-firm rivalry leads to implicit time pressure - actors strive to complete a search process faster (Radford, 1978; Elenkov, 1997; Fredrickson, 1984; Judge and Miller, 1991; Baum and Wally, 2003). In such a scenario, I contend that the length of the organizational search has a direct impact on risk-taking. Specifically, a longer search length reduces the risk-taking tendency of the actor. Generally, relevant literature argues that organizational search acts as a link between the organizational performance level and any subsequent risk-taking (Greve, 2003a; Baum et al., 2005; Chen and Miller, 2007; Posen et al., 2018; Gaba and Joseph, 2013; Kacperczyk et al., 2015; Chen, 2008). The possible impact of the search process on risk-taking is often overlooked. This study seeks to address that void by investigating the impact of the length of search on risk-taking. Organizations competing in a tournament are uninformed of one another's intentions, enabling faster decision-makers to achieve better levels of performance in a competition (Fredrickson, 1984; Judge and Miller, 1991; Baum and Wally, 2003). Those organizational members who seek and find alternatives promptly will feel more confident in their capacity to perform in the existing context (March and Shapira 1992), leading to more risk-taking (Mitchell, 1999). This research might add to the current literature conversation on organizational learning and risk-taking in a variety of ways. This study specifically considers the influence that the process of search has in shaping participants' proclivity to take risks. Furthermore, it combines research on self-confidence and risk-taking in order to explain why actors opt for more risky strategies during competition. The article discusses an alternate style of learning in which information is learned through engaging in the present rather than studying the past.

The focus of the last study is on the post-search process, with an emphasis on performance consequences tied to the type of competitive strategy chosen (offensive or defensive). The prospective repercussions of decisions taken in direct competition to attack the opponent organization or protect against attacks conducted by the opponent organization are investigated. One of the primary focuses of competitive dynamics theory is the relationship between organizational action and performance (Ferrier et al., 1999; Smith et al., 1992; Young, Smith, and Grimm, 1996). Competitive dynamics studies often examine how various elements, such as the volume and kind of actions taken by the focal actors, impact the organizational success (Ferrier et al., 1999; Smith et al., 1992). However, previous research on competitive dynamics failed to account for the fact that offensive and defensive characteristics of the actions by the same focal actor can have very different effects on their performance. Every organization can attack and defend itself against the moves of another firm at any time (Grimm, Lee, and Smith, 2006). The pertinent issue is whether firms would gain more from a more aggressive or, conversely, defensive approach. The more aggressive the actions used, the more the actors believe they have influence over the competition. On the other hand, being obliged to defend oneself implies giving up some environmental control and confronting increased degrees of uncertainty as a consequence of trying to estimate the opponent's next move. This is then contrasted with various cognitive and organizational resources required to execute the offensive and defensive strategies. As a result, we observe a temporary benefit of the attacking strategies and the negative influence of the defensive strategies on the performance. This paper aims to contribute to the literature on competitive dynamics mainly by studying the effects of attacking and defensive strategies separately, thus differentiating explicitly between the attacking moves and the defensive moves. We further extend the current research by investigating the consequences of attacking and defensive moves on performance depending on the deadline proximity. Additionally, we develop a cognitive framework that serves as the foundation for the different effects of attacks and defenses on an actor's performance.

To summarize, the dissertation starts with a reconceptualization of the social aspiration level - under the influence of the ranking system, actors involved in a competition interpret the aspiration level as well as the ways of measuring performance relative to the aspiration level differently because of the series of direct competitions that they have to engage in during the tournament. The focus then switches to the search process that takes place at the moment of the direct competition - the uncertainty tied to the direct competition heightens the awareness of the speed of searching for solutions, which then informs the actor about their capabilities to conduct effective decision-making in the current conditions. Finally, the post-search part of the direct competition is investigated - the effects of the chosen strategies and the eventual result of them on the performance are explored, whereby the importance of balancing the offensive and defensive strategies is highlighted.

The overarching goal of this dissertation is to advance our understanding of direct competition and the effects it has on decision-making. The interesting outcome of this work is that organizational competition has the potential to extend and complement the available theoretical arguments. This approach clearly has its limitations, some of which can definitely be considered in future research. Specifically, the inability to explicitly capture the psychological side of the direct competition with the collected data can serve as a motivation to continue this line of work in the direction of experiments, for example. Measuring motivational components and self-confidence levels could undoubtedly benefit the ideas established in this dissertation and thus enhance and strengthen the proposed links between psychological literature and organizational research. Additionally, future research would benefit from testing these ideas on data that is organizational in a traditional sense, which would eliminate the doubts about the generalizability of the results.

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