Can Changes in the Incentive Scheme Prevent Agents from Strategic Shirking? Evidence from the NBA Play-In Tournament

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ABSTRACT

Incentive adjustments are crucial in principal-agent problems. Tournament theory, proposed by Lazear and Rosen (1981), offers an incentive structure that rewards agents based on their ordinal ranking. Drawing on this theory, the reward scheme should be designed in a way that agents are motivated to engage in the tournament and compete for higher compensation like promotion instead of motivated to not exert any effort. Professional sports offer a unique opportunity to analyze the effects of changes in incentives to increase competitiveness and reduce shirking. The National Basketball Association (NBA) recently introduced a change to the reward system referred to as the play-in tournament (PI), allowing more teams to have a chance to compete for advancing to the final phase of the championship. This thesis is the first to explore the impact of the PI on team performance. Using observational data, I compare the eligibility for the PI in two periods, before and after the tournament was implemented. The research question is whether being eligible for the PI has a different impact on a team's likelihood of winning a game and on its risk-taking preferences in the two periods. The findings indicate that following the introduction of the play-in tournament, there is no discernible impact on team winning performance associated with eligibility for the tournament, but there are signals of increased risk-seeking behavior in some cases. Despite the absence of such effects on winning performance, the popularity of the play-in tournament among teams and fans suggests its potential for long-term existence.

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1. INTRODUCTION

Discouraging employees from not exerting effort in completing their duties during their tenure via appropriate incentives and evaluating their reaction to some changes in the current incentive scheme is a general problem that has been the focus of many studies within economics. Most frequently, these problems are associated with the principal-agent framework, where the principal is usually an employer or regulator, and the agent is the employer or the person following the rules set out by the principal. The principal's main goal is to realize the highest possible output, but the output also depends on the effort level provided by the agent. The effort level is a cost to the agent and is usually not observable by the principal. Therefore, the agent would like to exert as little effort as possible or none at all, in other words, to *shirk*, while not being exposed. To translate this opposite interest of the actors into economic terms, the Shapiro-Stiglitz model of efficiency wages establishes the no-shirking condition (Shapiro & Stiglitz, 1984, 436) that defines a critical limit above which the agent is induced to exert some effort. However, in many employment or principal-agent settings, the agent might still be motivated to purposefully shirk due to the deficiencies of the incentive scheme or specific characteristics of the given situation. Numerous cases exhibiting shirking behavior can readily be observed in the field of legislative bodies, management studies, or professional sports, with potential solutions provided.

In order to mitigate problems arising from strategic shirking, the principal might need to revisit and adjust the framework of incentives provided. Lazear and Rosen's (1981) tournament theory offers one possible solution, where performance is not measured directly, instead, rewards are distributed based on rankings relative to other competitors. This approach is extensively utilized in a broad range of fields, but apart from management studies, it is most prevalent in professional sports, where the well-defined and known regulations and the abundant data offer a unique opportunity to measure the effectiveness of the tournament structure as well as evaluate changes within.

Starting with the season in 2020-2021, the National Basketball Association (NBA) implemented a significant incentive change by introducing the play-in tournament. The primary purpose of this new opportunity was to discourage teams mainly in the middle of the standings from shirking and forfeiting games towards the end of the first half of the season (referred to as the regular season) and instead motivated them to compete until they qualify for the final, elimination phase of the season (referred to as the playoffs). The play-in tournament offers a novel way to give more teams a chance to qualify for the playoffs,[1] where the identity of the final winner is determined. Teams are ranked based on their number of wins during the regular season and these ordinal rankings translate into three categories at the end of the regular season: qualifying directly to the playoffs, qualifying to the play-in tournament, and getting eliminated. This was a clear step away from the system that was employed in the preceding years when there were only two types of teams: teams that clinched a playoff spot and teams that got eliminated. The main problem that the play-in tournament aimed to address was the tendency for teams to become unmotivated in their final regular season games and exert minimal effort once team positions in the standings were most likely solidified. Therefore, the play-in tournament sought to provide an incentive to continue to compete for teams that did not manage to secure a traditional spot in the playoffs during the regular season.

In this thesis, I analyze the potential effects of the introduction of the play-in tournament both on winning performance and on risk-taking behavior, with a greater focus on the former. Using game-level observational data, I compare the effect of being eligible for the

[1] It is important to note that while more teams were given a chance to qualify for the playoffs, the actual number of teams competing in the playoffs remained the same. For more details, see Chapter 3.

play-in tournament on the likelihood of winning and on risk-taking, focusing on the difference of these effects between seasons 2016-2019 for the pre-intervention period and seasons 2021-2023 for the post-intervention period. Being eligible is defined as a categorical variable and a team is considered to be eligible for the play-in until they can mathematically reach a position in the standings associated with play-in qualification. Besides controlling for other determinants of winning a basketball game (home court, team quality, tiredness), I investigate whether this new play-in system and the potential rewards attached to it have any impact on motivation and thus, the probability of winning a game. The analysis of risk-taking behavior follows a very similar path, using potential measures for risk-seeking instead of winning performance.

The results suggest that there is no discernible influence of being eligible for the play-in on the likelihood of winning a game after the implementation of this new tournament. In other words, having the chance to qualify for the play-in does not contribute to the explanation of how one can win a regular season basketball game. On the other hand, the significant determinants of winning are in line with the previous findings of the literature (Taylor & Trogdon, 2002): home court and higher team quality have a positive relationship with performance, and being eliminated from playoff contention is detrimental to performance. However, there are significant results indicating that teams might want to pursue riskier behavior after the play-in tournament was introduced, but these results do not seem to be consistent across different specifications and heavily depend on sample-calibrating decisions.

Even though there is no detectable, game-level impact of the eligibility for the play-in tournament on team winning performance using the methodology presented here, these win-or-go-home type games and the extra attention surrounding the tournament have a considerable impact and are cherished by both teams and fans. Moreover, as Erik Spoelstra, head coach of an NBA team that qualified for the 2023 playoffs through the play-in tournament has recently pointed out: "*There are far less teams tanking. Everyone was fighting for it those last two months. Every game was must-see TV and that was in both conferences. So I think [for] the league, that's probably the best thing that's happened in the last decade.*" (Friedell, 2023) Therefore, one might think that a more refined model and methodology for evaluating the effectiveness of the play-in tournament on motivating for winning and eliminating shirking behavior and the aim of intentional losing (or tanking) might lead to statistically significant results that are in line with the public perception expressed by experts and employees around the league. Apart from this, another reason for the conflict between my results and the perceived effect of the play-in tournament can be the timeliness of this evaluation as this is only the third year of this new reward scheme. Teams in the league might actually need more time to measure the exact rewards associated with the play-in and a re-evaluation of the effectiveness of the tournament would be necessary in subsequent years. Nevertheless, the play-in tournament is proven to be successful and is projected to remain in place for good.

This thesis is organized as follows: Chapter 2 introduces the main blocks of theoretical foundation such as principal-agent theory and tournament theory, and it observes results from multiple different disciplines, like the field of employment promotions, voting behavior, and professional sports performance. Chapter 3 highlights the basic characteristics of professional basketball in the US, how the incentive schemes have changed and look nowadays, alongside why these changes happened and how these can be assessed from a policy perspective, with a specific focus on the introduction of the play-in tournament. This chapter also emphasizes the characteristics of incentives in the NBA relate to the theoretical background presented earlier, with an emphasis on winning motives and risk-taking. Chapter 4 describes the retrieval of the observational data while also providing basic summary statistics, and it explains the derivation of the most important variables used in the thesis. Chapter 5 and Chapter 6 present the methodology, the main model equations, and the results for the likelihood of winning and risk-taking measures in the fashion of Taylor and Trogdon (2002). The former includes the analysis of the effects on winning performance, and the latter contains the examination of the impacts on risk-taking behavior. These chapters also argue the reasons for the model and variable selection alongside describing theoretical expectations, and implications are made regarding the detected impacts and the limitations of the play-in tournament. Finally, Chapter 7 concludes.

2. LITERATURE REVIEW

A. PRINCIPAL-AGENT FRAMEWORK

Economic activities characterized by misaligned or sometimes even opposite interests among superior and subordinate actors can be often referred to as principal-agent problems. In these settings, the principal – the owner of the capital, shareholder, employer – is usually forced to create such an incentive scheme for the agent – employee, manager/CEO – that they exert a relatively higher amount of effort than they would have expended otherwise if such incentives were lacking. This incentive scheme should also incorporate components that would ensure that the agent would not quit their current job provided by the principal for the sake of another form of compensation, like a salary from another position or unemployment benefit, or simply penalties for not working (these are generally referred to as the agent's outside option). On the other hand, for the higher effort and thus higher output, the principal has to compensate the agent in the form of appropriate incentives, let them be a relatively higher wage, shares in the firm, or any other form of benefits.

The main source of such problems is information asymmetry, as the principal realizes the output and the profit, but the output depends on the agent's decision on the effort level provided. Asymmetric information is key as the principal has less information than the agent regarding the latter's effort and contribution to the eventual output, and this asymmetry could only be resolved via potentially costly monitoring. The consequence of this situation is that the agent might want to exert less effort or none at all, so to shirk, as they do not bear risks, they face fewer costs because of providing less effort and this leads them to overall higher utility. The principal is pushed towards creating incentives where, rather than resolving the information asymmetry, they offer a wage, reward, or premium to the agent so that the agent is now also interested in achieving a higher output (because they are now exposed to some risk) while delivering the corresponding higher effort level.

In early research focusing on incentives, a labor market-specific model presented by Shapiro and Stiglitz (1984) that primarily sought to explain involuntary unemployment through the concept of efficiency wages found that firms pay a higher wage compared to the competitive framework to incentivize employees to refrain from shirking work. However, the incentive for the employee comes from the potential threat of being caught, terminated, and eventually becoming unemployed. In some cases, discouraging agents from shirking might be even more difficult for the principal because of the specific attributes of the employment circumstances. For instance, when an employee approaches the end of their contract that they do not intend to renew (due to subsequent retirement or change of workplace afterward) or when the employee has just secured a new long-term contract, it is plausible to assume that the agent is not motivated to provide much effort as no or little punishment can be imposed. Moreover, the agent might feel encouraged not only to shirk, but to do so intentionally, and overtly. The following subsection presents a unique example for the case of end-of-contract mentioned above with evidence from the labor market of legislative positions. The second subsection then introduces compensation schemes that are designed to rule out incentives towards shirking.

I. Shirking: end-of-contract

Intentional or strategic shirking might be more prevalent in settings that have end-of-contract characteristics, so the agent’s decision today has no effect on their future opportunities or payouts as there is no future period. This can happen most directly in situations where the agent considers retiring or switching profession completely, so immediate shirking does not affect their future wage or promotion prospects. Employees stepping down in legislative positions, such as elected members of the US Congress who are in their last term and are set to depart serve as a niche but interesting example, described by Rothenberg and Sanders (2000) and Carey (1994). Rothenberg and Sanders (2000) differentiate between ideological and participatory shirking, the former standing for changing the voting behavior along political motives, while the latter meaning reduced participation and less voting in general. They find little evidence for the existence of ideological shirking, but they detect striking contrast in participation of leaving Congress members compared to continuing ones, indicating an increased likelihood of abstention.

Carey (1994) approaches this dilemma by offering an idea of a party-administered pension system for resigning members of Congress or those who aspire to have a different – usually state-wide – position. This idea would ensure that the time horizon of the principal-agent situation becomes again indefinite, and the "last term" problem could be mitigated. His findings show that the effectiveness of such pension systems is quite low, however. Lastly, he also highlights that selection issues might bias the underlying mechanisms as members who tend to shirk in their last term are also the ones who shirk more in general, during previous sessions of the Congress.

II. Potential compensation schemes

Apart from the problems posed by asymmetric information in principal-agent settings and the possibility of shirking by the agent due to ill-designed incentives or some unique situations (such as the end-of-contract examples presented earlier), some other difficulties also arise within the scope of rewarding agents. For example, how one should exactly measure and evaluate the agent's marginal productivity, and how the principal should select the optimal compensation scheme when the usual conditions of the competitive framework are unmet. The first is important from the viewpoint of general competitive theory originating from Arrow and Debreu (Nalebuff & Stiglitz, 1983, 21), as in equilibrium with perfect information (also referred to as the first-best solution) an employee's wage should be their marginal product. When the economic situation differs from the general competitive setting, for example, it lacks perfect information, monitoring costs are very high, or workers are heterogenous, it is not obvious how to reward the agent while achieving the highest possible welfare. Several ways of compensation (second-best solutions) have been introduced in the early days of research. The Shapiro-Stiglitz model features a critical wage dependent on the effort level of the agent (Shapiro & Stiglitz, 1984, 436), other models (Lazear, 1986, 407) offer a fixed salary tied to some input such as hours worked or again, effort, while Stiglitz (1975), Mirrlees (1976), Lazear (1986, 406) and Gibbons (1987) all present models with piece-rate compensation, so that wage is related to the output produced.

Generally, all these models attempted to broaden the understanding of compensation schemes while focusing on different aspects of the model or the participants (principal and agent). These aspects can be the risk preference of the agent (usually either risk-aversion or risk-neutrality), the number of agents working for the same principal, the magnitude of the information asymmetry and monitoring costs, and so on. Sappington (1991) offers a comprehensive summary along this trajectory, starting from the canonical model and gradually extending it, highlighting the potentially optimal incentive scheme in each setting. In the case of multiple agents and high monitoring costs, organizing a competition between the agents and accounting for their relative performance instead of the actual level of their output, might result in an optimal outcome. This competition where compensation is based on the ranking of the agents depending on their relative performance is called a tournament.

B. Tournament theory

The concept of tournament theory was first introduced by Lazear and Rosen (1981) with respect to labor economics and optimum labor contracts, and it offered a novel compensation scheme as a consequence of risk aversion and heterogeneous employees.[2] The key advantage of the tournament theory model is that compensation depends on the ordinal rank of the competitors rather than their potentially unobservable or costly-to-monitor effort level and marginal product. This rank-order competition is labeled as a tournament, which is a competition because either the best-performing agents receive rewards, or the worst-performing agents are punished. The ordinal setting induces that rank is inherently defined relative to the other participants, therefore one has to only surpass their contestants in order to advance to a higher level with better rewards. However, the difficulty in a tournament design is to find the optimal reward scheme that incentivizes the agents.

Firstly, in this setting, the prize spread, or in other words, the difference in rewards between each stage of the ranking system should be sufficiently large enough to motivate the individuals to engage in the tournament, so as to exert effort and increase their investment, otherwise, it might not be optimal to compete as it is not worth the hustle. Formally, this is captured in Equation (5) in Lazear and Rosen (1981). Secondly, the productivity-earnings transformation provided by the tournament theory should be highly non-linear to counterbalance the decreasing marginal utility gained from subsequent rewards and the increasing marginal costs of investment. Nevertheless, if a tournament is well-designed, it could serve as second-best solution as supported by Sappington (1991). His main findings suggest that the implementation of the tournament framework eventually replaces monitoring costs while other approaches might not exhibit this.

Tournament schemes with such design and reward characteristics are present in many fields, and the theory has been widely implemented, most notably in management sciences as summarized by Connelly et al. (2014). This popularity on the one hand shows the usability

[2] Tournament is referred to as ’contest’ in Nalebuff and Stiglitz (1983), which is also an early work in the literature.

and effectiveness of this framework. On the other hand, they also highlight that there is very little if any connection between different applications of tournament theory across distinct fields, and insights might have been kept within the specific field, which might invalidate or disintegrate this theory to some extent. In the following, I describe three different fields with the intention to shed light on their similar foundation while demonstrating the important features of tournament theory. These fields are management and employment promotions, and professional sports tournaments.

I. Management and employment promotions

The original example in Lazear and Rosen (1981) and the motivation for tournament theory was the enormous and ever-increasing gap between employee and high-level executive or manager wages. According to Connelly et al. (2014, 17), the ratio increased almost tenfold in thirty years, between 1982 and 2012. The idea is that such a large gap in rewards might create extra motivation for employees to engage in the tournament, so as to aim for promotion. The tournament in this example is the competition organized by the employer (principal) and is held between the employees (agents). The ranking is based on the specific ordering scheme set by the principal in order to determine the winner, so the one agent that is awarded promotion by achieving the top rank in the tournament. Reward differences between stages of employment and the competition for the scarce number of superior positions are the most significant focus areas in a tournament theoretical framework in management studies, as listed by Connelly et al. (2014). The literature reviewed by the authors also frequently show that higher prize spreads might lead to some unplanned outcome, such as greater turnover rate, or damage caused to firms relying on cooperation as employees focus on individual goals rather than teamwork.

Incentives posed by tournament structures might also have other unintended consequences, most notably shirking during the process of work or the specific task. One straightforward example in a multi-agent setting is that when the prize for excelling is small, then some agents might not want to exert any effort. To overcome this problem, Sappington (1991, 55) proposes the idea of "loser-bear-all" instead of the "winner-take-all" approach, so none of the agents can allow themselves not to exert effort, risking some sort of punishment otherwise. Shirking can also occur when there are multiple dimensions through which agents can exhibit their effort towards the principal. In the model proposed by DeVaro and Gürtler (2013), agents competing for a promotion might overperform in tasks that are believed to improve their chances of being promoted and thus, getting higher future earnings, and underperform in other tasks, tasks that are not emphasized by the principal to be that important. This type of shirking can be resolved by assigning similar weights to tasks important to being promoted, but as the effort provision of agents is a resource allocation mechanism, they might unintentionally underperform in some exercises, nevertheless.

II. Professional sports tournaments

An important stream of literature within tournament theory and effort provision is probably the most straightforward one in nature and is closely related to the research question of this thesis, because it exhibits all sorts of tournament features and misaligned incentives that encourage shirking. Various branches of the sports industry have been built on tournaments for many decades now, let it be every national or international championships of teams or individuals. In these cases, the championship organizer (federations, associations, league regulators) is the principal, and the agents are the participating teams or individuals. So far in the discussion the agents were individuals, but in general, teams are organized alongside a common goal and the members are all part of this determination, with the very rare case of opposing interests. There might be cases where an individual aim is more important than the interest of the whole team and it leads to frictions, but this is beyond the scope of this thesis as well as it is usually assumed not to be the case in team sports competitions. The key elements of tournament theory should still hold, however: large spread in rewards between rankings and it should be non-linear, especially at the top of the rankings.

Research conducted by Becker and Huselid (1992) is among the first to prove the implications of the effects of tournament theory-based reward scheme on sports competitions using observational data from NASCAR and IMSA sport car racing. They find that the larger the spread differential is between the top rankings, the higher driver performance (finishing position) is, while controlling for race characteristics. They also emphasize that tournaments implicitly encourage contestants to be more selfish and focus on individual goals rather than to cooperate. Cooperation between individuals or teams might not be relevant in sports, moreover, it could be even considered as some ways of rigging and manipulating the outcome, but chasing individual interests might result in a more risk-taking behavior which would cause injuries or accidents more frequently. Interestingly, they also show that very large spread differentials even lead to riskier driver behavior and more muted driver safety. By contrast, O'Roark et al. (2012) present mixed results using NASCAR Chase Cup tournament, where the argument of riskiness (number of wrecks and collisions) is supported, but the argument of increased performance could not be substantiated. The main reason for the somewhat contradictory results might be the different characteristics of the analyzed tournaments, as Becker and Huselid (1992) inspected all but one NASCAR races in a season, whereas O'Roark et al. (2012) covered the Chase Cup, which was introduced in 2004, and later has been renamed to NASCAR playoffs (NASCAR playoffs, 2023). The former includes individual and independent races with rewards for each, while the latter focuses on a comprehensive structure (playoffs), where each race contributes to a final ranking and also contains the gradual elimination of the lowest-ranked participants. This type of difference between phases of a single season can be found in other sports as well, especially in North American major sports, for instance basketball and hockey, where seasons can be split into regular season and post season (or playoffs) parts. However, it is essential to describe the institutional characteristics of the given professional sport of interest to better understand the underlying incentive mechanisms. Therefore, the following chapter links principal-agent and tournament theory to professional basketball, highlighting the features and changes of the incentive scheme over time, focusing on especially the most recent change: the introduction of the play-in tournament.

3. INSTITUTIONAL SETUP

Men's professional basketball league in North America – the National Basketball Association (NBA) – serves as a great example of exhibiting principal-agent relations and tournament features over many dimensions. Principal-agent pairs might be the commissioner and the board of the league (regulators) over the teams in the league, team owners over team head coaches (managers), or team head coaches over team players, and so on. The related literature referenced in this chapter (Taylor & Trogdon, 2002; Price et al., 2010; Fornwagner, 2019) mostly investigates the first relationship, where the principal is the ownership or board of the league, and the agents are the teams in the league. The role or the definition of the principal is usually of lesser importance, the focus is on the teams instead. Teams in this sense essentially are referred to as the group of professional players over the season, and on a smaller scale, to the head coach and their staff. The main conflict of interest between the league governors and teams is that the former wishes to induce the latter to exert as much effort on the basketball court as possible, leading to playing thrilling games with their best and most popular players on the floor. However, the agents (the teams) might not want to comply with this interest as they may not want to win a particular game, or they want to rest their best players due to many reasons.

The tournament structure in the NBA is the yearly competition between teams within the league organized by the regulator, ranking the teams based on their performance and rewarding them accordingly. However, over the years, the league itself, the teams and the tournament framework providing incentives and the reward scheme have been changed and revisited many times. In order to understand how and why the regulators changed the features of the tournament, and whether these changes had any effect, these elements of tournament theory must be clearly defined in the world of basketball. In the following subsections, I define the relevant aspects and rules of men's professional basketball and highlight the similarities and differences compared to the theoretical tournament framework. Subsequently, I introduce the pieces of literature that have approached the NBA from a tournament theoretical point of view, with a focus on incentives that encouraged teams to intentionally lose games.

A. *General characteristics of the NBA*

The National Basketball Association (NBA) is the main professional basketball league for men in the US and in Canada, having its roots back to the 1940s. In the early days, the number of teams fluctuated around 8-12 until the first large expansion era between 1966 and 1980, when the number of teams doubled from 10 to 22 (Bishop, 2023). This period includes the merger of two competing leagues, the American Basketball Association (ABA) and the NBA, which itself resulted in the addition of 4 teams to the newly shaped NBA. Since then, several new teams have entered the league, and some also have relocated or changed their name (NBA Advanced Stats, Franchise History (n.d.)) reaching the current number of 30 teams in the 2004-2005 season,[3] and this number has not changed since.[4] The 30 teams are distributed in two conferences (East and West) mostly based on geographic location, having 15 teams each. These conferences are further divided into 3-3 divisions, each counting 5 teams. The divisions include teams that are geographically closest to each other, for example the Atlantic Division consists of teams located in Boston, New York, Philadelphia, and Toronto, while the Pacific Division includes teams based in Los Angeles, Phoenix, Sacramento, and San Francisco.

A game is played between two teams, which are most frequently labeled as home and away (or visitor) teams, playing at the home stadium of the home team, unless they play at a different location, then both are referred to as neutral. Games consist of four quarters, each

[3] As a season usually runs from October/November until June, I will refer to the season with the year in that it is finished, i.e., the 2004-2005 season was finished in June 2005, so it is season 2005.

[4] From now on, I focus on the characteristics and regulations in place since the 2004-2005 season.

lasting for twelve minutes with short pauses in between. The team who has scored more points by the end of the game is the winner, the other team is the loser. As there is no draw in basketball, if teams are tied after 48 minutes of playing time, there are additional 5-minute sections (called overtime) until there is no longer a tie.

I. The course of the season

A season consists of two main phases: the regular season and the postseason or playoffs. The regular season counts generally 82 games for each team that is calculated the following way (Arlauckas, 2022): a team is playing with its four division opponents four times (4x4 = 16), with six teams from the same conference also four times (6x4 = 24), and the remaining 4 teams from the same conference three times (4x3 = 12). Lastly, a team plays teams from the other conference only two times (15x2 = 30), which adds up to 82 games. The schedule is also organized in a way that each team plays exactly half of their games at home and the other half as a visitor. It is important to note that schedules are known by teams in advance and do not depend on previous performance or team quality, but they are rather given exogenously, with respect to the heavy influence of the conference and division structure on the scheduling format.

Although regular season games are held almost every day approximately from the end of October until the beginning of April in an average season, there are two notable dates when this schedule is interrupted. These are the trade deadline and the All-Star Weekend (ASW), which are an integral part of every regular season. The trade deadline is somewhat similar to the winter trade deadline for example in the world of football: teams are free to exchange players within appropriate limitations and rules after they agreed during the negotiations. It is important to note that this is the last chance for teams to reconsider their beginning-of-season aspirations, and act accordingly. Some teams might decide to forfeit their winning motives and aim to intentionally lose (or tank) for the remainder of the season, while some might choose to compete harder and acquire better players, or just simply make some small adjustments. In some cases, however, it might happen that a team becomes significantly different after the trade deadline if they choose to pursue either of these extreme goals of competing or tanking. Anyhow, team composition (or roster) and team quality can be considered constant after this point, that could be mostly overruled by injuries. The All-Star Weekend on the other hand does not have the potential for such a large change in the competitive balance of teams, instead it provides a couple days-long break within the season. In fact, this is the only multiday-rest period for teams and players during a season, as teams finish the 82 regular season games only within five and a half months. Even if changing the roster via trading is arguably more impactful on the potential future performance of team, having sufficient rest can be key in recharging players before the end of the regular season.

II. Ranking in the regular season

During the regular season, teams are ranked within their conference according to the number of wins in the percentage of the total number of games played until that point (referred to as win percentage or record from now on). Therefore, even though every team plays a total of 30 games against teams in the other conference, they are ranked only according to the teams within their own conference, which leads to two rankings (Eastern and Western conferences), both running from the 1st position (or seed) until the 15th position, the former having the highest, and the latter having the lowest win percentage in their respective conference. This ranking during the regular season resonates well with the ordinal ranking presented in tournament theory, and it is a practical measure of team quality as team effort might not be directly estimated nor a cardinal ranking could be defined, where the exact difference between the effort level provided by teams was measured. However, in order to determine how much value a specific seed holds in general, and to characterize the reward scheme of this tournament, one has to understand how the subsequent season phase (the playoffs) works and how higher-ranked teams benefit from achieving more wins during the tournament (the regular season).

B. *Historical and Recent Changes in the Reward Scheme*

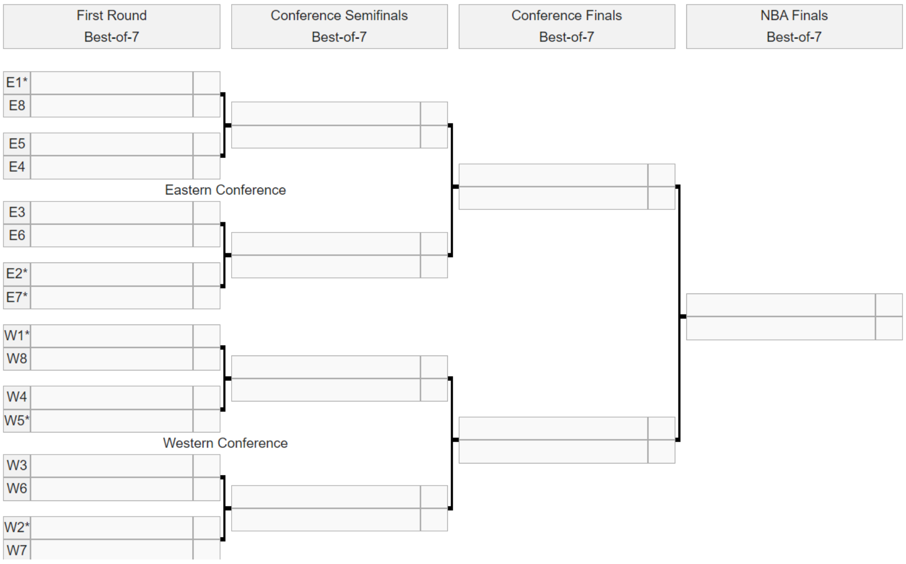
The following section outlines the basic characteristics of the structure of the playoffs before and after the play-in tournament was implemented, and it attempts to summarize the differences between the respective reward structures.

I. Main features of the playoff structure since 2016

After the regular season has been finished, the ordinal rankings in both conferences were used to define the playoff structure, leading to 8-8 teams advancing to the playoffs and 7-7 teams being eliminated in each conference. During the playoffs, the 8 advancing teams (from the 1^{st} to the 8^{th} seed) are organized into pairs, and they play best-of-seven elimination series according to the structure summarized in Figure 1. Best-of-seven series means that the team first achieves four wins advances, so the possible outcomes are then: 4-0, 4-1, 4-2, 4-3, and their opposites. In Figure 1, letters (E and W) stand for Eastern and Western conferences respectively, and the numbers (1-8) stand for the acquired position at the end of the regular season. This clearly conveys the message that the playoffs are organized the exact same way in both conferences and the eventual winners of the two conferences play against each other in the NBA Finals to determine the final winner. Additionally, higher-ranked teams receive lower-ranked ones in the first round, which can be seen as some sort of reward for finishing high in the standings, as one might assume that lower-ranked teams represent relatively lower quality in performance compared to higher-ranked ones.

Moreover, the higher-ranked team in every series is awarded home-court advantage, so the series is organized in a fashion that can be summarized as H, H, L, L, (H, L, H), where H stands for the home court of the higher-seeded team, and L stands for the home court of the lower-seeded team. Note that the last three letters appear in parentheses as those games might not be necessary if one team wins all the first 4 games. If a series lasts until a seventh (and final) game, then the higher-ranked team played at their home court on one more occasion than the lower-ranked team.

Figure 1. NBA playoff structure between 2003 and 2021



Source: NBA playoffs (2023).

However, the mechanism determining the order of the 8 advancing teams in a conference has changed slightly between 2005 and 2021 (Kraetsch, 2017). In seasons 2005 and 2006, the first three positions (or seeds) were assigned to the three division winners regardless of their win percentage, and the last five seeds were given to the remaining teams with the best record. Due to criticism, from season 2007 the three division winners were allocated between the first four seeds, and the 1st and 2nd seeds were given to teams with the best records in their respective conferences. After season 2016, the emphasis on winning a division has disappeared, meaning that no direct seed was assigned to division winners, rather the eight teams with the best record in their respective conferences were ranked[5] according to their record.

II. The play-in tournament

The final change to the structure of the playoffs happened before 2021 and it is in place ever since. This was the introduction of the play-in tournament, and this change is central to this thesis. The ranking of the teams based on win percentage remained the same as well as the eventual number of teams participating in the playoffs, that is 8-8 in the two conferences, 16 in total. By contrast, the number of teams qualified with certainty decreased to 6, and the remaining two playoff spots (the 7th and 8th position, respectively) now are determined by the play-in tournament.

Figure 2. NBA play-in tournament schedule

Source: 2022 NBA Play-In Tournament Schedule (2022).

In Figure 2 the exact schedule of the tournament can be seen. Teams ranked 7th and 8th play a single game, where the winner becomes the 7th seed in the playoffs, and is about to face the 2nd seed in the first round. The loser of the above game faces the winner of a single elimination game (winner advances, loser gets eliminated) played between teams ranked 9th

[5] If teams within the same conference achieve the same win percentage at the end of regular season, several tiebreaker criteria apply to determine their respective positions. For more details see NBA playoffs (2023).

and 10^{th}, and these teams play a final elimination game to determine who is going to be the 8^{th} seed in the playoffs, and will eventually face the 1^{st} seed in the first round. It is important to note that as these are single elimination games, the game is held at the home court of the higher-ranked team, so the 7^{th} and the 9^{th} seed play their initial play-in game at home, and the loser of the 7^{th}-seeded vs 8^{th}-seeded game plays their second game at home.

The characteristics of the reward scheme within a tournament are crucial to understanding how much effort teams provide and how they react to changes in this scheme. In Table 1, I attempt to summarize the differences between the reward system before and after the play-in tournament was introduced. My intention was to highlight everything that makes the incentives different and might be able to alter team behavior. The before period covers seasons 2016-2019 as these years featured the same team-ranking rules.

Table 1. Schematic summary of changes in the reward scheme by seed

Seed	Reward: before the PI	Reward: after the PI	Change in valuation after the PI
1^{st}, 2^{nd}	Certain spot, home court advantage	Certain spot, home court advantage	Decreased: exact opponents are revealed later
3^{rd}, 4^{th}			No change
5^{th}	Certain spot, no home court advantage	Certain spot, no home court advantage	No change
6^{th}			Increased: lowest seed with certain playoff-qualification
7^{th}		Uncertain spot, home court advantage for the initial PI game	Decreased: uncertain spot Increased: home court advantage for the initial PI game
8^{th}		Uncertain spot	Decreased: uncertain spot Increased: if the first PI game is lost, the second with home court advantage
9^{th}	Eliminated, first to miss out on the playoffs	Uncertain spot, home court advantage for the initial PI game	Increased: chance for the playoffs, home court advantage for the initial PI game (but no home court if there is a second PI game)
10^{th}	Eliminated from playoff contention	Uncertain spot	Increased: chance for the playoffs (but no home-court advantage for the two necessary PI games)
11^{th}		Eliminated, first to miss out on the PI	No change
12^{th}-15^{th}		Eliminated from playoff contention	

Notes: the above categories might not be completely exhaustive, but my intention is to only enumerate the apparent characteristics and differences between the two reward schemes.

It is rather complicated to assess how teams value these changes in the reward structure. It is clear that the tournament affects teams being 7^{th} to 10^{th}-seeded by design as they must participate in the play-in tournament. On the other hand, it is arguable what kind of impact the tournament has on the rest of the teams. The eventual reward for teams seeded between 1st and 6th, and below 11th is unaffected: the former group of teams secures a playoff spot, and the latter group is eliminated, just as in the previous system, However, there are some additional considerations due to the play-in. For example, approaching the end of the regular season, a 6th-seeded team might be more motivated to keep or improve its position to avoid participation in the play-in tournament. Moreover, an 11th-seeded team previously had no incentives to improve its record, but now there is a chance for these teams to secure (or clinch) a position in the play-in tournament, which might result in playoff participation. Lastly, the top two seeds might experience a drawback because of the play-in, as the identity of the 7th and 8th-seeded teams unfolds only after the play-in tournament is finished, resulting in fewer days of possible preparation for the 1st and 2nd seed for their first-round series.

Before describing the reasons why the play-in tournament was introduced on behalf of the league and how previous changes in the incentives scheme impacted team behavior, it is important to slightly elaborate on one additional aspect of the reward scheme: what is the reward for winning or performing well in the playoffs, why is it worth competing for a championship? This value should be substantially large to motivate several teams over many seasons to exert effort on the court. Interestingly, direct financial gains and rewards are rare compared to for example the most popular European football tournament, the UEFA Champions League (Bonn, 2023), the only notable reward being the Player's Playoff Pool funded by gate receipts during the playoffs, which has been approximately $20-30 million, and it is distributed among the 16-playoff participants (Singh, 2022; Marca, 2022). The winning team receives the largest share (around $3.5-4.0 million), but this constitutes a rather insignificant fraction of players' salaries. The actual pool of rewards involves many indirect forms of compensation that are difficult to measure. For teams, these can be higher market valuation from the business viewpoint, and greater popularity among fans, which can lead to a higher number of sales of jerseys and tickets and better potential sponsorship deals. For the players, these might be better positions to negotiate both in the case of future contracts and sponsorship agreements, building a legacy, personal image, and popularity, and competing for awards that are based on individual performance and might directly contribute to salary increases (Pavlovic, 2023).

C. Causes and impacts of changes in the incentive scheme

Introducing new incentive schemes or overruling existing ones most often has a dedicated cause and aim of why the change is taking place: what it intends to change, why, and how it is going to be achieved. Improving efficiency and thus generating higher revenues or targeting equality through promoting competitive balance are usual goals for league regulators in mass sports with many spectators. But these policy interventions should be evaluated from time to time to understand whether they achieved the articulated goals and mitigated the initial problems. The introduction of the play-in tournament is arguably among the most significant modifications to the reward scheme in recent years, and its impacts are yet to be studied. On the other hand, incentives promoting higher competitive balance through the draft system have been extensively investigated, and even though the motives behind the draft system are different from the ones behind the play-in tournament, the presented methodological tools and frameworks are certainly useful for my analysis as well.

I. Rationales behind the play-in tournament

The two important motives for the change via the play-in tournament in the allocation of playoff positions were to encourage more teams, especially teams in the middle of the standings, to engage in the competition towards securing a playoff spot and secondly, to incentivize teams not to shirk and forfeit games while approaching the end of the regular season. The first motive is quite apparent already in Figure 2 and is also an inherent part of the idea of the play-in tournament itself, as instead of 8 teams per conference, now 10 teams have at least the theoretical chance of qualifying for the playoffs. One can argue how probable it is for example for the 10th seed to qualify to the playoffs, as the 10th-seeded team has to win two consecutive away games to succeed. But as these are single elimination games and not best-of-seven series, and the teams in the play-in tournament can be considered similar with respect to team quality because they finished behind each other in the standings, the potential for somewhat unexpected results, like the 10th seed defeating both the 9th and 7th/8th seed, is not negligible.

The second motive revolves around the intention that the league wants to discourage teams from shirking or forfeiting games towards the end of the regular season. Shirking can happen on a large scale, ranging from resting key players only in a few games (referred to as load management) to ruling out better players for weeks, usually with injury-related explanations but with the implicit intention of becoming worse (so as to tank). It is supposed to be implicit, because in the opposite case, the league imposes significant fines on those teams that rest their players overtly, like in the case of the Dallas Mavericks for their resting policy during the last two games of the 2023 regular season (NBA, 2023). Interestingly, the strategy of resting healthy players was mainly discussed with a relation to tanking (Gong et al., 2022), and not more generally, involving teams in the top or in the middle of the standings. Shirking is clearly detrimental to the league and to viewers and fans as well, because the league wants to realize high viewership and profits, but it cannot meet these goals if fans know in hindsight that the popular players would not play in a particular game. Based on the uncertainty-of-outcome hypothesis presented by Horowitz (2018), fans of the sport generally prefer to watch competitive games where the outcome of the game is difficult to predict. Moreover, the predictability of the outcome might be viewed as some form of corruption, where the shirking team is rigging the game (Duggan & Lewitt, 2002). On the other hand, teams can forfeit games and not exert effort for various rational reasons that are not against the regulations. Firstly, the inherent characteristic of a very long tournament like the NBA regular season is that it can happen that some team positions are solidified many games before the regular season ends, so teams can neither gain nor lose their current position in the standings. Secondly, teams might want to rest their players, especially during such a lengthy regular season, because they focus on the final phase of the competition, and they concentrate their effort entirely on the playoffs. This might be also the interest of the league and fans, because they want to see the best players perform well in the playoffs rather than in the regular season, potentially risking an injury and missing the playoffs. Lastly, teams might strategically want to lose as many games as possible over the season which is usually referred to as tanking.

Understanding the motives behind losing games and racing to the bottom of the standings might seem odd and difficult at first glance, as tournaments presented so far rewarded the winners, or punished the losers. By contrast, tournaments in North American major sports (basketball, American football, baseball, and hockey) all feature a draft system with very similar characteristics that reward the worst-performing teams. The draft lottery system in the NBA enables teams to pick players from the pool of young and amateur talent and offer them contracts. The lower a team finished in the standings, the more likely they receive the right to select earlier in the draft. Consequently, whoever selects early (or high) in the draft can select from the pool of young players with the best prospects. Importantly, if a young player is drafted by a particular team, no other team can draft that player, so the later (or the lower) a team selects in a draft, the more likely it is that the most promising young players had already been selected. The reason for such a complicated draft lottery system is to maintain the competitive balance between the teams, so if a team performs badly in a given season, it is likely that they receive the right to select early in the subsequent draft and have the chance to become successful a few years later with those promising young players on their team. In the following subsection, I present the relevant literature that evaluated the draft system and its significant impact on encouraging teams to shirk.

II. Intentional shirking due to the draft system

The first evidence supporting how the draft system of the NBA motivates teams to shirk was presented by Taylor and Trogdon (2002). Their sample consists of three years with three different draft system mechanisms during the 1980s. The first is a reverse-order draft, which means that the team with the worst record receives the first pick with certainty, the second-worst team receives the second pick, and so on. Later the system was changed to a draft lottery, and teams missing out on the playoffs (seven teams at that time) were given equal probabilities of receiving the first draft pick. Lastly, the system remained a lottery with probabilities assigned to teams, but instead of equal probabilities, higher likelihoods were given to teams with the worst record, and lower to teams with better ones. Their results are in line with the predictions of tournament theory: the first and the third draft scheme indeed encouraged teams to shirk and lose more games than they would otherwise have lost after being eliminated. Teams shirk in order to obtain the worst record, because then they either certainly receive a high pick, or have a higher probability to receive one. Moreover, the measured effect is larger in absolute terms in the reverse-order system than in the lottery formulae, reflecting that teams realize the difference between the certain and the lottery scheme. By contrast, the second draft scheme had no effect on the winning probability of teams after they were eliminated, as the assigned probabilities for eliminated teams were equal. These results show that teams react quickly and substantially to changes in these perverse incentives, and accordingly to what theory suggests.

Following Taylor and Trogdon (2002),[6] Price et al. (2010) revisited the draft-related tournament incentives in the NBA using an extended data set ranging from 1977 to 2007. Their year-by-year analysis shows similar results in the years also covered by Taylor and Trogdon (2002), moreover, they indicate significant shirking behavior after being eliminated occurring in the late 90s. The main reason for this is that the league adjusted the draft lottery so that teams with the worst record are assigned higher probabilities. In other words, the rewards scheme of the tournament became more non-linear, and this change made shirking more appealing to teams. In the early 2000s, however, their results barely find evidence for tanking. The authors highlight that apart from some minor changes to the tournament format, one important explanation might be the preciseness of the valuation of the reward, so that actually how valuable top draft picks are, and how well these players perform later during their career. Teams can only calculate expected returns ex-ante but having the data of preceding drafts and of the performance of players drafted early enable a more precise calculation. Lastly, Price et al. (2010, 133) emphasize that these changes in the reward scheme might be triggered by perceptions of tanking or shirking, but it might not be the case at all. This finding points to the difficulty of appropriately defining and identifying tanking and shirking during the regular season.

As a large number of papers show, perverse or dual incentives originating from the draft system have been central to academic interest and how detrimental it is from a welfare viewpoint. Providing the lowest-ranked agents with some reward is clearly unique and is opposite to tournaments where a "loser-bear-all" structure is implemented (Sappington 1991, 55) and also unlike sports tournaments where the worst-performing teams are relegated to a lower division, such as in European football contests. However, the motives for winning and

[6] These results of teams losing intentionally due to perverse incentives are not unique to basketball. Based on the model by Taylor and Trogdon (2002), Fornwagner (2019) finds essentially the same effects using professional hockey data.

advancing to the playoffs were not studied this extensively, potentially because that part of the tournament scheme was largely unchanged during the years and winning strategies might be more heterogenous than intentional losing strategies. Certainly, securing (or clinching) a playoff spot was among the control variables of Taylor and Trogdon (2002) and of other pieces of literature utilizing this model, but these variables were not significant, nonetheless. In the following chapters using a methodology similar in philosophy to the model of Taylor and Trogdon (2002), I focus on how being eligible for the play-in tournament affects the likelihood of winning and whether this has changed after the play-in tournament was introduced.

4. DATA

To identify whether there has been a change in motivation towards winning and in risk-taking behavior after the implementation of the play-in tournament starting in 2021, game-level basketball data is necessary. Moreover, the daily standings data of teams is also substantial to compute whether a team is still eligible for the play-in tournament preceding a game or not. These types of observational data are available in a structured and comprehensive format on the basketball-related website of the company Sports Reference (Sports Reference, n.d.).[7] The following sections describe the scope of the datasets, the characteristics of both the data regarding eligibility for the play-in and the one regarding risk-taking, and finally, the summary of the combined dataset is introduced that is used for the analysis.

A. THE SCOPE OF THE DATA

The data covers game-level basketball in the National Basketball Association (NBA). The main reason for selecting the NBA apart from how well it exhibits many features of tournament theory is the availability of well-structured historical data and its representativeness of the highest quality and popularity of basketball. The dataset covers seven years (seasons) from 2016 to 2023. As the 2019-2020 season was severely affected by the Coronavirus pandemic and was suspended for several months,[8] it is excluded from the analysis.

Apart from the obvious exclusion of the 2020 season, the selection of the starting year of the dataset is important for two reasons. Firstly, as mentioned in the previous chapter, the period between 2016 and 2019 was homogenous from the viewpoint of the reward scheme, as

[7] All calculations are made using data from this source unless otherwise indicated.

[8] The season was restarted and finished later in 2020, but it was organized in a unique way that it makes it incomparable to other seasons.

the playoff structure has not changed during these years. This is important as any notable change during that period could potentially bias the estimates of the effects of the play-in tournament. Secondly, to allow for comparability between the before and after periods, I intended to restrict the period before the introduction play-in tournament to obtain an approximately similar number of observations, as the play-in tournament has been in place only for three years now. Note that the 2021 regular season was shorter than the other seasons due to the late start of the season caused by the late finish of the preceding, postponed 2020 season. However, it is unlikely that it would bias the analysis as the tournament structure and the incentives remained the same, only the total number of games necessary to play throughout the regular season has changed slightly, and teams needed to play 72 regular season games instead of 82. The playoff was unaffected on the other hand.

The main research question aims to identify the potential change in the behavior of teams in terms of winning motives and risk-taking, leading up to the postseason. Because of this, games in the playoffs and the play-in tournament itself are completely removed from the analysis, and the focus is on regular seasons, which constitute yearly tournaments in the NBA. Moreover, as team motives might be revisited throughout the regular season, I restrict my sample approximately to the last third of each regular season. The exact cut-off is determined by the trade deadline in each season, as it might involve changes in the roster, therefore in team quality as well. For robustness checks, I additionally examine the cut-off given by the All-Star Weekend, and report all related descriptive and estimated results in Appendix B.

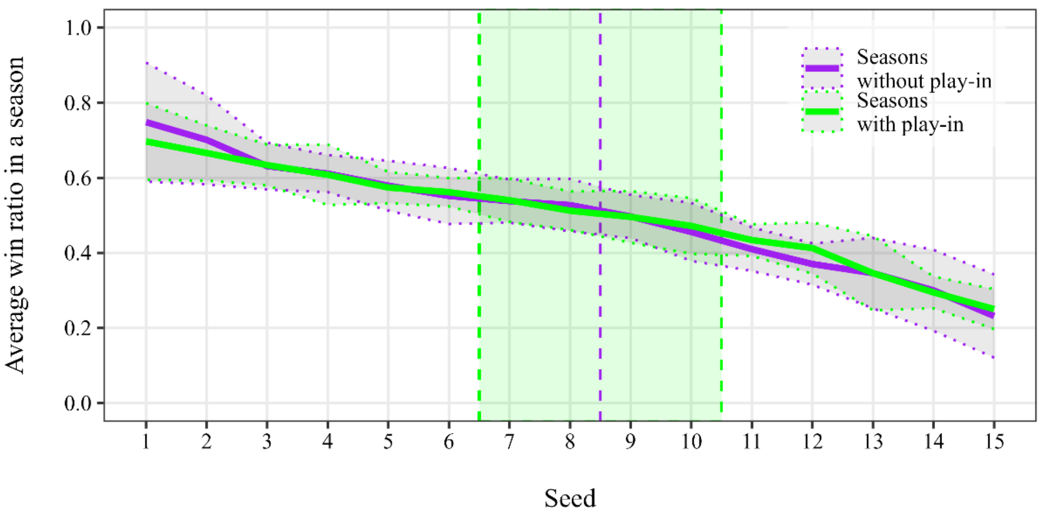
B. Building the Data

I. Standings data

In order to specify whether a team has clinched a playoff spot or is still eligible for the play-in or has been already eliminated, daily standings data is required. This is the simplest building block of the dataset, as it consists of daily observations, with each team from both conferences (thirty teams in total) and their winning percentages.

Figure 3 captures an important aspect of this dataset, namely the relationship between the average win ratio (number of wins over the total number of matches in that season) across seasons for each seed, split between years with the play-in tournament in place and years without it. In general, it means that on average how high of a win ratio is needed to secure a particular seed. The solid lines indicate the averages, and the dotted lines are the confidence intervals for the respective average. The vertical dashed lines show the cut-offs for each ranking system, so a single cut-off between the 8th and 9th seeds for years without the play-in, and an interval between the 7th and 10th for years with the play-in tournament.

Figure 3. Relationship between average win ratio and seeding



Notes: NBA regular season data, final regular season standings. Seven seasons in total: four seasons (2016-2019) before the introduction of the play-in tournament, and three seasons (2021-2023) afterward. Dotted lines indicate 95% confidence intervals. Vertical purple line indicates the sharp cut-off of the playoffs, vertical green lines indicate the qualifying positions for the play-in tournament. Source: Own calculations using data from Sports Reference (n.d.).

The general pattern clearly shows that the higher share of wins a team has achieved, the higher position it gets on the standings, and this relationship is close to linear. The difference between season groups 2016-19 and 2021-23 is negligible, the curves are practically the same. Although the averages tend to be the furthest from each other around seeds 11-12, there are clearly no sharp differences or discontinuities visible in the figure, which indicates that the introduction of the play-in tournament has no clear sign of reshaping the number of wins needed for a particular seed on average.

This lack of any form of discontinuity could be because of some simultaneous opposite effects that rule out each other. For example, teams might end up winning more often while fighting for the play-in tournament spots, but they tend to lose more in general than in the previous seasons. This would indicate some trends that there is an increasing gap between teams in quality, but this gap is somewhat erased by the introduction of the play-in. Figure 3 does not support that there was any difference before and after the play-in in terms of end-of-season winning percentage. Nevertheless, this is still an aggregate level of winning percentage, which might be different at the game level.

II. Game-level data

For every basketball game in the scope of the analysis, game-level data includes the name of the teams participating in the game, the identity of the teams (home, visitor, or neutral), the date of the game, the scores by the teams, and the result. Moreover, it also contains additional team-level statistics that help define risk-taking behavior.[9] Using the available dataset, one can compute how many games teams have won up to a given game (win percentage), whether a given game is played only one day after the preceding game (back-to-back game), and many risk-related variables can be derived. Among those, the ratio of three-point attempts over two-point attempts is extensively utilized, for example in Grund et al. (2013) and Böheim et al. (2016), as three-pointers are considered to be much riskier shots than two-pointers, while the expected value of points scored is very similar. Other risk-related variables are foul efficiency and turnover-assist ratio, both covering different aspects of the game, and described in detail in Appendix A.

[9] For a detailed description of team-level statistics of risk-taking behavior, see Appendix A.

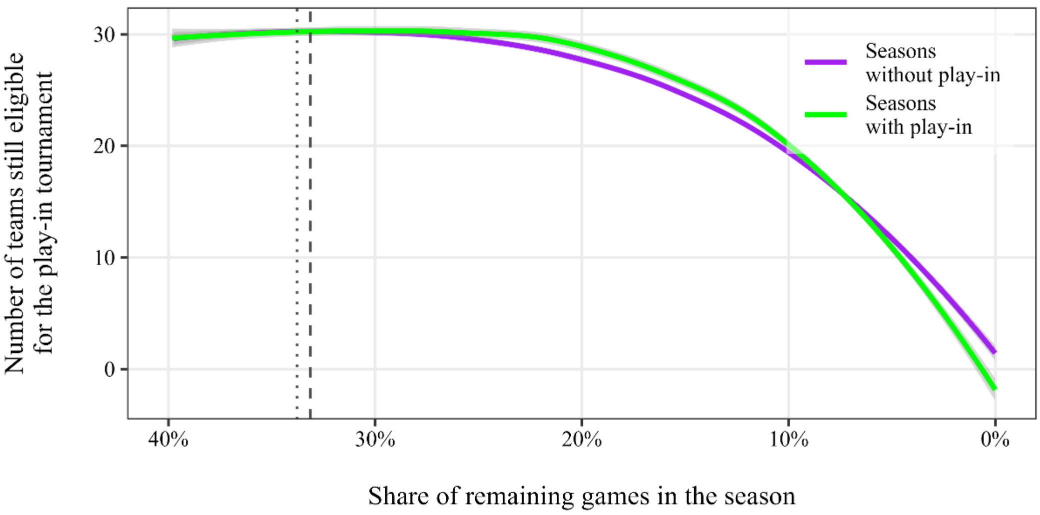
Game-level data is then paired with the data on standings using dates to link these two in order to define the eligibility variables, following the method set by Taylor and Trogdon (2002). Clinching a certain playoff position would happen if a team were within the top 6 in its conference and even if it lost all its remaining games while the currently 7th-seeded team won all its remaining ones, this given team cannot fall back further in the standings than the 6th position. Elimination is similar, but with the opposite sign: when a team cannot pass the 10th-seeded team while winning every remaining game of theirs even if the 10th-seeded team loses all its own remaining ones, then this team is eliminated from playoff contention. All the teams that neither have clinched a playoff spot, nor have got eliminated are considered still eligible for the play-in tournament, but once a team clinches a playoff spot or gets eliminated from playoff contention, that team is no longer eligible for the play-in, as its position is certainly defined within the two other categories.

III. Complete data

Emphasizing the importance of cut-off dates within a season now gains importance. Unless enough games are played within a regular season, each team could be either on the top or the bottom of the standings mathematically, even if it is an unlikely scenario, because there are so many games left to play. This would ruin the estimation as every team would be eligible for the play-in throughout the majority of the sample, and team heterogeneity would be hidden. However, limiting the scope of the data offers a solution by selecting the trade deadline or the All-Star Weekend (ASW) as a cut-off. The two dates are close to each other every year, in the seven years of the sample the absolute mean difference is 9.5 days, and the mean difference is 2 days between the two, therefore they can be considered identical. I select the cut-off provided by the trade deadline, as it might eliminate the potential bias of teams changing substantially due to trades. However, for robustness checks, I also perform the analysis using the ASW as a cut-off date.

The relationship between the remaining fraction of a season and the number of teams being still eligible for the play-in is depicted in Figure 4. The share of remaining games metric is required as season 2021 was shorter than the others. The green solid line indicates seasons with the play-in tournament while the purple solid line indicates seasons without it. The number of still eligible teams is averaged[10] across the share of remaining games in both (before and after) cases and Loess smoothing is applied.

Figure 4. The average number of still competing teams within a regular season



Notes: NBA regular season data. Seven seasons in total: four seasons (2016-2019) before the introduction of the play-in tournament, and three seasons (2021-2023) afterward, averaged across share of remaining games and smoothed using Loess. The share of remaining games is the average across the number of remaining games for every team for every day, divided by the length of the season. Dashed vertical line is the average point in time when the All-Star Weekend is held. Dotted vertical line is the average point in time when the trade deadline is set. Own calculations using data from Sports Reference (n.d.).

The figure shows that after approximately 80% of the regular season is over, there is a gradual solidification of league positions in every season. The green curve showing seasons with the play-in tournament starts to decline slightly later in time, but then it is steeper near the end of the season. Figure A1 in Appendix B uncovers the unique characteristics of each season. It is visible that the earliest decline in the number of still competing teams happened in 2016, while season 2022 saw the earliest end of the race for tournament positions, when every team secured its position 6 days before the end of the regular season. As there are not

[10] See Figure A1 in Appendix B, where instead of smoothing, each season curve is shown separately.

many seasons covered in the data, these relatively outlier values alter the averages substantially, nevertheless it seems as if seasons with the play-in tournament would see a somewhat earlier end to the competition for positions, which is quite the opposite of why it has been introduced, even if the magnitude is small.

Dotted and dashed vertical lines are the average relative points in time where the trade deadline and the ASW are set. Indeed, the two cut-offs are very close to each other and the choice between the two looks rather arbitrary, moreover, both are rather far from the point where the number of eligible teams starts to decline.

C. DATA SUMMARY

Finally, Table 2 offers a comprehensive look at the overall dataset as well as at the one restricted to after the trade deadline. Additional variables and summary tables with the ASW as a cut-off are presented in Appendix B. In the overall dataset ranging from the beginning of the regular season until the end, there are some missing values. This is due to the nature of the standings data, as at the beginning of a season, teams play their first game on different days, it usually takes a couple of days to have complete standings data with all thirty teams. Also, it is important to note that the actual number of games is half of what is reported in Table 2, as every game is counted twice, from the perspective of the team and its opponent. The main reason for this is to be able to control for home court advantage, which is considered to be an important factor in measuring winning performance. The straightforward consequence of this "double-entry accounting", similar to Taylor and Trogdon (2002, 33), is that variables and their opponent-named counterparts are exactly the same in terms of statistics by design.

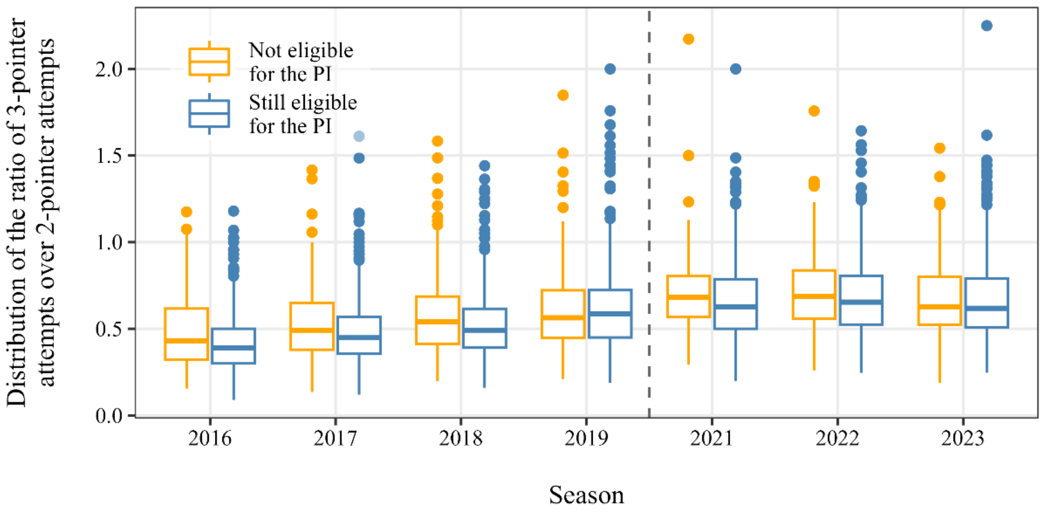
Table 2. Summary statistics of key variables

	Introduction of the Play-In tournament		
	FULL SEASON		
Variable	**Before**, N = 9,840	**After**, N = 7,080	**Overall**, N = 16,920
Eligibility control variables			
Still eligible for PI (0/1)	0.92 (0.27)	0.92 (0.27)	0.92 (0.27)
Missing	132	107	239
Opponent still eligible for PI (0/1)	0.92 (0.27)	0.92 (0.27)	0.92 (0.27)
Missing	132	107	239
Eliminated (0/1)	0.04 (0.19)	0.03 (0.18)	0.03 (0.18)
Missing	132	107	239
Opponent eliminated (0/1)	0.04 (0.19)	0.03 (0.18)	0.03 (0.18)
Missing	132	107	239
Risk-taking measures			
Ratio of three-point attempts	0.50 (0.20)	0.68 (0.23)	0.58 (0.23)
Opponent ratio of three-point attempts	0.50 (0.20)	0.68 (0.23)	0.58 (0.23)
	AFTER THE TRADE DEADLINE		
	Before, N = 3,260	**After**, N = 2,440	**Overall**, N = 5,700
Eligibility control variables			
Still eligible for PI (0/1)	0.76 (0.43)	0.78 (0.41)	0.77 (0.42)
Opponent still eligible for PI (0/1)	0.76 (0.43)	0.78 (0.41)	0.77 (0.42)
Eliminated (0/1)	0.11 (0.31)	0.10 (0.30)	0.10 (0.30)
Opponent eliminated (0/1)	0.11 (0.31)	0.10 (0.30)	0.10 (0.30)
Risk-taking measures			
Ratio of three-point attempts	0.52 (0.21)	0.67 (0.23)	0.58 (0.23)
Opponent ratio of three-point attempts	0.52 (0.21)	0.67 (0.23)	0.58 (0.23)

Notes: Mean values with standard errors in parentheses. NBA regular season data, the whole sample, and the one restricted to the period after the trade deadline. Seven seasons in total: four seasons (2016-2019) before the introduction of the play-in tournament, and three seasons (2021-2023) afterward. Each game is counted twice.

The extended dataset consists of (6×82+72)×30/2 = 8460 matches, and of 2850 in the case of the sample restricted by the trade deadline. Obviously, the average value for the still eligible for the play-in variable decreased after the sample restriction, but it is still very high (0.76) on average. In parallel, the share of teams having been eliminated increased as expected. Columns before and after show the averages with respect to the two periods: before and after the play-in tournament was implemented. Average values and standard errors hardly change, which again reinforces that on the aggregate level, nothing was changed by the introduction of the play-in tournament. Interestingly, the only notable difference is the one measuring risk-taking, the ratio of three-point attempts over two-point attempts (or shot selection) in a game. However, this might have really little to do with the play-in tournament, as the increase in the share of three-pointers among total shots attempted during the last fifteen-twenty years is steady (Verma, 2022) and indicates a significant shift in the way the game is played.

Figure 5. Distribution of shot selection over the years



Notes: NBA regular season data. Seven seasons in total: four seasons (2016-2019) before the introduction of the play-in tournament, and three seasons (2021-2023) afterward, indicated by dashed vertical line. Risk-taking measure is the ratio of three-point attempts over two-point attempts, split by eligibility for the play-in tournament. Own calculations using data from Sports Reference (n.d.).

This relationship is also depicted in Figure 5, with additionally differentiating between whether or not being eligible for the play-in tournament as well. The dashed vertical line indicates the separation between the before and after period regarding the introduction of the play-in tournament. While the overall increasing trend of the share of three-point attempts is not that striking during this seven-year span, it is still visible. Differentiating between whether being eligible for the play-in again does not support any change in behavior on the aggregate level, as the orange (not eligible for the PI) and the blue (still eligible for the PI) distributions seem to be very close to each other.

The additional control and risk-taking variables are described in Table A1 in Appendix B. These variables are crucial in the analysis of team performance because they cover important aspects of the game and team quality. Home court is definitely a key element, as teams do not need to travel, and they can enjoy the support of their spectators. Moreover, it be addressed easily as every game is played in the arena of one of the two teams playing with some rare exceptions, when the venue is held at a neutral location, usually outside of the US. However, there is no neutral location in this restricted sample, this is why the mean for the home court is exactly one half. The quality or skill sum of a team might not be measured precisely, so a proxy variable is needed. The most straightforward metric is the already described win percentage over the season until that game, which measures the preceding success of the team. Also, this measure naturally translates to the ordinal ranking of teams in the tournament, moreover, it accounts for the presence of serious injuries: if an important player is injured for a relatively long period of time during a regular season, then team results will probably deteriorate as well.

Other than home-court and team quality characteristics, fatigue and injuries might play a role in the outcome of single games. While the latter is more difficult to incorporate in the model other than assuming that it alters win percentage to some extent, physically intense periods can be controlled for by variables referred to as back-to-back, which indicate whether a team had a game also on the day before. Even though team fatigue is again some abstract concept, moreover it can be classified more as an individual characteristic rather than a team one, at the same time, professional athletes might be affected very similarly by the heavy physical pressure imposed on them by the dense regular season schedule. As the usual rest period for teams between two games is 2-3 days, playing twice in two days regularly might be exhausting even for the best athletes. Back-to-back has a mean of 0.2, which means that one-fifth of the games played by teams during the regular season is the second night of back-to-back games.

The two additional variables measuring risk-taking behavior (foul efficiency, turnover-assist ratio) are also shown similar to the shot selection variable in Figure A2 and Figure A3 in Appendix B. These series neither exhibit any large differences over time between whether being eligible for the play-in tournament. While foul efficiency looks stable over time, a time trend can also be detected regarding the turnover-assist ratio, with the average ratio decreasing. Lastly, the summary statistics of the dataset featuring the All-Star Weekend as a cut-off in the regular season (Table A2) show almost identical mean and standard error values to the results in Table 2, which can be expected on the aggregate level.

5. Effects on winning performance

This and the subsequent chapter outline the analysis framework, that is used to seek an answer to whether the policy intervention introduced as the play-in tournament had a different impact on team performance between the two surrounding periods: before and after it was implemented. This chapter deals with the effects on winning performance, while the subsequent chapter covers the impacts on risk-taking behavior in a similar manner. Here, firstly, the general model for explaining winning likelihood is presented following the philosophy of Taylor and Trogdon (2002), and variables are explained. After a discussion about variable selection and the predictions based on theory, the results are summarized. Then a second, slightly modified model is also described, with this model having an additional emphasis on differentiating between teams with distinct motives. The findings of this model are also presented, and general implications are made regarding how results of the effects of winning performance fit into theory and existing literature.

A. Baseline model on winning performance

In order to estimate the effect of the introduction of the play-in tournament on the likelihood of winning, a linear probability model in Equation (1) is presented. For team *i*, season *s*, and game *g*:

$$\Pr(Win_{i,s,g} = 1) = \beta_1 {*} Home_{i,s,g} + \beta_2 {*} Win\_Pct_{i,s,g} + \beta_3 {*} Opp\_Win\_Pct_{i,s,g} + \beta_4 {*} B2b_{i,s,g} + \beta_5 {*} Opp\_B2b_{i,s,g} + \beta_5 {*} (Still\_Elig\_PI_{i,s,g} \times AFTER) + \beta_6 {*} (Opp\_Still\_Elig\_PI_{i,s,g} \times AFTER) + \beta_7 {*} Elim_{i,s,g} + \beta_8 {*} Opp\_Elim_{i,s,g} + \nu_s + \varepsilon_{i,s,g}, \quad (1)$$

where

Win =	dummy equal to 1 if team *i* have won game *g* during season *s* and 0 otherwise.
Home =	dummy equal to 1 if team *i* plays game *g* during season *s* on its home court and 0 otherwise.
Win_Pct =	the share of won games in percent of total number of games by team *i* during season *s* up until game *g*.
Opp_Win_Pct =	the share of won games in percent of total number of games by the opponent of team *i* during season *s* up until game *g*.

B2b =	dummy equal to 1 if game *g* during season *s* is the second night of back-to-back games (two games played in two days) for team *i* and 0 otherwise.
Opp_B2b =	dummy equal to 1 if game *g* during season *s* is the second night of back-to-back games for the opponent of team *i* and 0 otherwise.
Still_Elig_PI =	dummy equal to 1 if team *i* is still eligible for the play-in Tournament (or equivalently, seeds between 7-10th) preceding game *g* during season *s* and 0 otherwise.
Opp_Still_Elig_PI =	dummy equal to 1 if the opponent of team *i* is still eligible for the play-in Tournament preceding game *g* during season *s* and 0 otherwise.
AFTER =	dummy equal to 1 if season *s* is either 2021, 2022, or 2023 and 0 otherwise.
Elim =	dummy equal to 1 if team *i* has been eliminated from *any* form of playoff contention (or equivalently, 11th or lower seed) preceding game *g* during season *s* and 0 otherwise.
Opp_Elim =	dummy equal to 1 if the opponent of team *i* has been eliminated from *any* form of playoff contention preceding game *g* during season *s* and 0 otherwise.

Lastly, ν_s is the season-specific fixed effect and ε is the error term. As observations are constructed as team *i* and its opponent, all games appear twice. To account for this, I cluster standard errors at the game level.

I. Expectations of the model

Winning games over a season can be predicted based on many technical aspects of the game (strategy, spacing, shooting form, defense), but winning only one game at a time from a causal rather predictive perspective is much more difficult. This is why I use the control variables defined given in Equation (1), with the potential testing for other measures as well, if applicable. For instance, a slightly different measure for team quality instead of win percentage can also be used, for example, win percentage over the last five games, which is the share of wins within the last five games. This serves as the proxy of skill in the very recent past. Another approach is to omit the win percentage variables and utilize team and opponent-specific fixed effects instead, which hides the possibility of exact interpretation for team quality, but it essentially controls for the same thing. All things considered, home court and win percentage are expected to positively contribute to winning performance, whereas tiredness (back-to-back) is expected to contribute negatively.

The main variable of interest is the interaction term between Still_Elig_PI (or Opp_Still_Elig_PI) and AFTER. It is important to note, that as each game appears twice in the analysis, the eligibility dummies are essentially the same, only with the different signs. Being still eligible reflects the state of teams during the regular season until they are still competing for a play-in spot. However, this dummy only equals 1 until the point that teams are eligible for the play-in: immediately after a team clinches a playoff spot or gets eliminated from any form of playoff contention or it becomes certain that it is participating in the play-in tournament, this dummy is set to zero. This construction incorporates, that these categorical variables cannot be all included in a regression, as one should be the reference level. As I am interested in the distinction between teams with winning motives, I select the categorical variable measuring teams clinching a playoff spot as a reference level.

By this construction, I intend to highlight the potential motivating factors behind the play-in tournament, as teams clinching a playoff spot on the top of the standings or those not qualified at all might forfeit their remaining games with greater likelihood than teams still under race. Teams about to clinch a playoff spot might shirk in order to rest their best players, and teams on the verge of elimination might tank to receive a high draft position as described in Chapter 3. For both reasons, the teams in the middle might be more motivated than other teams and exert more effort. The inclusion of variable AFTER is important to identify if the policy intervention brought by the introduction of the play-in tournament had any effect on winning performance. Due to the play-in, more teams have been given a chance to qualify for the playoffs, and fewer teams are qualified directly as well, I expect that teams become more motivated after this policy intervention, but likely to a small extent, as this change in the incentives raises the rewards of the particular standings positions (7^{th}-10^{th}) of the tournament only slightly.

II. Main results of the model

Results of the baseline model on winning performance are presented in Table 3. The complete set of control variables and coefficients is presented in Table A3 and further findings are summarized in Table A4 using a slightly different sample.

The first column of Table 3 includes the coefficients estimated using linear probability model described in Equation 1, using season fixed effects and game-level clustered errors. The interaction terms investigating whether a change occurred in the likelihood of winning of teams that are still eligible for the play-in after its introduction clearly suggest an effect of practically zero, with substantially large standard errors. This suggests that the introduction of the play-in itself has not changed how teams behave while being still eligible for the play-in tournament and does not contribute to winning performance. Apart from being very noisy as the standard errors are large, the signs of the coefficients of the interaction terms are the opposite of what was expected. The still eligible variables themselves are not significant at any conventional significance levels either, but the coefficients are more different from zero than in the case of the coefficients of the interaction terms, they are measured with less noise. They also have the expected signs, implying the motivating characteristics of being eligible for the play-in, but this is irrespective of whether the play-in has been introduced.

The second column of Table 3 only focuses on the subsample of the before period (seasons 2016-2019) as a benchmark result level for comparison. Therefore, neither the interaction nor the variable AFTER is included. The coefficients for eligibility are significant, indicating that the other control variables being constant, being eligible for the play-in results in a 6.1 percentage points increment on average, compared to having clinched a playoff spot (the reference level). This difference is quite large, considering that it would result in an additional 5 wins in an 82-game-long regular season. Even if the before period did not have the play-in tournament as such, being eligible for it means nothing more than having the chance to finish within positions 7th to 10th.

Table 3. Baseline results on winning performance

	Dependent variable: Win					
	(1)	(2)	(3)	(4)	(5)	(6)
	All seasons OLS	Before PI OLS	All seasons OLS	All seasons OLS	All seasons OLS	All seasons Logit
Still eligible for PI × AFTER	**-0.016**		**-0.003**	**0.006**		**-0.088**
	(0.038)		(0.039)	(0.049)		(0.192)
Opponent still eligible for PI × AFTER	**0.016**		**0.003**	**-0.006**		**0.088**
	(0.038)		(0.039)	(0.049)		(0.192)
AFTER (0/1)					**-0.002**	
					(0.005)	
Still eligible for PI (0/1)	0.042	**0.061****	-0.064**	0.055*		0.201
	(0.027)	(0.030)	(0.027)	(0.033)		(0.136)
Opponent still eligible for PI (0/1)	-0.042	-0.061**	0.064**	-0.055*	-0.045	-0.201
	(0.027)	(0.030)	(0.027)	(0.033)	(0.029)	(0.136)
Team and opponent FE			✓			
Season FE	✓	✓	✓	✓		✓
Observations	5,700	3,260	5,700	5,700	4,387	5,700
Adjusted R^2	0.146	0.167	0.089	0.169	0.136	0.111

Notes: Columns 1,2,3,4,5 OLS, column 6 Logit regression model. Standard errors are clustered at the game level and are in parentheses. Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.1. NBA regular season data, restricted to the period after the trade deadline. Seven seasons in total: four seasons (2016-2019) before the introduction of the play-in tournament, and three seasons (2021-2023) afterward. Model in column 2 only consists of the before period (2016-2019). Model in column 5 is restricted to where Still eligible for PI equals 1. Except for model in column 5, AFTER is removed due to perfect collinearity with season fixed effects. Coefficients of interest are highlighted in bold.

Column 3 replaces win percentage as the proxy for team quality with team and opponent fixed effects. These fixed effects are interacted with season fixed effects so that team (and opponent) fixed effects might vary across, but not within seasons. While the interaction term is unchanged and is still zero, the sign of the uninteracted eligibility variables changes, which results are rather controversial to the ones in the previous columns. Column 4 also selects a different team quality proxy due to robustness considerations. This team quality measure (win percentage during last five games – Win_5Pct) performs very similarly to simple win percentage. It also uncovers that having a good recent form indicated by Win_5Pct has a positive relationship with having a good form in general during the season.

Column 5 in Table 3 restricts the sample to games where team *i* is still eligible for the play-in, practically removing observations where team *i* has already clinched a playoff spot or got eliminated. This setup highlights the variable AFTER, which would be the main channel for the potential change caused by the introduction of the play-in tournament. However, this model has very similar results to all models previously presented and especially to the baseline model in column 1. The coefficient of AFTER is now rather precisely measured with small standard errors, and it is zero, the opponent still eligible variable is negative and only insignificant by a small margin. The small shrinkage in the sample size demonstrates well that most teams are eligible for the play-in tournament for an extended amount of time even at the end of the season. The last model in column 6 is the same as the baseline model in column 1, but instead of fitting a linear model, logistic function is applied. However, it comes as no surprise that neither the signs nor the significance levels change due to the logistic model.

As Table A3 shows in Appendix B, most covariates are on the other hand significant and have the expected signs. The construction of the model by counting every game twice to have a viewpoint of team *i* and an opponent team enables the research design to include a home categorical variable to account for the effects of home court. It is called home court advantage for a reason: comparing otherwise identical teams, playing a particular game at one's home stadium compared to playing as a visitor has on average a 13 percentage points increase across different model specifications, which can be translated to 10.67 additional wins in a usual regular season. Note that in specification 2, this effect is even larger, resulting in a striking 0.17 percentage point increase in the likelihood of winning a game, or equivalently, almost 14 wins in a regular season. The impact of win percentage is large, significant, and positive throughout the different specifications, as well as the coefficient of back-to-back games also corresponds to theory. If game *g* is a second night of a back-to-back for team *i*, then with other control variables being constant it results in a 3.3-5.0 percentage points decrease in the likelihood of winning, which is a small magnitude, but still be important in the rankings. Lastly, being eliminated has a negative effect on winning performance, which is in line with the results of the literature (Taylor & Trogdon, 2002). However, it depends on the model specification whether this effect is significant or not, as it only gains significance in the model specified in column 3 with team and opponent fixed effects. Finally, it is important to note that the same estimates are presented in Table A4, but the trade deadline is replaced with the date of the All-Star Weekend as a sample cut-off mechanism. As the little difference between the two cut-offs has been already shown, it is not surprising that the results are almost identical to the results presented in Table 3 and Table A3.

B. Extended model on winning performance

As the presented findings show that there is no significant effect due to the large standard errors, it might be beneficial to further break down unique team motives. As of now, in the baseline model being still eligible for the play-in tournament involves all teams that have the mathematical chance to advance or fall back to positions associated with the play-in. This can be problematic as teams at the top of the standings and yet to clinch a playoff spot might behave differently than teams indeed fighting for play-in positions. Moreover, teams that are low in the standings and decided to tank for example after the trade deadline might as well remain eligible for the play-in for a longer period of time if they have won enough games in the first half of the season.

Along this path, therefore I further intend to separate the effect for teams with different winning motives. This points to the idea that the interaction term of interest further needs to be controlled for by another variable measuring team motives or potential. One possible solution could be to interact win percentage with the already existing interaction term, if one assumes that teams with different win percentages (so quality), after the introduction of the play-in tournament, react differently to being eligible for the play-in. This would be a welcome distinction, but the problem is that it implicitly applies that motivation changes are linear in win percentage, which might not be the case, as implied above. Top teams, while still eligible for the play-in might realize that they do not need to fight to win all their remaining games because they are very likely to finish in a position worth certain playoff qualification, and the only question is how high that position will be. On the other hand, teams in the middle of the standings might be more motivated than top teams, as they face the problem of qualifying at all for the playoffs, and this might encourage them to exert more effort. In order to categorize teams into contending, competing, and tanking groups, one needs an exogenous measure. I use projected standings data retrieved from FiveThirtyEight (n.d.). They provide data on a weekly basis, and they predict how teams would finish in a season using information available up to that point, and also incorporating some then-future knowledge, such as the remaining schedule of teams which is known in advance. Using the date closest to the trade deadline (or to the All-Star Weekend), I construct three categorical variables and their opponent-based counterparts: playoffs position, play-in position, and eliminated. These dummies are equal to one if a team is projected to finish the regular season in a position worth playoff qualification (1^{st}-6^{th} seed), play-in qualification (7^{th}-10^{th} seed), or elimination (11^{th}-15^{th} seed) respectively, and zero otherwise. The advantage of this measure is that it comes from a somewhat exogenous source of projection, as projected standings can only incorporate past performance, but team motives might always change along the season. The drawback is that this data is only available starting from 2017 and that it makes interpretation rather complicated. The model defined in Equation (2) using this additional variable is the slightly modified version of the model presented in Equation (1), using the same subscripts and covariates. The model is defined as follows:

$$\Pr(Win_{i,s,g} = 1) = \beta_1{*}Home_{i,s,g} + \beta_2{*}B2b_{i,s,g} + \beta_3{*}Opp\_B2b_{i,s,g} + \beta_4{*}(Still\_Elig\_PI_{i,s,g} \times AFTER \times Projected\_Pos_{i,s}) + \beta_5{*}(Opp\_Still\_Elig\_PI_{i,s,g} \times AFTER \times Opp\_projected\_Pos_{i,s}) + \beta_6{*}Elim_{i,s,g} + \beta_7{*}Opp\_Elim_{i,s,g} + \nu_s + \varepsilon_{i,s,g}, \quad (2)$$

where the only change is that Projected_Pos (and Opp_projected_pos), standing for projected league positions is added and win percentage measures (team and opponent) are removed. This is rather straightforward as win percentage and projected league position are closely related as both measuring team quality, moreover, projected positions heavily incorporate actual win percentage.

I. Expectations of the model

The only modification of the model is the categorical variable derived above, having values of playoff, play-in, and elimination, where elimination is the reference level, so it is excluded from the regression. As it is a triple interaction term and coefficients β_4 (or its opposite, β_5) that now I am interested in, it makes interpretation rather difficult compared to the interaction term presented earlier. The main intention with its introduction was that if a team is eligible for the play-in tournament, and it was projected to finish in a play-in position, then the associated change after the introduction of the play-in tournament might be different for them than for teams currently also being eligible for the play-in tournament but being projected to finish in a position which would result in elimination. As the reference level is the group of teams projected to get eliminated, I would expect both other groups (projected to finish in a playoff spot or play-in spot) to have a positive coefficient for the team and a negative for the opponent version of the triple interaction. Lastly, as discussed above, play-in projected teams might be more motivated to win than their playoff-projected counterparts, so the respective coefficient should be larger following theory. Nevertheless, the exact interpretation of the coefficients of the triple interaction terms would be challenging as there are in total 20 coefficients to be estimated (4 of single terms, 5 of double terms, 1 of the triple term for both team and opponent versions).

II. Main results of the model

The exact interpretation of the triple interaction term might be more meaningful alongside the interpretation of the interaction terms previously highlighted (Still_Elig_PI interacted with AFTER). In Table 4, the estimates for the model given by Equation (2) are reported. The additional set of coefficients for the remaining control variables are presented in column 1 of Table A5, and in column 1 of Table A6 for robustness checks with a slightly different sample.

The estimated model in Table 4 shows again insignificant results for the coefficients of interest, which are the triple interaction terms. Similarly to the previous estimates, the coefficients are measured with large (but not as large) standard errors, and therefore, they are insignificant. Compared to the baseline of teams projected to be eliminated while also being still eligible for the play-in tournament, there is no statistically significant difference between the periods before and after the introduction of the play-in tournament. This suggests that teams grouped by different projected finishes do not differentiate between their strategies because of the implementation of the play-in. Moreover, the sign is rather contradictory as it is negative for the team (and positive for the opponent). Looking at the other triple interaction term featuring playoff projected position, it shows the same story but on a much smaller scale.

The interaction terms of interest previously are also reported in Table 4, but the coefficients are still insignificant and measured with substantial noise, but the sign fits expectations. Nevertheless, among the control variables reported in Table A5, variables such as home court, back-to-back, and being eliminated remained significant with the expected signs.

Table 4. Extended results on winning performance

	Dependent variable:
	Win
	OLS
Still eligible for PI × play-in seed × AFTER	**-0.101**
	(0.096)
Opponent still eligible for PI × opponent play-in seed × AFTER	**0.101**
	(0.096)
Still eligible for PI × playoff seed × AFTER	-0.058
	(0.066)
Opponent still eligible for PI × opponent playoff seed × AFTER	0.058
	(0.066)
Still eligible for PI × AFTER	0.033
	(0.053)
Opponent still eligible for PI × AFTER	-0.033
	(0.053)
Team and opponent FE	
Season FE	✓
Observations	4,848
Adjusted R^2	0.135

Notes: Standard errors are clustered at the game level and are in parentheses. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. NBA regular season data, restricted to the period after the trade deadline. six seasons in total: three seasons (2017-2019) before the introduction of the play-in tournament, and three seasons (2021-2023) afterward. Seeds refer to league position projections after the trade deadline, calculated by FiveThirtyEight (n.d.). Playoff seed: after the trade deadline, these teams were projected to finish in the top six of their respective conference. Play-in seed: projected to finish between seeds 7^{th}-10^{th}. The benchmark level is the eliminated seed: those teams are projected to finish among the bottom five teams. AFTER is removed due to perfect collinearity with season fixed effects. Coefficients of interest are highlighted in bold.

Finally, the accompanying results for robustness checks in column 1 of Table A6 surprisingly report a much different narrative. There, the interaction term of interest is significant at the 5% level and has a negative sign. Moreover, the single term of Still_Elig_PI is also negative and significant, and lastly, the interaction between Still_Elig_PI and the projected position is significant and positive. To fully understand how these different states affect the likelihood of winning, these coefficients should be all taken into consideration which makes interpretation difficult. Clearly, the negative coefficient for the triple interaction term contradicts the theory and suggests, that after the introduction of the play-in tournament and being still eligible for the play-in, teams projected to finish in a position worth play-in qualification are less likely to win on average than otherwise identical teams that were projected to get eliminated. A potential explanation for such differences between the estimates in Table 4 and estimates in Table A6 column 1 is that selecting the All-Star Weekend as a deadline not only affects the sample size as it did until now, but it also has an impact on how the projected position dummy is assigned to each team. Even if the difference between the two dates is around one week on average, projected positions might shift enough to alter the results. Nevertheless, further analysis of the fluctuations of the projected positions data over time would be necessary to understand this change in the findings. But on the other hand, the triple interaction term with projected playoff position and the usual control variables remained unchanged both in terms of significance and sign.

C. *Implications of the Results*

Apart from the contradictory results presented in the last section, findings of both the baseline and the extended model suggest that the introduction of the play-in tournament does not alter the motives regarding winning performance for teams still being eligible for the play-in tournament. The results are quite noisy as standard errors are very large compared to the coefficient estimates, especially in the case of the baseline result. This implies two things: firstly, it might be the case that there is an effect, but due to the relatively small number of years covered in the sample, there is not enough precision to find these effects. From a practical point of view, teams might not have understood and valued the play-in tournament correctly, and they did not associate any additional reward with it. This evaluation element based on public perception might change in the future, as the format is getting more popular among league members and spectators (Lucia, 2023), and also due to the fact that in the current playoffs, two teams qualified through the play-in tournament have advanced to their respective conference final (Coleman, 2023), with one having been qualified to the NBA Finals as the first-ever play-in team to achieve so. Secondly, and also slightly contrasting the previous implication, it might be also reasonable to assume that the sample period while teams are still eligible for the play-in is too long and either the trade deadline or the All-Star Weekend does not provide a sufficiently tight window when teams are approaching the end of the regular season and stakes are increasing. To test this, however, more data is needed because the sample size is already not large enough and further restricting the number of observations would be likely to lead to imprecise estimates.

6. IMPACTS ON RISK-TAKING BEHAVIOR

This chapter follows the same structure as in the previous chapter, with a focus on risk-taking behavior instead of winning performance, as also conducted by Becker and Huselid (1992). After introducing a slightly different version of Equations 1 and 2, expectations, results, and general implications follow in as similar fashion.

A. MODELING RISK-TAKING BEHAVIOR

It is important to note that modeling risk-taking behavior mostly includes the same covariates as the model for winning likelihood, as Becker and Huselid (1992) also argued. A completely different equation is hence not needed, but two slight modifications are made. Equation (3) is defined again or team *i*, season *s*, and game *g*:

$$\text{Risk-taking measure}_{i,s,g} = \beta_1\text{*Opp\_Risk-taking measure}_{i,s,g} + \beta_2\text{*Home}_{i,s,g} + \beta_3\text{*B2b}_{i,s,g} + \beta_4\text{*Opp\_B2b}_{i,s,g} + \beta_5\text{*(Still\_Elig\_PI}_{i,s,g} \times \text{AFTER)} + \beta_6\text{*(Opp\_Still\_Elig\_PI}_{i,s,g} \times \text{AFTER)} + \beta_7\text{*Elim}_{i,s,g} + \beta_8\text{*Opp\_Elim}_{i,s,g} + (\alpha_i+\gamma_i)\text{*}\nu_s + \varepsilon_{i,s,g}, \qquad (3)$$

where everything is the same as in Equation (1), but additionally, α_i is team fixed effects and γ_i is opponent fixed effects (also defined by *i*). The addition of fixed effects instead of win percentages is that they can be interacted with season fixed effects to allow for across-season variation in team quality, but otherwise, it is the same. The second difference is that as the risk-specific measures on the left-hand side are defined as ratios for team *i*, therefore the ratio defined for the opponent is included on the right-hand side to account for the possibility of contemporary effects within games. This means that these “mirror-variables” with team and opponent distinction are no longer symmetric, and coefficients can be different.

The factors measuring risk-taking behavior are the ratio of three-point attempts over two-point attempts, foul efficiency, and turnover-assist ratio. All are constructed in a way that an increase in the ratio would indicate a growth in risk-taking. The most important one is the ratio of three-point attempts over two-point attempts as often utilized in the literature, advocated by Grund et al. (2013) and Böheim et al. (2016). Their results suggest an increased risk-taking behavior in their investigated settings. Because these measures are continuous and not categorical variables as the likelihood of winning used previously, these are estimated using simple linear models.

Subsequently, Equation (2) is also slightly modified, but only opponent risk-taking measure is added, as projected positions rule out the possibility of including teams and opponent fixed effect. The equation including triple interaction terms with risk-taking behavior on the left-hand side is defined as:

$$\begin{gathered}\text{Risk-taking measure}_{i,s,g} = \beta_1\text{*Opp\_Risk-taking measure}_{i,s,g} + \beta_2\text{*Home}_{i,s,g} + \beta_3\text{*B2b}_{i,s,g} + \\ \beta_4\text{*Opp\_B2b}_{i,s,g} + \beta_5\text{*(Still\_Elig\_PI}_{i,s,g} \times \text{AFTER} \times \text{Projected\_Pos}_{i,s}\text{)}+ \\ \beta_6\text{*(Opp\_Still\_Elig\_PI}_{i,s,g} \times \text{AFTER} \times \text{Opp\_projected\_Pos}_{i,s}\text{)} + \beta_7\text{*Elim}_{i,s,g} + \\ \beta_8\text{*Opp\_Elim}_{i,s,g} + \nu_s + \varepsilon_{i,s,g}.\end{gathered} \tag{4}$$

I. Expectations of the model

Risk-taking or seeking more profitable ways of playing in order to win is common is professional sports. As Becker and Huselid (1992) highlight, incentives within a tournament might encourage participants to compete and cooperation disappears, which would be detrimental from a welfare point of view. However, in sports instead of weakening cooperation, one might experience increased risk-seeking behavior. The risk-taking measures used in this thesis are designed to capture some elements of basketball that might be considered as an increased preference for risks. These variables are shot selection (or the ratio of three-pointer attempts over two-pointer attempts), foul efficiency, and turnover-assist ratio. My expectations are that these variables increase if a team is still eligible for the play-in tournament, as these teams must win in order to qualify for the playoffs. However, the inclusion of both teams' risk-taking measures is crucial as teams might affect each other: if one experiences that the other is less cautious and takes more risks, it might be necessary to react accordingly if the risk-taking pays off for the former team. However, the reacting team can also try to behave even more cautiously and exploit the risk-taking behavior of the former team.

II. Main results of the model

In this subsection, the results regarding risk-seeking preferences are summarized in Table 5, according to models defined in Equations 3 and 4. Columns 1-3 contain the estimates using Equation 3, while columns 4-6 present the estimates using Equation 4. The remaining set of covariates are listed in columns 2-7 of Table A5, while estimates on a slightly different dataset are included in columns 2-7 of Table A6.

In columns 1 and 4, the ratio of three-point attempts over two-point attempts is the dependent variable. An increase in this variable suggests that a team attempts relatively more 3-pointers than 2-pointers and therefore relies more on shots with higher risk. The model specified in column 1 does not yield significant results and does not support that the introduction of the play-in encouraged teams being eligible for the play-in tournament to take more risks. The point estimate is very small as well as the standard error, which together suggest that there is no relationship between shot selection and being eligible for the play-in after it has been introduced. Column 1 in Table A5 further uncovers that the majority of the control variables do not affect the ratio of three-point attempts over two-point attempts, not even the shot selection of the opponent. Interestingly, the adjusted R^2 is substantially higher than in other models, which indicates that the model fit is not extremely bad. This might be due to team, opponent, and season fixed effects, as three-point shooting can be considered to be affected by the playing and coaching style of teams, as well as time-related factors as three-pointers became a much more significant part of the way the basketball is played, as already described in Chapter 4. These time and team-related effects are captured by the fixed effects within the model.

Table 5. Results on risk-taking behavior

	Dependent variable:					
	Ratio of three-point attempts	Foul efficiency	Turnover-assist ratio	Ratio of three-point attempts	Foul efficiency	Turnover-assist ratio
	(1)	(2)	(3)	(4)	(5)	(6)
Still eligible for PI × play-in seed × AFTER				**0.055**	**0.333***	**0.024**
				(0.042)	(0.183)	(0.047)
Opponent still eligible for PI × opponent play-in seed × AFTER				**0.011**	**-0.236**	**-0.042**
				(0.046)	(0.144)	(0.044)
Still eligible for PI × playoff seed × AFTER				0.098***	-0.046	-0.003
				(0.035)	(0.138)	(0.031)
Opponent still eligible for PI × opponent playoff seed × AFTER				-0.003	-0.083	-0.019
				(0.034)	(0.125)	(0.029)
Still eligible for PI × AFTER	**-0.009**	**0.004**	**0.002**	-0.042*	0.058	0.023
	(0.013)	(0.073)	(0.018)	(0.024)	(0.125)	(0.025)
Opponent still eligible for PI × AFTER	**0.007**	**-0.066**	**0.008**	-0.013	-0.008	-0.007
	(0.014)	(0.070)	(0.017)	(0.027)	(0.103)	(0.022)
Team and opponent FE	✓	✓	✓			
Season FE	✓	✓	✓	✓	✓	✓
Observations	5,700	5,700	5,700	4,848	4,848	4,848
Adjusted R^2	0.552	0.119	0.157	0.128	0.040	0.056

Notes: All columns are OLS regression models. Standard errors are clustered at the game level and are in parentheses. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. NBA regular season data, restricted to the period after the trade deadline. Columns 1,2,3: seven seasons in total: three seasons (2016-2019) before the introduction of the play-in tournament, and three seasons (2021-2023) afterward. Columns 4,5,6: six seasons in total, before period is three years (2017-2019). The dependent variable in the first column is winning, all other columns feature a risk-taking measure on the left-hand side. Seeds refer to league position projections after the trade deadline, calculated by FiveThirtyEight (n.d.). Playoff seed: after the trade deadline, these teams were projected to finish in the top six of their respective conference. Play-in seed: projected to finish between seeds 7th-10th. The benchmark level is the eliminated seed: those teams are projected to finish among the bottom five teams. AFTER is removed due to perfect collinearity with season fixed effects. Coefficients of interest are highlighted in bold.

Column 4 specifies the model with the multiple-interaction terms, and the one with a projected playoff seed variable yields a significant and positive result. It indicates that comparing the period before the play-in tournament to the period after it was implemented, teams being projected to achieve a playoff position exhibit an increased risk-taking while being eligible for the play-in compared to teams being projected to get eliminated but currently still being eligible for the play-in. The triple interaction term with teams projected to finish in a position worth play-in is also positive, but not significant. However, the point estimate and its standard error are both large, meaning that now instead of a precisely measured zero, this effect is rather imprecise and noisy.

Moving to the other risk-taking measures specified in columns 2 and 3, they have many common features. The interactions between being eligible and the implementation of the tournament are not significant, the coefficients suggest that the point estimates are very close to zero, but with very large noise. However, the coefficients of the risk-taking measures defined from the viewpoint of the opponent are positive and significant as opposed to the shot selection variable, which points to the possible explanation of the importance of the within-game environment and how teams adapt to each other. If one team is fouling more frequently or turns the ball over many times, then the other team might be also a bit more careless and risk-seeking as they would not be exploited and punished for that behavior to some extent, and they might also be forced to take risks to keep up with their opponents. Also, this explanation inherently exhibits the potential for endogeneity as both teams can “encourage” the other team to behave similarly, so these models would need further analysis that is beyond the scope of this thesis. Lastly, looking at the additional results in Table A5, it is worth mentioning that the coefficient for home is significant and negative both in columns 2 and 3. This sheds light on an interesting mechanism about how home court helps home teams: these teams apparently foul and turn the ball over less frequently than away teams.

Models presented in columns 5 and 6 are the extended versions of models in columns 2 and 3, respectively. Most previous results hold as the opponent versions of the dependent variables are significant and positive. However, a significant result at the 10% level emerges in column 5 (but not in column 6) for the interaction term between play-in seed, play-in eligibility, and being after the implementation of the play-in tournament. The coefficient is positive, meaning that after the play-in tournament has been implemented, and the team currently being eligible for the play-in tournament, being projected to finish at a position worth play-in qualification compared to a team also being eligible for the play-in tournament and otherwise being identical but its projected position was being eliminated, the risk-taking of the play-in projected team is increased by 0.33 This is approximately equal to one fifth-one sixth of the mean of foul efficiency. Because of the way how foul efficiency is constructed, the increased measure can mean relatively more fouls committed at the expense of blocks and steals, or the opposite with a decrease in successful blocks and steals. Nevertheless, the opponent versions of the variables are not significant across the models presented in Table 5, indicating that the other team being eligible and therefore more motivated does not play a role in how team *i* plays. Lastly, additional results of the control variables in Table A5 suggest that for example, the home variable remained negative and significant in models presented in columns 5 and 6.

Discussing the final robustness checks summarized in Table A6, the findings show some notable differences when replacing the cut-off of the trade deadline with the All-Star Weekend in terms of significance. These differences are most likely to occur due to the way the projected position variable is defined, as it also depends on the cut-off selection. Columns 1-3 defining risk-taking measures using the model described by Equation (3) are largely unchanged, but columns 4-6 show some interesting differences. In column 4, apart from the interaction term with projected playoff position being positive and significant, the interaction term with projected play-in position is also positive and significant at the 10% level, but with a much smaller magnitude. This would imply that compared to the group of teams projected to be eliminated, both other groups are more likely to exhibit riskier strategies when being eligible for the play-in tournament and after it has been introduced. In column 5, the previously analyzed significant and positive interaction term with the projected play-in position remains significant, and it even increases by a small margin. Lastly, in column 6 the interaction term with projected play-in position of the opponent team is significant and negative at the 10% level, but the interpretation is a bit vaguer. It can be translated as such that a given team tries to play in a more cautious way if its opponent is still eligible for the play-in and was projected to finish in a position worth play-in qualification, but no similar results have been supported in other specifications.

B. General implications and limitations

In general, risk-taking measures featured several significant results supporting the theoretical expectations. Using the All-Star Weekend (ASW) as a sample and variable shaping method, significant results emerged with shot selection and foul efficiency as well, even though the latter was significant in both sample selection cases. However, it was also the sample designed by the ASW that yielded the result of a significant and negative result in the case of winning performance for play-in projected teams, so it would still require further analysis to properly select the sample.

Nevertheless, the overall findings suggest four main implications. Firstly, the corresponding results of the presented models are in line with what the literature has described, and they are consistent over the various specifications. Being eliminated from the playoffs encourage teams to shirk and lose games intentionally, home court is indeed an advantage, and playing exhausting back-to-back games impacts winning performance. Secondly, whatever way the model describing the likelihood of winning is defined, results do not suggest that teams are better motivated due to the introduction of the play-in tournament and being eligible for it, and consequently, they would end up winning more games than before the tournament has been introduced. Thirdly, using the complex model including triple interactions is helpful as it differentiates between teams alongside their distinct motives which is required to characterize the adequate groups being targeted by the play-in tournament. Fourthly, using the extended model, the introduction of the play-in tournament might have impacted the risk-taking of teams being eligible and being projected to finish in positions worth play-in qualification. Some findings support the idea that compared to teams projected to be eliminated, play-in projected teams might bear more risks while being eligible for the play-in during seasons 2021-2023, with risk-taking characterized by either shot selection (three-pointer attempts over 2-pointer attempts), defense (foul efficiency) or playmaking (turnover-to-assist-ratio). This last implication together with the second one can be translated to some kind of hustle mentality, where players become more motivated and ready to take risks due to the additional incentives introduced by the policy intervention, but this might not be mirrored in the final result, and it might be difficult to convert risk-taking and enthusiasm to winning.

Even if one believes these findings support the impact of the play-in tournament on risk-taking behavior, these estimates have a small (but not negligible) magnitude compared to their respective sample mean, meaning that they only alter slightly (but significantly) the risk-taking behavior. Other sources of limitations might be sufficient sample selection, not appropriate differentiation between teams with different motives or defining reasonable eligibility for the play-in tournament.

These concerns lead to the question of whether league regulators would be satisfied with such patterns occurring due to the change in the incentive scheme that the findings of this thesis suggest. It is rather subjective to assess whether the risk-taking and hustle mentality of teams appeals to spectators and the teams themselves, or it is undermined by the fact that this effect does not seem to translate to actually winning games on a statistically significant level. Nevertheless, after some criticism of the play-in tournament upon its introduction

(MacMahon, 2021), only two years later the NBA community started to embrace the play-in and reacted to the incentives in a way the league intended to (Uggetti, 2021), and Friedell (2023) emphasized that league coaches acknowledge the existence of hustle mentality and fighting spirit. Interestingly, the criticism articulated in MacMahon (2021) does not issue particular elements of the play-in, instead, it highlights the inherently opposite interest of the league and team management: while the former intends to provide exciting games with high stakes, the latter dislikes this motive due to the lack of sufficient rest for the team at the end of the regular season and the need for exerting additional effort. Moreover, viewership data suggests (Lucia, 2023) that the play-in games themselves, even if there were very few of them during this three-year period, are very popular and it is followed by an increasing number of spectators, whereas the viewership of the NBA regular season which leads up to the postseason has been decreasing in recent years (Karp, 2023). If this gain in popularity both from the side of teams and spectators remains, then the play-in tournament is unlikely to be reversed or changed in the upcoming years.

7. CONCLUSION

In conclusion, this thesis aimed to examine the effects of the introduction of the play-in tournament on team performance in the National Basketball Association (NBA). By comparing eligibility for the play-in before and after this policy intervention was implemented, this thesis investigated whether being eligible for the tournament had a different impact on a team's likelihood of winning a game and its risk-taking preferences. The findings indicate that the introduction of the play-in tournament did not have a discernible effect on the winning performance of teams, but these estimates exhibit substantial noise. However, there were indications of increased risk-seeking behavior in certain cases, implying that teams are likely to exert more effort by bearing more risks, but it might not be translated into winning a particular game. It was also shown that differentiating between teams along their motives improves the analysis. These findings also highlight the complexity of team dynamics and the role of incentives in shaping team and player behavior.

This thesis contributes to the understanding of incentive structures in professional sports such as in Taylor and Trogdon (2002) or Becker and Huselid (1992). The value of this research lies in its exploration of a novel tournament format, which was yet to be analyzed. Understanding how changes in tournament formats affect team dynamics can assist league officials, team managers, and policymakers in general in making informed decisions about future tournament designs.

Lastly, this study opens avenues for further research on incentive structures in sports and their potential implications for the future of the NBA. Firstly, evaluating the impacts of the play-in tournament years later with more data available might lower measurement error and allow for a more precise estimation of the potential effects. Secondly, utilizing additional data on injury reports and resting policies, this analysis can be extended to understand the effects of teams resting healthy players and intentionally shirking in a similar way that Gong et al. (2022) analyzed, but instead of focusing on teams on the bottom of the standings with an intention to tank, study the group of teams on the top and the middle, that are eligible for the play-in tournament.

APPENDIX

A. BASKETBALL RULES

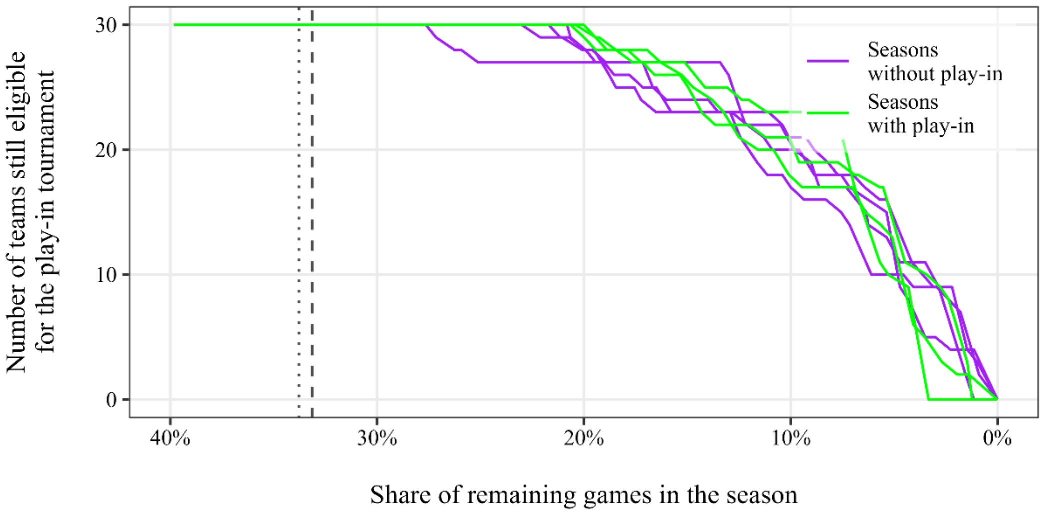
In the following, I define some details of the game of basketball in the NBA that are crucial to understanding the analysis in the main body of the thesis. The description heavily relies on the Official NBA Rulebook (NBA Official Rules 2022-2023, (2022)).

The game of basketball in the NBA is played by two teams, with 5 players on each team. The basketball court is rectangular, having two baskets in the middle of the shorter sides of the court. A game consists of four quarters, twelve minutes each. The team who scores more is the winner. Games consist of possessions when one team is attacking and the other is defending. Players can score by throwing the ball into the basket in three ways: by throwing a 2-pointer (is worth 2 points) within the area of the three-point line during the game, by throwing a 3-pointer (is worth 3 points) from outside of the three-point line during the game, and by throwing free throws (each is worth 1 point) after being fouled while the game is stopped. A foul is called when a player acts against the rules of basketball. After six personal fouls, a player is dismissed from that game. If a player shoots a successful two- or three-pointer, the pass preceding it (if there was one) by their teammate is called an assist. A turnover is made when a pass is mistaken, and the ball is acquired by the opponent. If it is not out of bounce (the ball goes outside of the court and the game is stopped), instead a player from the opposing team grabs the ball, it is considered a steal. A block is made when a player of the defending team deflects the shot attempt of the player of the attacking team by hand and according to the applying rules.

Additional risk-taking measures are defined as follows. Foul efficiency is defined as the ratio of the sum of steals and blocks over the sum of personal fouls within a team in a game (Personal foul efficiency, n.d.). However, I use the inverse of it in this thesis and refer to it as foul efficiency to address that a potentially riskier behavior leads to an increase in this metric. It can be considered as a potential measure of risk-taking as teams are not cautious enough when playing aggressive defense (measured by blocks and steals), and instead of acquiring the ball, they commit a foul. The turnover-assist ratio is defined as the ratio of turnovers over assists made by a team within a game. It can be considered as a potential measure of risk-taking as teams forcing difficult attacking schemes and passes might result in turning the ball over more often due to risky or bad execution of passes.

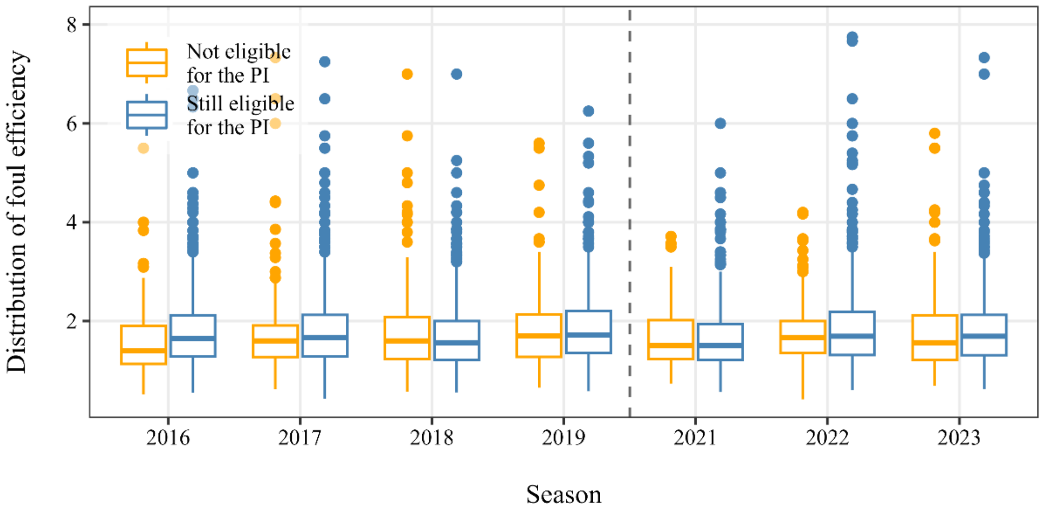
B. ADDITIONAL TABLES AND RESULTS

Figure A 1. The number of still competing teams in each season



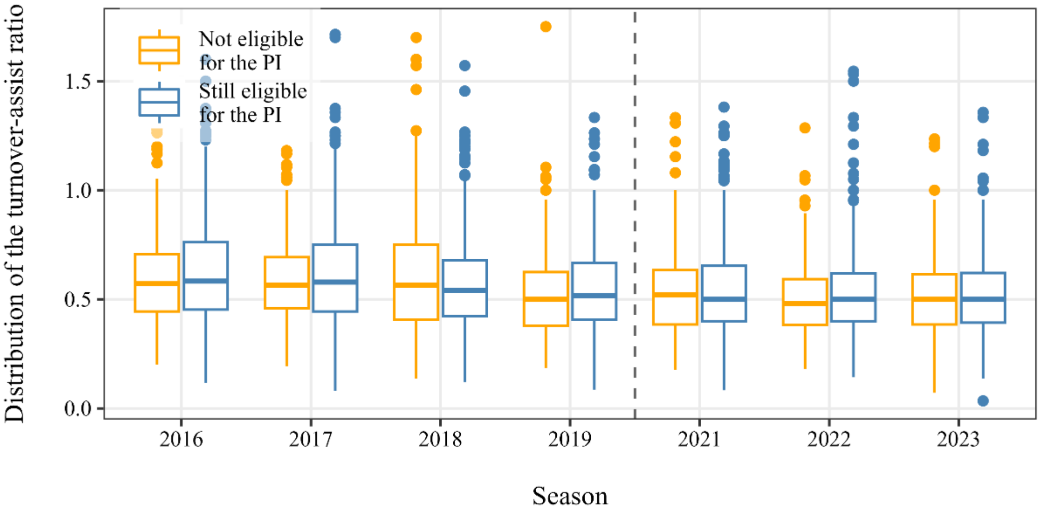
Notes: NBA regular season data. Seven seasons in total: four seasons (2016-2019) before the introduction of the play-in tournament, and three seasons (2021-2023) afterward. The share of remaining games is the average across the number of remaining games for every team for every day, divided by the length of the season. Dashed vertical line is the average point in time when the All-Star Weekend is held. Dotted vertical line is the average point in time when the trade deadline is set. Own calculations using data from Sports Reference (n.d.).

Figure A 2. Distribution of foul efficiency over the years



Notes: NBA regular season data. Seven seasons in total: four seasons (2016-2019) before the introduction of the play-in tournament, and three seasons (2021-2023) afterward, indicated by dashed vertical line. Risk-taking measure is foul efficiency (number of fouls over the sum of blocks and steals), split by eligibility for the play-in tournament. Three outlier datapoints removed for better visibility. Own calculations using data from Sports Reference (n.d.).

Figure A 3. Distribution of turnover-assist ratio over the years



Notes: NBA regular season data. Seven seasons in total: four seasons (2016-2019) before the introduction of the play-in tournament, and three seasons (2021-2023) afterward, indicated by dashed vertical line. Risk-taking measure is the turnover-assist ratio, split by eligibility for the play-in tournament. Own calculations using data from Sports Reference (n.d.).

Variable	Introduction of the Play-In tournament		
	FULL SEASON		
	Before, N = 9,840	**After**, N = 7,080	**Overall**, N = 16,920
Additional control variables			
Home (0/1)	0.50 (0.50)	0.50 (0.50)	0.50 (0.50)
Win percentage (0-1)	0.50 (0.18)	0.50 (0.17)	0.50 (0.17)
Missing	120	90	210
Opponent win percentage (0-1)	0.50 (0.18)	0.50 (0.17)	0.50 (0.17)
Missing	120	90	210
Back-to-back (0/1)	0.19 (0.39)	0.18 (0.38)	0.19 (0.39)
Opponent back-to-back (0/1)	0.19 (0.39)	0.18 (0.38)	0.19 (0.39)
Additional risk-taking measures			
Foul efficiency	1.80 (0.86)	1.79 (0.83)	1.80 (0.85)
Opponent foul efficiency	1.80 (0.86)	1.79 (0.83)	1.80 (0.85)
Turnover-assist ratio	0.62 (0.24)	0.55 (0.20)	0.59 (0.23)
Opponent turnover-assist ratio	0.62 (0.24)	0.55 (0.20)	0.59 (0.23)
	AFTER THE TRADE DEADLINE		
	Before, N = 3,260	**After**, N = 2,440	**Overall**, N = 5,700
Additional control variables			
Home (0/1)	0.50 (0.50)	0.50 (0.50)	0.50 (0.50)
Win percentage (0-1)	0.50 (0.15)	0.50 (0.13)	0.50 (0.14)
Opponent win percentage (0-1)	0.50 (0.15)	0.50 (0.13)	0.50 (0.14)
Back-to-back (0/1)	0.19 (0.40)	0.20 (0.40)	0.20 (0.40)
Opponent back-to-back (0/1)	0.19 (0.40)	0.20 (0.40)	0.20 (0.40)
Additional risk-taking measures			
Foul efficiency	1.80 (0.89)	1.79 (0.81)	1.79 (0.86)
Opponent foul efficiency	1.80 (0.89)	1.79 (0.81)	1.79 (0.86)
Turnover-assist ratio	0.59 (0.22)	0.53 (0.19)	0.56 (0.21)
Opponent turnover-assist ratio	0.59 (0.22)	0.53 (0.19)	0.56 (0.21)

Notes: Mean values with standard errors in parentheses. NBA regular season data, the whole sample, and the one restricted to the period after the trade deadline. Seven seasons in total: four seasons (2016-2019) before the introduction of the play-in tournament, and three seasons (2021-2023) afterward. Each game is counted twice.

Table A 1. Summary statistics on additional variables

	AFTER THE ALL-STAR WEEKEND		
	Before, N = 3,078	**After**, N = 2,480	**Overall**, N = 5,558
Eligibility control variables			
Still eligible for PI (0/1)	0.75 (0.44)	0.79 (0.41)	0.76 (0.42)
Opponent still eligible for PI (0/1)	0.75 (0.44)	0.79 (0.41)	0.76 (0.42)
Eliminated (0/1)	0.11 (0.32)	0.09 (0.29)	0.10 (0.31)
Opponent eliminated (0/1)	0.11 (0.32)	0.09 (0.29)	0.10 (0.31)
Additional control variables			
Home (0/1)	0.50 (0.50)	0.50 (0.50)	0.50 (0.50)
Win percentage (0-1)	0.50 (0.15)	0.50 (0.13)	0.50 (0.14)
Opponent win percentage (0-1)	0.50 (0.15)	0.50 (0.13)	0.50 (0.14)
Back-to-back (0/1)	0.19 (0.40)	0.20 (0.40)	0.20 (0.40)
Opponent back-to-back (0/1)	0.19 (0.40)	0.20 (0.40)	0.20 (0.40)
Risk-taking measures			
Ratio of three-point attempts	0.51 (0.21)	0.67 (0.23)	0.58 (0.23)
Opponent ratio of three-point attempts	0.51 (0.21)	0.67 (0.23)	0.58 (0.23)
Foul efficiency	1.80 (0.91)	1.77 (0.78)	1.78 (0.85)
Opponent foul efficiency	1.80 (0.91)	1.77 (0.78)	1.78 (0.85)
Turnover-assist ratio	0.59 (0.23)	0.53 (0.19)	0.56 (0.21)
Opponent turnover-assist ratio	0.59 (0.23)	0.53 (0.19)	0.56 (0.21)

Notes: Mean values with standard errors in parentheses. NBA regular season data, one restricted to the period after the All-Star Weekend. Seven seasons in total: four seasons (2016-2019) before the introduction of the play-in tournament, and three seasons (2021-2023) afterward. Each game is counted twice.

Table A 2. Summary statistics on additional variables using the All-Star Weekend as cut-off

Table A 3. Additional results on winning performance using the trade deadline as cut-off

	Dependent variable: Win					
	(1)	(2)	(3)	(4)	(5)	(6)
	All seasons	Before PI		All seasons		
	OLS	OLS	OLS	OLS	OLS	Logit
Still eligible for PI × AFTER	**-0.016**		**-0.003**	**0.006**		**-0.088**
	(0.038)		(0.039)	(0.049)		(0.192)
Opponent still eligible for PI × AFTER	**0.016**		**0.003**	**-0.006**		**0.088**
	(0.038)		(0.039)	(0.049)		(0.192)
AFTER (0/1)					**-0.002**	
					(0.005)	
Still eligible for PI (0/1)	0.042	**0.061****	-0.064**	0.055*		0.201
	(0.027)	(0.030)	(0.027)	(0.033)		(0.136)
Opponent still eligible for PI (0/1)	-0.042	-0.061**	0.064**	-0.055*	-0.045	-0.201
	(0.027)	(0.030)	(0.027)	(0.033)	(0.029)	(0.136)
Home (0/1)	0.132***	0.170***	0.128***	0.129***	0.125***	0.615***
	(0.018)	(0.024)	(0.018)	(0.018)	(0.020)	(0.083)
Win percentage (0-1)	0.840***	0.876***			0.912***	3.916***
	(0.048)	(0.063)			(0.052)	(0.272)
Opponent win percentage (0-1)	-0.840***	-0.876***			-0.911***	-3.916***
	(0.048)	(0.063)			(0.052)	(0.272)
Win percentage during last 5 games (0-1)			0.193***			
			(0.026)			
Opponent win percentage during last 5 games (0-1)			-0.193***			
			(0.026)			
Back-to-back (0/1)	-0.045***	-0.033	-0.043**	-0.050***	-0.048**	-0.214***
	(0.017)	(0.022)	(0.017)	(0.017)	(0.019)	(0.079)
Opponent back-to-back (0/1)	0.045***	0.033	0.043**	0.050***	0.050***	0.214***
	(0.017)	(0.022)	(0.017)	(0.017)	(0.019)	(0.079)
Eliminated (0/1)	-0.033	0.005	-0.256***	0.036		-0.183
	(0.029)	(0.040)	(0.026)	(0.031)		(0.156)
Opponent eliminated (0/1)	0.033	-0.005	0.256***	-0.036	0.009	0.183
	(0.029)	(0.040)	(0.026)	(0.031)	(0.043)	(0.156)
Constant					0.483***	
					(0.032)	
Team and opponent FE			✓			
Season FE	✓	✓	✓	✓		✓
Observations	5,700	3,260	5,700	5,700	4,387	5,700
Adjusted R^2	0.146	0.167	0.089	0.169	0.136	0.111

Notes: Columns 1,2,3,4,5 OLS, column 6 Logit regression model. Standard errors are clustered at the game level and are in parentheses. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. NBA regular season data, restricted to the period after the trade deadline. Seven seasons in total: four seasons (2016-2019) before the introduction of the play-in tournament, and three seasons (2021-2023) afterward. Model in column 2 only consists of the before period (2016-2019), model in column 5 is restricted to where Still eligible for PI equals 1. Except for model in column 5, AFTER is removed due to perfect collinearity with season fixed effects. Coefficients of interest are highlighted in bold.

Table A 4. Additional results on winning performance using the All-Star Weekend as cut-off

	Dependent variable: Win					
	(1)	(2)	(3)	(4)	(5)	(6)
	All seasons	Before PI	All seasons			
	OLS	OLS	OLS	OLS	OLS	Logit
Still eligible for PI × AFTER	**-0.016**		**-0.003**	**0.005**		**-0.086**
	(0.038)		(0.039)	(0.049)		(0.192)
Opponent still eligible for PI × AFTER	**0.016**		**0.003**	**-0.005**		**0.086**
	(0.038)		(0.039)	(0.049)		(0.192)
AFTER (0/1)					**-0.002**	
					(0.005)	
Still eligible for PI (0/1)	0.040	**0.058***	-0.065**	0.057*		0.189
	(0.027)	(0.030)	(0.027)	(0.034)		(0.136)
Opponent still eligible for PI (0/1)	-0.040	-0.058*	0.065**	-0.057*	-0.044	-0.189
	(0.027)	(0.030)	(0.027)	(0.034)	(0.029)	(0.136)
Home (0/1)	0.137***	0.175***	0.129***	0.134***	0.131***	0.634***
	(0.018)	(0.024)	(0.018)	(0.018)	(0.020)	(0.084)
Win percentage (0-1)	0.827***	0.858***			0.902***	3.828***
	(0.051)	(0.067)			(0.056)	(0.281)
Opponent win percentage (0-1)	-0.827***	-0.858***			-0.900***	-3.828***
	(0.051)	(0.067)			(0.056)	(0.281)
Win percentage during last 5 games (0-1)			0.186***			
			(0.027)			
Opponent win percentage during last 5 games (0-1)			-0.186***			
			(0.027)			
Back-to-back (0/1)	-0.042**	-0.024	-0.041**	-0.045***	-0.043**	-0.196***
	(0.017)	(0.023)	(0.017)	(0.017)	(0.019)	(0.079)
Opponent back-to-back (0/1)	0.042**	0.024	0.041**	0.045***	0.045**	0.196***
	(0.017)	(0.023)	(0.017)	(0.017)	(0.019)	(0.079)
Eliminated (0/1)	-0.037	-0.001	-0.259***	0.029		-0.212
	(0.030)	(0.041)	(0.026)	(0.032)		(0.158)
Opponent eliminated (0/1)	0.037	0.001	0.259***	-0.029	0.014	0.212
	(0.030)	(0.041)	(0.026)	(0.032)	(0.044)	(0.158)
Constant					0.478***	
					(0.033)	
Team and opponent FE			✓			
Season FE	✓	✓	✓	✓		✓
Observations	5,558	3,078	5,558	5,558	4,245	5,558
Adjusted R^2	0.142	0.164	0.088	0.165	0.131	0.108

Notes: Columns 1,2,3,4,5 OLS, column 6 Logit regression model. Standard errors are clustered at the game level and are in parentheses. Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.1. NBA regular season data, restricted to the period after the All-Star Weekend. Seven seasons in total: four seasons (2016-2019) before the introduction of the play-in tournament, and three seasons (2021-2023) afterward. Model in column 2 only consists of the before period (2016-2019), model in column 5 is restricted to where Still eligible for PI equals 1. Coefficients of interest are highlighted in bold.

Table A 5. Additional results on risk-taking behavior using the trade deadline as cut-off

	Dependent variable:						
	Winning motive	Risk-taking					
	Win	Ratio of three-point attempts	Foul efficiency	Turnover-assist ratio	Ratio of three-point attempts	Foul efficiency	Turnover-assist ratio
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Still eligible for PI × play-in seed × AFTER	**-0.101**				**0.055**	**0.333***	**0.024**
	(0.096)				(0.042)	(0.183)	(0.047)
Opponent still eligible for PI × opponent play-in seed × AFTER	**0.101**				**0.011**	**-0.236**	**-0.042**
	(0.096)				(0.046)	(0.144)	(0.044)
Still eligible for PI × playoff seed × AFTER	-0.058				0.098***	-0.046	-0.003
	(0.066)				(0.035)	(0.138)	(0.031)
Opponent still eligible for PI × opponent playoff seed × AFTER	0.058				-0.003	-0.083	-0.019
	(0.066)				(0.034)	(0.125)	(0.029)
Still eligible for PI × AFTER	0.033	**-0.009**	**0.004**	**0.002**	-0.042*	0.058	0.023
	(0.053)	(0.013)	(0.073)	(0.018)	(0.024)	(0.125)	(0.025)
Opponent still eligible for PI × AFTER	-0.033	**0.007**	**-0.066**	**0.008**	-0.013	-0.008	-0.007
	(0.053)	(0.014)	(0.070)	(0.017)	(0.027)	(0.103)	(0.022)
Opponent ratio of three-point attempts		-0.016			0.030		
		(0.021)			(0.021)		
Opponent foul efficiency			0.090***			0.104***	
			(0.020)			(0.019)	
Opponent assist-turnover ratio				0.084***			0.070***
				(0.020)			(0.021)
Home (0/1)	0.120***	0.005	-0.095***	-0.027***	0.009	-0.088***	-0.024***
	(0.019)	(0.004)	(0.022)	(0.006)	(0.006)	(0.026)	(0.006)
Back-to-back (0/1)	-0.045**	-0.008	0.044	0.001	-0.009	0.037	-0.003
	(0.018)	(0.005)	(0.028)	(0.007)	(0.008)	(0.033)	(0.008)
Opponent back-to-back (0/1)	0.045**	0.001	-0.021	-0.019***	-0.007	0.005	-0.013*
	(0.018)	(0.005)	(0.028)	(0.007)	(0.008)	(0.030)	(0.007)
Still eligible for PI (0/1)	-0.135	-0.002	0.016	0.002	0.059*	-0.005	0.040
	(0.095)	(0.010)	(0.051)	(0.013)	(0.034)	(0.170)	(0.045)
Opponent still eligible for PI (0/1)	0.135	-0.016*	0.140***	0.012	-0.061	-0.0004	-0.009
	(0.095)	(0.009)	(0.052)	(0.013)	(0.044)	(0.167)	(0.040)
Eliminated (0/1)	-0.185**	0.013	0.011	-0.003	0.078**	0.147	0.083**
	(0.089)	(0.011)	(0.057)	(0.015)	(0.031)	(0.143)	(0.042)
Opponent eliminated (0/1)	0.185**	0.012	0.023	-0.014	-0.049	-0.193	-0.056
	(0.089)	(0.012)	(0.050)	(0.014)	(0.041)	(0.151)	(0.036)
Play-in seed (0/1)	0.009				0.076*	0.084	0.033
	(0.108)				(0.040)	(0.200)	(0.051)

Table A5 (continued).

Playoff seed (0/1)	0.135				0.164***	-0.184	0.009
	(0.095)				(0.037)	(0.166)	(0.046)
Opponent play-in seed (0/1)	-0.009				-0.078*	-0.107	-0.038
	(0.108)				(0.046)	(0.175)	(0.047)
Opponent playoff seed (0/1)	-0.135				-0.101**	0.049	-0.018
	(0.095)				(0.045)	(0.161)	(0.041)
Still eligible for PI × play-in seed	0.204*				-0.086**	-0.253	-0.077
	(0.111)				(0.041)	(0.208)	(0.053)
Still eligible for PI × playoff seed	0.139				-0.105***	0.037	-0.034
	(0.098)				(0.039)	(0.173)	(0.047)
Opponent still eligible for PI × opponent play-in seed	-0.204*				0.066	0.264	0.065
	(0.111)				(0.048)	(0.185)	(0.049)
Opponent still eligible for PI × opponent playoff seed	-0.139				0.075	0.165	0.056
	(0.098)				(0.046)	(0.174)	(0.042)
Play-in seed × AFTER	0.061				-0.011	-0.232	-0.043
	(0.088)				(0.039)	(0.169)	(0.043)
Playoff seed × AFTER	0.028				-0.050	0.178	-0.030
	(0.054)				(0.031)	(0.120)	(0.026)
Opponent play-in seed × AFTER	-0.061				-0.004	0.212*	0.033
	(0.088)				(0.042)	(0.125)	(0.040)
Opponent playoff seed × AFTER	-0.028				0.011	0.052	0.002
	(0.054)				(0.030)	(0.099)	(0.025)
Team and opponent FE		✓	✓	✓			
Season FE	✓	✓	✓	✓	✓	✓	✓
Observations	4,848	5,700	5,696	5,700	4,848	4,848	4,848
Adjusted R^2	0.135	0.552	0.119	0.157	0.128	0.040	0.056

Notes: All columns are OLS regression models. Standard errors are clustered at the game level and are in parentheses. Significance levels: *** p < 0.01, ** p < 0.05, * p < 0.1. NBA regular season data, restricted to the period after the trade deadline. Column 2,3,4: seven seasons in total: three seasons (2016-2019) before the introduction of the play-in tournament, and three seasons (2021-2023) afterward. Column 1,5,6,7: six seasons in total, before period is three years (2017-2019). Dependent variable in the first column is winning, all other columns feature a risk-taking measure on the left-hand side. Seeds refer to league position projections after the trade deadline, calculated by FiveThirtyEight (n.d.). Playoff seed: after the trade deadline, these teams were projected to finish in the top six of their respective conference. Play-in seed: projected to finish between seeds 7th-10th. The benchmark level is the eliminated seed: those teams are projected to finish among the bottom five teams. AFTER is removed due to perfect collinearity with season fixed effects. Coefficients of interest are highlighted in bold.

Table A 6. Additional results on risk-taking behavior using the All-Star Weekend as cut-off

	Dependent variable:						
	Winning motive	Risk-taking					
	Win	Ratio of three-point attempts	Foul efficiency	Turnover-assist ratio	Ratio of three-point attempts	Foul efficiency	Turnover-assist ratio
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Still eligible for PI × play-in seed × AFTER	**-0.232****				**0.078***	**0.373***	**0.023**
	(0.094)				(0.044)	(0.197)	(0.047)
Opponent still eligible for PI × opponent play-in seed × AFTER	**0.232****				**-0.027**	**-0.154**	**-0.075***
	(0.094)				(0.053)	(0.145)	(0.044)
Still eligible for PI × playoff seed × AFTER	-0.059				0.109***	-0.024	-0.023
	(0.067)				(0.035)	(0.142)	(0.031)
Opponent still eligible for PI × opponent playoff seed × AFTER	0.059				0.028	-0.039	-0.009
	(0.067)				(0.033)	(0.127)	(0.030)
Still eligible for PI × AFTER	0.043	**-0.016**	**0.017**	**-0.006**	-0.051**	0.070	0.032
	(0.054)	(0.014)	(0.072)	(0.018)	(0.024)	(0.128)	(0.025)
Opponent still eligible for PI × AFTER	-0.043	**0.018**	**-0.075**	**0.004**	-0.013	-0.064	-0.013
	(0.054)	(0.014)	(0.070)	(0.017)	(0.027)	(0.107)	(0.022)
Opponent ratio of three-point attempts		-0.003			0.041**		
		(0.021)			(0.021)		
Opponent foul efficiency			0.085***			0.097***	
			(0.020)			(0.018)	
Opponent assist-turnover ratio				0.077***			0.069***
				(0.020)			(0.021)
Home (0/1)	0.122***	0.004	-0.085***	-0.024***	0.007	-0.071***	-0.019***
	(0.020)	(0.004)	(0.023)	(0.006)	(0.007)	(0.026)	(0.006)
Back-to-back (0/1)	-0.041**	-0.010*	0.059**	0.001	-0.012	0.065*	-0.002
	(0.018)	(0.006)	(0.029)	(0.007)	(0.008)	(0.033)	(0.008)
Opponent back-to-back (0/1)	0.041**	0.002	-0.019	-0.019***	-0.004	0.007	-0.013*
	(0.018)	(0.005)	(0.028)	(0.007)	(0.008)	(0.031)	(0.007)
Still eligible for PI (0/1)	-0.251***	-0.002	0.003	0.008	0.045	0.158	0.034
	(0.095)	(0.010)	(0.050)	(0.014)	(0.038)	(0.231)	(0.048)
Opponent still eligible for PI (0/1)	0.251***	-0.019**	0.141***	0.016	-0.082*	-0.010	-0.048
	(0.095)	(0.009)	(0.051)	(0.013)	(0.048)	(0.180)	(0.041)
Eliminated (0/1)	-0.300***	0.005	0.005	0.001	0.055	0.315	0.088**
	(0.088)	(0.010)	(0.057)	(0.015)	(0.035)	(0.206)	(0.044)
Opponent eliminated (0/1)	0.300***	0.002	0.012	-0.012	-0.066	-0.259	-0.098***
	(0.088)	(0.010)	(0.050)	(0.014)	(0.045)	-0.204	-0.103**
Play-in seed (0/1)	-0.148				0.036	0.357	0.042
	(0.106)				(0.045)	(0.277)	(0.055)

Table A6 (continued).

Playoff seed (0/1)	0.006				0.135***	0.006	0.015
	(0.096)				(0.040)	(0.227)	(0.048)
Opponent play-in seed (0/1)	0.148				-0.095*	-0.204	-0.103**
	(0.106)				(0.051)	(0.181)	(0.047)
Opponent playoff seed (0/1)	-0.006				-0.118**	-0.035	-0.062
	(0.096)				(0.048)	(0.176)	(0.042)
Still eligible for PI × play-in seed	0.358***				-0.073	-0.496*	-0.061
	(0.110)				(0.046)	(0.283)	(0.056)
Still eligible for PI × playoff seed	0.257***				-0.088**	-0.141	-0.023
	(0.100)				(0.042)	(0.234)	(0.050)
Opponent still eligible for PI × opponent play-in seed	-0.358***				0.085	0.256	0.131***
	(0.110)				(0.052)	(0.191)	(0.049)
Opponent still eligible for PI × opponent playoff seed	-0.257***				0.088*	0.183	0.095**
	(0.100)				(0.050)	(0.189)	(0.044)
Play-in seed × AFTER	0.191**				-0.003	-0.340*	-0.061
	(0.085)				(0.041)	(0.182)	(0.044)
Playoff seed × AFTER	0.027				-0.042	0.126	-0.027
	(0.056)				(0.030)	(0.121)	(0.026)
Opponent play-in seed × AFTER	-0.191**				0.014	0.213*	0.061
	(0.085)				(0.050)	(0.124)	(0.040)
Opponent playoff seed × AFTER	-0.027				0.004	0.083	0.008
	(0.056)				(0.028)	(0.099)	(0.025)
Team and opponent FE		✓	✓	✓			
Season FE	✓	✓	✓	✓	✓	✓	✓
Observations	4,700	5,558	5,558	5,558	4,700	4,700	4,700
Adjusted R^2	0.129	0.545	0.112	0.155	0.138	0.037	0.055

Notes: All columns are OLS regression models. Standard errors are clustered at the game level and are in parentheses. Significance levels: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. NBA regular season data, restricted to the period after the All-Star Weekend. Column 2,3,4: seven seasons in total: three seasons (2016-2019) before the introduction of the play-in tournament, and three seasons (2021-2023) afterward. Column 1,5,6,7: six seasons in total, before period is three years (2017-2019). Dependent variable in the first column is winning, all other columns feature a risk-taking measure on the left-hand side. Seeds refer to league position projections after the All-Star Weekend, calculated by FiveThirtyEight (n.d.). Playoff seed: after the All-Star Weekend, these teams were projected to finish in the top six of their respective conference. Play-in seed: projected to finish between seeds 7th-10th. The benchmark level is the eliminated seed: those teams are projected to finish among the bottom five teams. AFTER is removed due to perfect collinearity with season fixed effects. Coefficients of interest are highlighted in bold.

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