# A probabilistic match classification model for sports tournaments

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"*The pivotal change in the reforms announced by the UEFA Executive Committee is the departure from the current format's group stage system. [...] This gives the opportunity for clubs to test themselves against a wider range of opponents and raises the prospect for fans of seeing the top teams go head to head more often and earlier in the competition. It will also result in more competitive matches for every club across the board.*"

(New format for Champions League post-2024: Everything you need to know (UEFA, 2024))

**Abstract**

Existing match classification models in the tournament design literature have two major limitations: a contestant is considered indifferent only if uncertain future results do never affect its prize, and competitive matches are not distinguished with respect to the incentives of the contestants. We propose a probabilistic framework to address both issues. For each match, our approach relies on simulating all other matches played simultaneously or later to compute the qualifying probabilities under the three main outcomes (win, draw, loss), which allows the classification of each match into six different categories. The suggested model is applied to the previous group stage and the new incomplete round-robin league, introduced in the 2024/25 season of UEFA club competitions. An incomplete round-robin tournament is found to contain fewer stakeless matches where both contestants are indifferent, and substantially more matches where both contestants should play offensively. However, the robustly higher proportion of potentially collusive matches can threaten with serious scandals.

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# 1 Introduction

In the history of (association) football, some matches have become notorious and even got their own name. One of them is the *Disgrace of Gijón* (Kendall and Lenten, 2017, Section 3.9.1), the last game of Group 2 in the 1982 FIFA World Cup, played by Austria and West Germany in the Spanish city of Gijón. A win by West Germany would result in three teams with the same number of points. Furthermore, an outcome of 1-0 or 2-0 would have ensured the qualification of Austria and West Germany at the expense of Algeria due to their better goal difference.

Thus, when West Germany scored a goal after ten minutes, almost all incentives for attacking were eliminated for both teams, as they could have lost much more by conceding a goal than to win by scoring one. This led to a notoriously boring game in the remaining 80 minutes.

The match inspired a significant rule change in the FIFA World Cup, as well as in several other competitions: since then, the games in the last round are generally played at the same time, in order to prevent the collusion opportunities arising from the knowledge of the outcome of the other games. The high threat of collusion in groups of three teams, shown by Guyon (2020), Chater et al. (2021), and Stronka (2024), also prompted the organisers of the 2026 FIFA World Cup to revise the original decision for such a format (FIFA, 2017) and chose groups of four teams instead to mitigate the risk of collusion (FIFA, 2023).

The majority of sports and games involve matches between two players or teams. A crucial task for the organiser is to manage the incentives of the contestants in a way that keeps the matches attractive to the audience. While collusion appears to have the largest impact on decision-makers as we have seen, this is not the only potential problem with incentives. Attractiveness can seriously suffer, and match-fixing may become threatening if a match remains stakeless for one (or both) team(s) because its outcome does not influence their prize. For instance, Buraimo et al. (2022) demonstrate that English Premier League matches with strong implications for championship, UEFA Championship qualification, or relegation—the main prizes available for the clubs—attract additional viewers.

## 1.1 The research gap

As will be uncovered in Section 2, the operational research literature has devoted serious effort to assess competitiveness in sports tournaments and to classifying the matches into different categories. The most detailed clustering is provided by Devriesere et al. (2025b), which contains four types of games: (a) asymmetric when exactly one team is indifferent; (b) stakeless when both teams are indifferent; (c) collusive when no team is indifferent but a particular outcome guarantees the best possible prize for both of them; (d) competitive if none of the above conditions holds.

Nonetheless, these models exhibit two major limitations. First, previous papers (Chater et al., 2021; Csató, 2023; Csató et al., 2024; Csató, 2025c; Csató and Gyimesi, 2025; Devriesere et al., 2025b; Gyimesi, 2024) consider the incentives of the teams as a binary concept: a team is indifferent if and only if its prize is fully independent of the outcome of any match with an unknown result. However, it can be reasonably assumed that a probabilistic approach is more relevant because team strategies are likely not influenced by outcomes with a small chance of occurring. For example, a team may be satisfied with a particular result if it guarantees its qualification with a sufficiently high chance.

Second, asymmetric and competitive matches can strongly differ depending on whether the incentives to play offensively or defensively are stronger. For instance, a result of 0-0 can be favourable for both teams in an asymmetric match if the team that is not indifferent qualifies

Table 1: Simulated qualifying probabilities in the last round of the 2024/25 UEFA Conference League league phase

| Home team | Away team | Home win (1-0) | | Draw (0-0) | | Away win (0-1) | |
|---|---|---|---|---|---|---|---|
| | | Home | Away | Home | Away | Home | Away |
| APOEL | Astana | 95.91% | 0% | 0.16% | 0% | 0% | 55.24% |
| Borac Banja Luka | Omonia | 100% | 29.48% | 100% | 97.97% | 49.71% | 100% |
| Molde | Mladá Boleslav | 98.41% | 2.91% | 0% | 93.67% | 0% | 100% |

The column Home (Away) shows the probability that the home (away) team qualifies for the knockout stage play-offs—or, in the case of APOEL, for the Round of 16—based on 10 thousand simulations of the last round.

with this particular outcome, while the same result of 0-0 is less advantageous if the team that is not indifferent is eliminated by playing 0-0 but could qualify by a win of 1-0.

## 1.2 Motivating examples

Table 1 presents the probability of obtaining the relevant prize for six teams playing three matches in the last matchday of the 2024/25 UEFA Conference League, computed from 10 thousand simulations of the 17 matches played simultaneously for each of the three outcomes of the given match according to the prediction model described in Section 3.3. The existing match classification models show that these matches are competitive: the qualifying probability depends on the outcome of the match for all teams, and no pair of teams can guarantee qualification by a particular result.

However, these matches are fundamentally different with respect to the incentives of the teams. For APOEL and Astana, a draw is at most marginally better than a small loss; thus, both of them should and could take high risks in order to score from the beginning of the game. For Borac Banja Luka and Omonia, a draw of 0-0 is much more beneficial than a small loss, while a win is closely equivalent to a draw. Consequently, they will take few (if any) risks in order to score. The same condition holds for Mladá Boleslav, but its opponent, Molde, needs to win. Hence, we expect a match where the home team plays (strongly) offensively and the away team defensively if the current result is a draw of 0-0.

## 1.3 Our contributions

We present a general classification scheme for contests with two participants and three outcomes (this domain is called match for the sake of simplicity) in Section 3. For each match, it is based on simulating the results of all matches played simultaneously or later, which allows computing probabilities to earn different prizes under the three main outcomes of this particular match: a win for the first contestant, a draw, and a loss (win) for the first (second) contestant.

Each contestant can be (1) indifferent, or it can have either (2) stronger incentives to win than to avoid losing; or (3) stronger incentives to avoid losing than to win. This implies six distinct combinations, which serve as a solid foundation to classify any two-player contest. A match is called stakeless if both contestants are indifferent. A match is called defensive (offensive) asymmetric if one contestant is indifferent and the other has more powerful incentives to avoid losing (win) than to win (avoid losing). A match is called antagonistic if one contestant has more powerful incentives to win than to avoid losing, and the other has more powerful incentives to avoid losing than to win: Molde vs Mladá Boleslav in Table 1. A match is called defensive if both contestants have more powerful incentives to avoid losing than to win: Borac Banja Luka

vs Omonia in Table 1. Finally, a match is called offensive if both contestants have more powerful incentives to win than to avoid losing: APOEL vs Astana in Table 1.

The proposed model is used to classify all matches played simultaneously in the last round of UEFA club competitions. First, Section 4.1 applies our approach to analyse the 2024/25 UEFA Conference League. Then, in Section 4.2, the relative frequency of the six categories of matches are computed for (1) a home-away round-robin tournament played by four teams with eight representative distributions of team strengths (the 2023/24 UEFA Champions League groups); (2) four incomplete round-robin tournaments with 36 teams and eight rounds (the 2024/25 and 2025/26 UEFA Champions League and UEFA Europa League); (3) two incomplete round-robin tournaments with 36 teams and six rounds (the 2024/25 and 2025/26 UEFA Conference League).

We find that an incomplete round-robin tournament contains somewhat fewer stakeless, but substantially more defensive and offensive matches, especially with quite strong incentives. Unsurprisingly, playing six rounds instead of eight aggravates these effects, as well as reduces the proportion of asymmetric matches because the last round has a higher impact on the final ranking. While the incomplete round-robin format with 36 teams and six rounds indeed contains more competitive (antagonistic or offensive) matches than the traditional groups, the variant with eight rounds does not outperform double round-robin groups with four teams from this perspective—in contrast to the claim of the Union of European Football Associations (UEFA), cited at the beginning of the paper. Nonetheless, replacing antagonistic matches with offensive matches may attract more spectators.

The proposed framework can be applied to any sport where draws are frequent and choosing an offensive option instead of a defensive one increases the probability of both winning and losing. These conditions certainly hold for association football, but might be relevant to chess, as well as to other relatively low scoring sports such as field hockey and ice hockey, especially towards the end of a match.

# 2 Literature review

Match classification is an extensively investigated topic in operational research over the last decade. Inspired by the planned format of the 2026 FIFA World Cup, Guyon (2020) studies the risk of collusion in a single round-robin tournament with three teams when the two opponents in the last game know what results will let both of them advance. It is analysed how the risk of collusion depends on competitive balance and the match schedule. It is also shown that the high risk of collusion cannot be reduced by forbidding draws. These results have probably contributed to changing the format of the 2026 FIFA World Cup (Csató and Gyimesi, 2025).

Stronka (2024) considers two innovative policies to mitigate the risk of collusion in this setting: randomised tie-breaking if some teams have the same number of points to generate extra uncertainty, and dynamic scheduling, which allows to determine the next match to be played based on the previous results. According to Monte Carlo simulations, the expected number of matches with a high risk of collusion decreases from 5.5 to 0.26 if both proposals are implemented.

Analysing groups of three teams is relatively simple since the matches are played sequentially. However, this condition does not hold for groups of four teams, where the last two matches are usually played simultaneously since the Disgrace of Gijón. Chater et al. (2021) present an assessment method for the competitiveness of the matches played in the last round in this case. Three types of matches are distinguished: (a) competitive where neither team is indifferent and their targets are incompatible; (b) collusive where neither team is indifferent and their targets are compatible (a non-empty subset of final scores exists that is optimal for both of them); and (c) stakeless where at least one team is indifferent. The frequencies of these matches are

determined via simulations as a function of the schedule if two teams qualify from the group. Several alternative formats proposed for the FIFA World Cup with 48 teams are also studied.

Csató (2023) examines how tie-breaking rules affect the proportion of matches with at least one indifferent team in the four groups of the 2022/23 UEFA Nations League A, a double round-robin tournament with four teams. Giving priority to goal difference instead of head-to-head results can reduce the probability of a fixed position in the final group ranking by at least two percentage points in the last round. Csató (2025c) determines all collusion opportunities created by preferring head-to-head records for tie-breaking in a single round-robin tournament played by four teams. The probability of these situations is increased by at least 11 percentage points in the 2024 UEFA European Football Championship, which cannot be mitigated by any static match schedule.

Csató et al. (2024) introduce another match classification scheme with three categories: (a) competitive if neither team is indifferent; (b) weakly stakeless if exactly one team is indifferent; and (c) strongly stakeless if both teams are indifferent. The model is applied to a double round-robin contest with four teams, used in the previous group stage of UEFA club competitions. The probabilities of weakly and strongly stakeless matches are computed by a simulation model under the 12 valid schedules. Gyimesi (2024) calculates the proportion of these three types of matches for the pre-2024 and post-2024 designs of the UEFA Champions League, as well as the planned European Super League. The new incomplete round-robin league is found to reduce the number of stakeless matches played by the top teams.

Csató and Gyimesi (2025) refine the concept of stakeless matches based on their expected outcome, as such a game is more costly if the indifferent team has a higher probability of winning *a priori*. Monte Carlo simulations are used to estimate the probability that a given team becomes indifferent in the last round for two formats of the 2026 FIFA World Cup, the official and an alternative containing imbalanced groups. The proposed innovative design highly reduces the risk of a stakeless match played by the strongest teams.

Currently, the most detailed match classification model is given by Devriesere et al. (2025b), where asymmetric, collusive, stakeless, and competitive games are distinguished, see Section 1.1. Their probabilities are quantified via simulations for the pre-2024 and post-2024 formats of the UEFA Champions League. For the incomplete round-robin format, various schedules are generated based on reasonable ideas, such as pushing the most competitive matches to the first or to the last matchdays. The incomplete round-robin league is revealed to substantially reduce the proportion of asymmetric and stakeless matches under all plausible schedules.

According to Section 1.1, these previous studies suffer from two main limitations: the consideration of qualification as a binary concept, and the merging of competitive matches with potentially diverging incentives for the two contestants. While our paper aims to resolve both shortcomings, the classification requires a simulation method as before, which is a standard technique in the tournament design literature (Csató, 2021; Lasek and Gagolewski, 2018; Scarf et al., 2009; Sziklai et al., 2022). Indeed, several studies simulated the UEFA Champions League to quantify various tournament metrics (Corona et al., 2019; Dagaev and Rudyak, 2019; Scarf et al., 2009); see Devriesere et al. (2025a) for a survey of these works.

We know about five papers that simulate the new incomplete round-robin format of UEFA club competitions. Devriesere et al. (2025a) and Gyimesi (2024) have already been discussed. Csató et al. (2025b) aim to measure the uncertainty of the draw in the UEFA Champions League by computing the variance of qualifying probabilities generated by the draw for each team. Csató (2025a) calculates the potential gains and losses from attacking based on changes in the probability of reaching the critical ranking thresholds. The novel incomplete round-robin league phase is demonstrated to provide stronger incentives for offensive play. Winkelmann et al. (2025)

develop a bivariate Dixon–Coles model to account for the lower frequency of draws observed in the 2024/25 UEFA Champions League, and use it to predict the qualification thresholds.

The probabilistic approach proposed in the following has been recently considered for manipulation in tournaments. Stronka (2020) and Csató (2025b) focus on the temptation to lose in the FIFA World Cup, where the group runner-up can face a weaker opponent than the group winner, creating an incentive to deliberately lose the last group game. Csató (2022) presents a method to quantify the probability of violating incentive compatibility, when a team would be strictly better off by losing. The model is applied to the European Qualifiers for the 2022 FIFA World Cup to show that a carefully selected set of draw constraints can greatly reduce this threat.

Finally, one may ask whether the proposed quantification of incentives is supported by empirical evidence. According to Feddersen et al. (2023), participants in betting markets believe that European football clubs adjust their effort level in line with the incentives provided by the structure of the league towards the end of the season. In particular, the expected reduced effort from indifferent teams is incorporated in the betting odds. The probabilistic match classification model presented in Section 3 could provide a solid foundation for future studies on this issue.

# 3 Methodology

Our match classification scheme attempts to resolve the two limitations mentioned in Section 1.1. Therefore, for any given match, all other matches of the tournament played at the same time or later are simulated. Next, we compare the increase in the probability of obtaining a prize by winning instead of playing a draw with the decrease in the probability of obtaining this prize by losing instead of playing a draw, in order to determine the potential gains and losses from playing offensively. The details are provided in Section 3.1.

The proposed match classification model will be applied to the last round of the pre-2024 and post-2024 formats of UEFA club competitions. Section 3.2 presents the main characteristics of these tournaments. Last but not least, the simulation method is described in Section 3.3.

## 3.1 A match classification scheme based on incentives

Let us take a match between two contestants, where the possible outcomes are $m$-0, 0-$m$, and 0-0. Even though an outcome $m$-$n$ is also possible in several sports, they are disregarded for the sake of simplicity. An offensive tactic is assumed to be associated with a higher probability of both scoring and conceding a goal.

Assume that the match is part of a tournament, where many contestants compete to earn some prizes. Denote the set of available prizes by $\mathcal{R}$. We define the possible gain $\mathcal{G}_i$ and possible loss $\mathcal{L}_i$ of contestant $i$ from playing more offensively as follows:

$$\mathcal{G}_i = \max_{k \in \mathcal{R}} P_{m\text{-}0}^{(i,k)} - P_{0\text{-}0}^{(i,k)},$$

$$\mathcal{L}_i = \max_{k \in \mathcal{R}} P_{0\text{-}0}^{(i,k)} - P_{0\text{-}m}^{(i,k)},$$

where $P_h^{(i,k)}$ is the probability that contestant $i$ obtains prize $k \in \mathcal{R}$ if the result of its match is $h$. In other words, $\mathcal{G}_i$ indicates the gain from a win of $m$-0 compared to playing a draw of 0-0, while $\mathcal{L}_i$ indicates the loss from a loss of 0-$m$ compared to playing a draw of 0-0. Naturally, both gains and losses are evaluated with respect to the probability of obtaining a prize specified by the rules of the tournament. Clearly, if $\mathcal{G}_i$ is relatively high (low) compared to $\mathcal{L}_i$, contestant $i$ has strong incentives to attack (defend).

The result 0-0 is chosen as a benchmark since each match starts with this result. Thus, we quantify the incentives of the contestants at the beginning of the match. Naturally, these incentives change dynamically if a goal is scored either in the given match, or in another match played simultaneously.

Since all probabilities are estimated from simulations, an indifference threshold $\mathcal{I}$ is introduced to avoid the possible distortion caused by a low probability event: we say that contestant $i$ is indifferent if both $\mathcal{G}_i$ and $\mathcal{L}_i$ remain below the exogenously given parameter $\mathcal{I}$.

Six distinct types of matches exist. In particular, the game played by contestants $i$ and $j$ is:

- *Stakeless* if $\max\{\mathcal{G}_i; \mathcal{L}_i; \mathcal{G}_j; \mathcal{L}_j\} \leq \mathcal{I}$;
- *Defensive asymmetric* if $\max\{\mathcal{G}_i; \mathcal{L}_i\} \leq \mathcal{I}$ but $\max\{\mathcal{G}_j; \mathcal{L}_j\} > \mathcal{I}$ and $\mathcal{G}_j < \mathcal{L}_j - \mathcal{I}$;
- *Offensive asymmetric* if $\max\{\mathcal{G}_i; \mathcal{L}_i\} \leq \mathcal{I}$ but $\max\{\mathcal{G}_j; \mathcal{L}_j\} > \mathcal{I}$ and $\mathcal{G}_j \geq \mathcal{L}_j - \mathcal{I}$;
- *Antagonistic* if $\max\{\mathcal{G}_i; \mathcal{L}_i\} > \mathcal{I}$ and $\max\{\mathcal{G}_j; \mathcal{L}_j\} > \mathcal{I}$ such that $\mathcal{G}_i < \mathcal{L}_i - \mathcal{I}$ and $\mathcal{G}_j \geq \mathcal{L}_j - \mathcal{I}$;
- *Defensive* if $\max\{\mathcal{G}_i; \mathcal{L}_i\} > \mathcal{I}$ and $\max\{\mathcal{G}_j; \mathcal{L}_j\} > \mathcal{I}$ such that $\mathcal{G}_i < \mathcal{L}_i - \mathcal{I}$ and $\mathcal{G}_j < \mathcal{L}_j - \mathcal{I}$;
- *Offensive* if $\max\{\mathcal{G}_i; \mathcal{L}_i\} > \mathcal{I}$ and $\max\{\mathcal{G}_j; \mathcal{L}_j\} > \mathcal{I}$ such that $\mathcal{G}_i \geq \mathcal{L}_i - \mathcal{I}$ and $\mathcal{G}_j \geq \mathcal{L}_j - \mathcal{I}$.

Hence, the contestants tend to play offensively by default, and choose a defensive strategy only if the payoff associated with avoiding a loss ($\mathcal{L}_i$) is higher than the payoff associated with winning ($\mathcal{L}_i$) by the "margin of error" $\mathcal{I}$.

In a stakeless game, both contestants are indifferent. In a defensive asymmetric game, one contestant is indifferent, and the other contestant has stronger incentives to avoid a loss than to win. In an offensive asymmetric game, one contestant is indifferent, and the other contestant has at least as strong incentives to win as to avoid a loss.

In an antagonistic game, neither contestant is indifferent; one contestant has stronger incentives to avoid a loss than to win, while the other contestant has at least as strong incentives to win as to avoid a loss. In a defensive game, neither contestant is indifferent; and both contestants have stronger incentives to avoid a loss than to win. In an offensive game, neither contestant is indifferent; and both contestants have at least as strong incentives to win as to avoid a loss.

A defensive game—although similar—does not coincide with a collusive game defined in the previous literature (Chater et al., 2021; Csató, 2025c; Devriesere et al., 2025b). In a collusive game, a particular outcome, either a draw or a win/loss with a small margin, guarantees the best possible prize for both contestants. Therefore, the match Borac Banja Luka vs Omonia, discussed in Section 1.2, is not collusive since Omonia is eliminated with a positive probability if the result is 0-0. But it is a defensive game, where tacit collusion is attractive, because the incentives to avoid losing are more powerful than to win for both contestants.

The difference between winning and avoiding a loss for team $i$ can be quantified as

$$\omega_i = \begin{cases} 0 & \text{if } \max\{\mathcal{G}_i, \mathcal{L}_i\} \leq \mathcal{I}; \\ |\mathcal{G}_i - \mathcal{L}_i| & \text{if } \max\{\mathcal{G}_i, \mathcal{L}_i\} > \mathcal{I}. \end{cases}$$

If contestants $i$ and $j$ play against each other, the strength of incentives $\kappa$ in a(n)

- stakeless match is $\kappa = 0$;

- defensive/offensive asymmetric match is $\kappa = 100 \times \max\{\omega_i; \omega_j\}$;
- antagonistic/defensive/offensive match is $\kappa = 100 \times \min\{\omega_i; \omega_j\}$.

Therefore, $\kappa$ is based on the incentives of the contestant that is not indifferent in an asymmetric match, and on the minimal incentives for the two contestants in an antagonistic/defensive/offensive match. Note that $0 \leq \kappa \leq 100$. In Section 4, we will call the incentives *moderate* if $0 \leq \kappa < 25$, and *strong* otherwise. $\kappa \geq 25$ means that the difference between the gain from winning and the loss from losing reaches 25% in terms of the probability of obtaining the relevant prize for *both* contestants.

## 3.2 The tournament formats of UEFA club competitions

In the 21 seasons played between 2003/04 and 2023/24, the most prestigious UEFA club competition, the UEFA Champions League, contained a group stage with eight groups of four teams each. A home-away round-robin tournament was played in each group, the first two teams qualified for the Round of 16, and the third-placed team was transferred to the second most prestigious UEFA club competition, called UEFA Cup until 2008/09 and UEFA Europa League after. Hence, similar to Devriesere et al. (2025b), the first prize is assumed to be the top two positions and the second prize is assumed to be the third place in every group.

Since the 2024/25 season, the first stage of the three UEFA club competitions is a single incomplete round-robin league. The 36 teams play eight (UEFA Champions League and the UEFA Europa League) or six (UEFA Conference League) matches each, half of them at home and half of them away. The top eight teams directly qualify for the Round of 16. The next 16 teams play against each other in the knockout stage play-offs, and the winners advance to the Round of 16. The ranking is based on the number of points scored, followed by goal difference (Csató et al., 2025a). Thus, following Devriesere et al. (2025b), the first prize is the top eight positions, and the second prize is the positions from the 9th to the 24th.

This definition of prizes makes the comparison of the old and new designs relatively fair: if all teams are of equal strength, they have a chance of 50% and 22.2% to obtain the first, as well as 75% and 66.7% to obtain at least the second prize, respectively. Even though the first prize is easier to obtain in the old format, teams also have a higher probability of avoiding elimination. Consequently, the change in the proportion of stakeless and asymmetric matches—where one or both teams are indifferent—caused by the reform is not predetermined by the prize structure of the pre-2024 and post-2024 designs.

## 3.3 The simulation framework

Simulating a sports tournament requires an assumption on the strength of the teams and a prediction model for match outcomes based on their strengths. For the pre-2024 design, we simulate the eight groups of four teams each in the 2023/24 UEFA Champions League. In any group, there exist 12 different schedules with respect to the last round (Csató et al., 2024): a given team has three possible opponents, and can play against them either at home or away, while the other match has two possible versions depending on which team plays at home.

For the post-2024 design, we consider the set of 36 clubs participating in the 2024/25 and 2025/26 UEFA Champions League, UEFA Europa League, and UEFA Conference League league phases. This provides six incomplete round-robin tournaments, four with eight rounds, and two with six rounds. In all these cases, the actual schedules are used since the principles of scheduling remain unknown, and it is far from trivial to generate further reasonable schedules (Devriesere et al., 2025b; Guyon et al., 2025; de Werra et al., 2025).

The strengths of the teams are measured by their Elo rating. The Elo rating is updated after the team plays a match; hence, it changes throughout the season, but we follow the usual approach of fixing Elo ratings at the beginning of the season. In particular, Football Club Elo Ratings (http://clubelo.com) on 2 September, which is between the date of the league or group stage draw and the first match of the competition in every season, are used.

The standard choice for the distribution of the number of goals scored by a team is a Poisson distribution (Maher, 1982; van Eetvelde and Ley, 2019). We adopt this approach, analogous to the previous match classification literature (Chater et al., 2021; Csató and Gyimesi, 2025; Csató et al., 2024; Devriesere et al., 2025b). The expected number of goals scored in a match between teams $i$ and $j$ is assumed to be a cubic polynomial of win expectancy $W_{ij}$, which depends on the difference of the Elo ratings $E_i$ and $E_j$:

$$W_{ij} = \frac{1}{1 + 10^{-(E_i - E_j)/400}}.$$

The cubic polynomials are estimated separately for the home and away team on the basis of all (almost 8000) matches played from 2003/04 to 2023/24 in UEFA club competitions and their qualifications. Further details and the exact values of the parameters can be found in Csató et al. (2025b, Section 4.2).

We aim to classify the matches played in the last round of the group stage and league phase, when the results of previous rounds are known. Instead of using the historical results of the competitions only, which suffer from high randomness and do not provide an adequate sample size, all matches played before the last round are simulated 500 times for each competition design. Then, in each of these 500 scenarios, all matches played in the last round are simulated 1000 times. At first sight, it would be straightforward to compute the probability of obtaining a given prize from these 1000 simulations. However, this leads to only a limited number of wins (losses) for weak (strong) teams, making the frequencies observed in the simulations possibly inaccurate.

Therefore, since the classification scheme in Section 3.1 requires comparing the probabilities of obtaining a prize under a win of $m$-0, a draw of 0-0 and a loss of 0-$m$, 1000 home wins of $m$-0 and 1000 away wins of 0-$m$ are considered for each match such that the results of all matches played simultaneously are given by the actual simulation run. Fixing $m$ to a particular value would bias the probabilities (see Section 4.1 for some illustrations); thus, the probabilities of all $1 \leq m \leq 10$ are estimated for both the home and away teams in each match separately, using the match prediction model above. For example, if the home team has a 30% chance of scoring one goal, 35% of scoring two goals, 10% of scoring three goals, etc., then among the 1000 home wins, 300 are assumed to be 1-0, 350 to be 2-0, 100 to be 3-0, etc. This ensures that the probability calculations are based on realistic goal differences. Finally, for each team, we calculate the probabilities of obtaining the prizes—top 2 and top 3 in the group stage, top 8 and top 24 in the league phase, as discussed in Section 3.2—under a win, a draw, or a loss.

Knowing the set of prizes $\mathcal{R}$, the probabilities $P_{m\text{-}0}^{(i,k)}$, $P_{0\text{-}0}^{(i,k)}$, $P_{0\text{-}m}^{(i,k)}$ directly determine the possible gain $\mathcal{G}_i$ and possible loss $\mathcal{L}_i$ for each team $i$. The baseline value of the indifference threshold is $\mathcal{I} = 0.02$, which has two roles. First, it controls the likelihood of stakeless and asymmetric matches, as will be studied in Section 4.3 in more detail. Second, any team $i$ compares the possible gain $\mathcal{G}_i$ with $\mathcal{L}_i - \mathcal{I}$. This is important for the previous group format of the UEFA Champions League, where one team has exactly the same possible gain and possible loss in about 0.75% of the simulations, which would make the classification of the match sensitive to whether the equality of implies $\mathcal{G}_i$ and $\mathcal{L}_i$ an offensive or defensive strategy. By comparing $\mathcal{G}_i$ to $\mathcal{L}_i - \mathcal{I}$, this uncertainty is fully eliminated.

For each group of the 2023/24 UEFA Champions League, 500 scenarios are created with each of the 12 possible match schedules. Since two matches are played in the last round, the

probability of each match type is computed from a sample of 12000 cases. For the six incomplete round-robin leagues, only the actual schedule is used, but the last round consists of 18 matches, which results in a comparable sample size of 9000. Note that, although these numbers may seem limited at first sight, the type of a match is also determined from the three outcomes for the given match (win of $m$-0 with a simulated $m$, draw of 0-0, loss of 0-$m$ with a simulated $m$) and 1000 simulations of all matches played simultaneously, respectively.

Naturally, our approach has some limitations. First, the incentives of the teams are computed only for the baseline result of 0-0, and may change if the result of the given match, or one match played simultaneously, changes. Second, a model estimated on the basis of the previous format of UEFA club competitions can be invalid in the novel league phase due to the shifts in the incentives of the teams (Csató, 2025a; Winkelmann et al., 2025). Third, the definition of the available prizes is simplified. In the Round of 16 until the 2023/24 season, the group winners played against the runners-up with hosting the second leg, which might have created some incentives to win the group. In the new design, the knockout brackets are almost fixed; for example, the team ranked 1st (8th) in the league phase plays against the winner of the playoff between the teams ranked the 15/16th and 17/18th (9/10th and 23rd/24th). Furthermore, the top two teams are guaranteed to play the second leg at home in the Round of 16, quarterfinals, and semifinals since the 2025/26 season. Consequently, there are differences even among the top 8 and the following 16 teams.

# 4 Applications

Section 4.1 focuses on the league phase of the 2024/25 UEFA Conference League, where the last round provides excellent illustrations of all categories of matches. This is followed by computing the probability of each match type in the eight groups of the 2023/24 UEFA Champions League, as well as in the six finished seasons of UEFA club competitions organised in an incomplete round-robin format. Last but not least, Section 4.3 presents a sensitivity analysis with respect to the indifference threshold $\mathcal{I}$ and group balance in order to highlight the unique features of the incomplete round-robin format.

## 4.1 The last round of the 2024/25 UEFA Conference League

The last matchday of the 2024/25 UEFA Conference League league phase was 19 December 2024. Table 2 shows the standing on the previous day. Recall from Section 3.2 that the top eight clubs directly qualify for the Round of 16, the next 16 clubs advance to the knockout phase play-offs, and the last 12 are eliminated.

Table 3 classifies the 18 matches played simultaneously in the last round according to the scheme presented in Section 3.1, together with their final result.

Figure 1 plots the possible gain $\mathcal{G}_i$ and loss $\mathcal{L}_i$ for six matches (12 teams) as a function of parameter $m$ based on 10 thousand simulation runs. $\mathcal{G}_i$ and $\mathcal{L}_i$ are also depicted for the expected value of $m$, shown by the dotted lines, which overlap with the values for a given $m$ if the latter is independent of $m$. For example, if APOEL wins by 1-0 against Astana, the probability that APOEL (Astana) qualifies directly for the Round of 16 (the knockout phase play-offs) increases by 95.75% (does not change). We give a detailed analysis of three matches based on Tables 1–3.

First, APOEL was ranked 10th before the last round, and the most favourable position that can be achieved by playing a draw of 0-0 is the 8th: the first five teams, as well as one team playing in the matches Jagiellonia Białystok vs Olimpija Ljubljana and Rapid Wien vs Copenhagen, respectively, are guaranteed to be ranked higher than APOEL if it plays 0-0.

Table 2: 2024/25 UEFA Conference League league phase: standing before the last round

| Pos | Team | W | D | L | GF | GA | GD | **Pts** |
|---|---|---|---|---|---|---|---|---|
| 1 | Chelsea | 5 | 0 | 0 | 21 | 4 | 17 | **15** |
| 2 | Vitória de Guimarães | 4 | 1 | 0 | 12 | 5 | 7 | **13** |
| 3 | Fiorentina | 4 | 0 | 1 | 17 | 6 | 11 | **12** |
| 4 | Legia Warsaw | 4 | 0 | 1 | 12 | 2 | 10 | **12** |
| 5 | Lugano | 4 | 0 | 1 | 9 | 5 | 4 | **12** |
| 6 | Shamrock Rovers | 3 | 2 | 0 | 11 | 4 | 7 | **11** |
| 7 | Cercle Brugge | 3 | 1 | 1 | 13 | 6 | 7 | **10** |
| 8 | Jagiellonia Białystok | 3 | 1 | 1 | 10 | 5 | 5 | **10** |
| 9 | Rapid Wien | 3 | 1 | 1 | 8 | 5 | 3 | **10** |
| 10 | APOEL | 3 | 1 | 1 | 7 | 4 | 3 | **10** |
| 11 | Djurgårdens IF | 3 | 1 | 1 | 8 | 6 | 2 | **10** |
| 12 | Pafos | 3 | 0 | 2 | 9 | 5 | 4 | **9** |
| 13 | Olimpija Ljubljana | 3 | 0 | 2 | 7 | 6 | 1 | **9** |
| 14 | Gent | 3 | 0 | 2 | 8 | 7 | 1 | **9** |
| 15 | 1. FC Heidenheim | 3 | 0 | 2 | 6 | 6 | 0 | **9** |
| 16 | Copenhagen | 2 | 2 | 1 | 8 | 6 | 2 | **8** |
| 17 | Real Betis | 2 | 1 | 2 | 5 | 5 | 0 | **7** |
| 18 | Panathinaikos | 2 | 1 | 2 | 6 | 7 | −1 | **7** |
| 19 | Víkingur Reykjavík | 2 | 1 | 2 | 6 | 7 | −1 | **7** |
| 20 | Borac Banja Luka | 2 | 1 | 2 | 4 | 7 | −3 | **7** |
| 21 | Omonia | 2 | 0 | 3 | 7 | 7 | 0 | **6** |
| 22 | Mladá Boleslav | 2 | 0 | 3 | 4 | 6 | −2 | **6** |
| 23 | Heart of Midlothian | 2 | 0 | 3 | 4 | 7 | −3 | **6** |
| 24 | İstanbul Başakşehir | 1 | 2 | 2 | 8 | 11 | −3 | **5** |
| 25 | Celje | 1 | 1 | 3 | 10 | 11 | −1 | **4** |
| 26 | Molde | 1 | 1 | 3 | 6 | 8 | −2 | **4** |
| 27 | TSC | 1 | 1 | 3 | 6 | 10 | −4 | **4** |
| 28 | Astana | 1 | 1 | 3 | 3 | 7 | −4 | **4** |
| 29 | HJK | 1 | 1 | 3 | 3 | 8 | −5 | **4** |
| 30 | St. Gallen | 1 | 1 | 3 | 9 | 17 | −8 | **4** |
| 31 | Noah | 1 | 1 | 3 | 3 | 12 | −9 | **4** |
| 32 | The New Saints | 1 | 0 | 4 | 3 | 7 | −4 | **3** |
| 33 | Dinamo Minsk | 1 | 0 | 4 | 4 | 9 | −5 | **3** |
| 34 | LASK | 0 | 2 | 3 | 3 | 13 | −10 | **2** |
| 35 | Petrocub Hînceşti | 0 | 1 | 4 | 2 | 11 | −9 | **1** |
| 36 | Larne | 0 | 0 | 5 | 2 | 12 | −10 | **0** |

The top eight teams directly qualify for the Round of 16, and the next 16 teams (ranked from 9th to 24th) qualify for the knockout phase play-offs.
Pos = Position; W = Won; D = Drawn; L = Lost; GF = Goals for; GA = Goals against; GD = Goal difference; Pts = Points. All teams played five matches.

Therefore, APOEL can be the 8th only if Shamrock Rovers loses against Chelsea with a goal margin of at least 5. On the other hand, it is quite likely that at least two higher ranked teams are overtaken if APOEL wins. Last but not least, APOEL is guaranteed to finish in the top 24 even with a loss. The situation of the 28th Astana is even clearer. A draw of 0-0 is equivalent to

Table 3: Matches in the last round of the 2024/25 UEFA Conference League league phase

| Home team | Away team | Result | Match type | Incentives $\kappa$ |
|---|---|---|---|---|
| 1. FC Heidenheim | St. Gallen | 1-1 | Offensive | 21.8 (Moderate) |
| APOEL | Astana | 1-1 | Offensive | 67.1 (Strong) |
| Borac Banja Luka | Omonia | 0-0 | Defensive | 54.1 (Strong) |
| Celje | The New Saints | 3-2 | Offensive | 13.7 (Moderate) |
| Cercle Brugge | İstanbul Başakşehir | 1-1 | Offensive | 71.2 (Strong) |
| Chelsea | Shamrock Rovers | 5-1 | Defensive asymmetric | 28.4 (Strong) |
| Djurgårdens IF | Legia Warsaw | 3-1 | Antagonistic | 21.2 (Moderate) |
| Heart of Midlothian | Petrocub Hînceşti | 2-2 | Defensive asymmetric | 50.5 (Strong) |
| Jagiellonia Białystok | Olimpija Ljubljana | 0-0 | Offensive | 40.7 (Strong) |
| Larne | Gent | 1-0 | Offensive asymmetric | 46.2 (Strong) |
| LASK | Víkingur Reykjavík | 1-1 | Defensive asymmetric | 23.1 (Moderate) |
| Lugano | Pafos | 2-2 | Antagonistic | 67.2 (Strong) |
| Molde | Mladá Boleslav | 4-3 | Antagonistic | 85.4 (Strong) |
| Panathinaikos | Dinamo Minsk | 4-0 | Antagonistic | 2.6 (Moderate) |
| Rapid Wien | Copenhagen | 3-0 | Offensive | 2.6 (Moderate) |
| Real Betis | HJK | 1-0 | Antagonistic | 4.0 (Moderate) |
| TSC | Noah | 4-3 | Offensive | 29.6 (Strong) |
| Vitória de Guimarães | Fiorentina | 1-1 | Defensive asymmetric | 4.5 (Moderate) |

The last column shows the strength of incentives $\kappa$ based on the expected value of parameter $m$.

a loss as the first 23 teams and one team from the match TSC vs Noah will be ahead of Astana. However, even a small victory of 1-0 makes elimination less likely than finishing in the top 24. Consequently, both clubs lose almost nothing by conceding some goals, while they have strong incentives to win. This leads to a game where no team should play defensively; the match is called offensive, and the strength of incentives $\kappa$ is high, exceeding 65.

Second, the 20th Borac Banja Luka and the 21th Omonia play against each other. None of them could finish in the top 8: the first six teams and one team playing in the matches Jagiellonia Białystok vs Olimpija Ljubljana and Rapid Wien vs Copenhagen, respectively, are guaranteed to be ranked higher than the winner of this match. However, the loser is certainly overtaken by the winner, as well as one team playing in the match Molde vs Mladá Boleslav. Thus, Borac Banja Luka is eliminated if at least two teams from a set of four (Heart of Midlothian, İstanbul Başakşehir, Celje, TSC) win, while this "threatening" set contains four additional teams (Astana, HJK, St. Gallen, Noah) for Omonia. Even though, in contrast to Borac Banja Luka, a draw does not guarantee finishing in the top 24 for Omonia, its chance remains remarkably high due to the negative goal difference of all lower-ranked teams. Therefore, a win of 1-0 does not change (increases) the probability of qualification (by only 2.03%) for Borac Banja Luka (Omonia) compared to playing a goalless draw, while a loss of 0-1 reduces it by more than 50 percentage points for both teams. To conclude, they win almost nothing by scoring some goals, but have robust incentives to avoid a loss, with the value of $\kappa$ approaching 55. This probably leads to a boring game, where no team should play offensively; a similar match is called defensive. Note also that the top right plot (Borac Banja Luka vs Omonia) of Figure 1 is essentially a reflection of the top left plot (APOEL vs Astana) across the point (0,0).

Third, the 22th Mladá Boleslav plays against the 26th Molde. Analogous to Omonia, a draw of 0-0 is quite favourable for Mladá Boleslav despite its worse goal difference, while a win barely

Figure 1: Incentives in six representative matches played in the last round of the 2024/25 UEFA Conference League league phase

*Note*: The dotted line shows the (average) change when the value of $m$ is simulated.

increases its probability of finishing in the top 24. On the other hand, a draw of 0-0 is worthless for Molde because the first 23 teams and one team playing in the match Celje vs The New Saints will certainly be ranked higher. But even a minimal win of 1-0 means qualification with a probability of 98.41%, and this outcome increases the chance of Mladá Boleslav being eliminated by more than 90 percentage points. Consequently, Mladá Boleslav wins essentially nothing by scoring some goals, but gains much by avoiding a loss. In contrast, Molde does not lose anything by conceding some goals, and has powerful incentives to win. The spectators should prepare for a match where one team uses an offensive, and the other uses a defensive strategy; the match is strongly antagonistic with $\kappa$ above 85.

The match Real Betis vs HJK is perhaps the most difficult to categorise. HJK should win; otherwise, the first 24 teams will be ranked ahead of it. Betis has the best goal difference among all teams that collected 7 points; even a small loss does not threaten its chances of qualification. Therefore, the match would be offensive asymmetric if $m = 1$ is assumed, but Betis should avoid a larger defeat, so the match becomes antagonistic with the expected value of $m$. Nevertheless, the incentives are clearly weaker than in the previous match Molde vs Mladá Boleslav, reflected by the smaller value of $\kappa$, which remains around 4.

Finally, Figure 1 presents two matches where one team is already eliminated. In the case of Larne vs Gent, the home team cannot reach the top 24, while the away team finishes among the best eight with a decent chance if it wins. Hence, this is an offensive asymmetric match: scoring a goal is much more important than avoiding a loss for the team that is not indifferent, indicated by the high value of $\kappa$, which is above 45. The counterpart is the match LASK vs Víkingur Reykjavík, where the away team has nothing to gain by winning but could be easily eliminated if it loses. Thus, it is called a defensive asymmetric match. Again, the corresponding middle right plot is a reflection of the middle left plot across the point (0,0).

The characteristics of the remaining 12 matches are listed in Table 2 and plotted in Figures A.1 and A.2 in the Appendix. Three further matches are defensive asymmetric, but there is no stakeless match. Six additional matches are offensive; the value of $\kappa$ exceeds 25 for three of them. No other defensive match exists. One of the three remaining antagonistic matches, Lugano vs Pafos, has a $\kappa$ above 65, showing an extremely strong clash between the incentives of the opposing teams.

## 4.2 The distribution of match types in UEFA club competitions

Obviously, the proportion of matches in the six categories highly depends on competitive balance: if the strengths of the teams are closer, more draws and intransitive cycles are expected, which increases the chance that the teams are closer before the last round. Our simulations of the earlier group stage format provide important insights into this issue, as the eight groups in the 2023/24 UEFA Champions League are surprisingly heterogeneous, see Figure 2. For instance, the range of Elo ratings is below 100 in Group F, but approaches 500 in Group G such that the difference between both the two strongest and the two middle teams is around 200-250. The uniqueness of Group B resides in the closeness of the three weakest teams, while Groups A and C are similar to each other, except for the difference between the top two teams. Last but not least, Group E contains a clear underdog.

Figure 3 shows the relative frequency of the six types of matches for these eight groups, as well as for the six seasons of UEFA club competitions played in an incomplete round-robin format. The proportion of stakeless matches is in close association with group balance; this is halved to 17% in the most balanced Group F compared to the highly unbalanced Group G. Nonetheless, stakeless matches occur even more rarely in the novel league phase, as their probability always

Figure 2: Strength differences in the 2023/24 UEFA Champions League group stage

remains below 11%.

Regarding asymmetric matches, the differences among the 14 scenarios are smaller than for stakeless matches. Nonetheless, defensive asymmetric matches are more likely in unbalanced groups, and the Conference League seems to contain fewer games with one indifferent team.

Antagonistic matches are more frequent in the previous group stage. Their proportion is higher if a group is more balanced, or the incomplete round-robin tournament consists of fewer rounds. The latter relationship also holds for antagonistic matches with strong incentives. Although antagonistic matches are competitive, some spectators might not be enthusiastic to see a game where one team plays offensively and the other plays defensively.

The effects of the incomplete round-robin format are most visible for defensive and offensive matches. The relative frequency of a defensive match is increased from 2% in a balanced group to at least 6%, and sometimes to 8%. This threatens the integrity of UEFA club competitions by inspiring collusive behaviour—recall that the match Borac Banja Luka vs Omonia, studied in Section 4.1, indeed resulted in a goalless draw. Furthermore, while defensive matches with strong incentives to play a draw ($\kappa$ above 25) are essentially non-existent with a probability of at most 0.5% in the group stage, now their proportion is 2% even in the Champions League.

On the other hand, the new format of UEFA club competitions also increases the proportion of matches in the last round where both teams should play offensively, from less than 4.5% to more than 17%. In addition, while the previous group stage contains strongly offensive matches only occasionally, about a tenth of all matches are offensive with strong incentives to win ($\kappa$ at least 25) in the Champions League, and even higher in the Conference League.

Finally, Figure 4 aims to check the official statement of UEFA—cited at the beginning of the paper—that the new format leads to more competitive matches. Among the six categories, antagonistic and offensive matches can be called competitive, as in asymmetric and stakeless matches, at least one team is indifferent, while defensive matches could inspire collusion. According to our results, even though an incomplete round-robin league with six rounds clearly outperforms even a balanced group from this perspective, the advantage of the incomplete round-robin league

Figure 3: The proportion of different categories of matches in UEFA club competitions

Figure 4: The proportion of competitive matches in UEFA club competitions

with eight rounds remains questionable.

However, Figure 4 does not reflect the substantial change in the composition of competitive matches towards offensive games at the expense of antagonistic games. Thus, if UEFA aimed to increase the proportion of matches where both teams should exert more effort to attack than to defend, then the reform is certainly successful. Nevertheless, this is achieved at the cost of more defensive matches that can lead to serious scandals.

## 4.3 Sensitivity analysis

The simulation framework of Section 3.3 has a seemingly arbitrary parameter, the indifference threshold $\mathcal{I}$. Figure 5 provides crucial information on its impact for Groups F and G, the least and most unbalanced groups in the 2023/24 UEFA Champions League, as well as for two incomplete round-robin leagues, the 2024/25 UEFA Champions League and the 2024/25 UEFA Conference League. The value of $\mathcal{I}$ essentially does not influence the proportion of match types in the round-robin groups; the only change is the marginally higher (lower) proportion of stakeless (defensive asymmetric) matches in an unbalanced group if the indifference threshold grows.

Contrarily, increasing the threshold from 0 to 5% more than doubles the proportion of stakeless matches in the novel format, together with a moderate growth in asymmetric matches, while the proportion of the other three match categories is reduced by 21–37%. In each case, the main conclusions still hold: the incomplete round-robin design implies substantially more defensive and offensive matches. In particular, at least a tenth of matches are switched to offensive, while at least four percent of all matches become defensive compared to a round-robin group. The relative position of the Champions League and the Conference League is entirely unaffected by parameter $\mathcal{I}$, that is, playing fewer rounds magnifies the effects of the reform.

The results for the pre-2024 design may be driven by the possibly unique composition of the groups in the 2023/24 UEFA Champions League. Therefore, the proportion of the six categories of matches is considered from another perspective in Figure 6. First, we take the eight groups from the 2022/23 and 2023/24 seasons of the UEFA Champions League, respectively, and determine the minimal and maximal proportions of each match type. They are compared to

Figure 5: Sensitivity analysis: The impact of the indifference threshold $\mathcal{I}$

the proportions observed in the 2024/25 Champions League (incomplete round-robin with eight rounds) and the 2024/25 Conference League (incomplete round-robin with six rounds). The ranges for the 2023/24 Champions League, already seen in Figure 3, are wider than the ranges for the previous, 2022/23 season (except for offensive symmetric matches), since the variance in group balance was higher in the 2023/24 season.

To summarise, Figure 6 reinforces our three main findings: (1) stakeless matches are less frequent in an incomplete round-robin league; (2) the proportion of defensive matches greatly increases in relative terms but not so much in absolute terms since defensive matches are rare in a round-robin group; (3) the proportion of offensive matches robustly increases in both absolute and relative terms compared to even a balanced round-robin group, such as Group F in the 2023/24 Champions League. In contrast, the observed frequency of other categories (antagonistic, defensive and offensive asymmetric) in the novel format could have occurred in the traditional group stage of UEFA club competitions, with the possible exception of antagonistic matches if the number of rounds is eight. Consequently, the main question is whether the favourable changes in the proportion of stakeless and offensive matches are sufficient to compensate for the higher probability of defensive matches that are vulnerable to (at least tacit) collusion.

Figure 6: Sensitivity analysis: The impact of group composition

# 5 Conclusions

The current paper argues for a new probabilistic match classification scheme to resolve two major limitations of the literature: the treatment of indifference in a simple binary sense, and the merging of quite different competitive matches in the same category. To that end, we propose a simulation framework to quantify the possible gain and loss from the risky strategy of playing offensively. and applied it to the two recent, fundamentally different designs of UEFA club competitions, a round-robin group stage and a single incomplete round-robin league.

The comparison of the two tournament formats has taught crucial lessons. While the smaller proportion of stakeless and the substantially higher proportion of offensive matches are clearly favourable developments due to the 2024 reform, the increase in the frequency of defensive matches is worrying. These games create robust incentives for collusion, which is straightforward to implement because each match starts at 0-0. According to Table 1, no one could have been surprised on 19 December 2024 to see that two teams, Borac Banja Luka and Omonia, played a draw of 0-0. Hence, the official UEFA statement, cited at the beginning of the paper, may be an overstatement: the claim of more competitive matches for *every* club across the board is certainly untrue. As the Disgrace of Gijón has shown, seemingly collusive matches can really threaten the integrity of sports.

To summarise, we provide robust evidence that the novel classification method has meaningful applications for football; however, it is also applicable to other contests that involve matches between two contestants. It requires (a) a non-negligible chance of a draw, and (b) the possibility of an offensive (defensive) tactic that increases (decreases) the probability of both winning and losing. Besides football, chess and ice hockey can be plausible examples.

Our match classification model can be useful for various stakeholders. Bookmakers could adjust the betting odds by taking the incentives of the contestants into account, and bettors might generate profit from mispriced games. Coaches are allowed to select the starting squad that has the highest probability of achieving the beneficial outcome. Media companies can broadcast the most attractive matches for their audience, and spectators may choose which

game to watch from the set of games played simultaneously—both tasks being quite challenging when 18 matches are played at the same time as in the new format of UEFA club competitions. Hopefully, the proposed model will also inspire empirical papers that explore the relationship between incentives created by the matches and their statistical features.

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# Appendix

Figure A.1: Incentives in further matches played in the last round of the 2024/25 UEFA Conference League league phase I.

*Note*: The dotted line shows the (average) change when the value of $m$ is simulated.

Figure A.2: Incentives in further matches played in the last round of the 2024/25 UEFA Conference League league phase II.

*Note*: The dotted line shows the (average) change when the value of $m$ is simulated.