Increasing competitiveness by imbalanced groups: The example of the 48-team FIFA World Cup

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13th February 2025

> "*The objectives of FIFA are: [. . .]*
> *g) to promote integrity, ethics and fair play with a view to preventing all methods or practices, such as corruption, doping or match manipulation, which might jeopardise the integrity of matches, competitions, players, officials and member associations or give rise to abuse of association football.*"
>
> (FIFA Statutes, May 2022 edition (FIFA, 2022, Article 2))

Abstract

A match played in a sports tournament can be called stakeless if at least one team is indifferent to its outcome because it already has qualified or has been eliminated. Such a game threatens fairness since teams may not exert full effort without incentives. This paper suggests a novel classification for stakeless matches according to their expected outcome: they are more costly if the indifferent team is more likely to win by playing honestly. Our approach is illustrated with the 2026 FIFA World Cup, the first edition of the competition with 48 teams. We propose a novel format based on imbalanced groups, which drastically reduces the probability of stakeless matches played by the strongest teams according to Monte Carlo simulations. The new design also increases the uncertainty of match outcomes and requires fewer matches. Governing bodies in sports are encouraged to consider our innovative idea in order to enhance the competitiveness of their tournaments.

Keywords: OR in sports; fairness; FIFA World Cup; simulation; tournament design

MSC **class**: 90-10, 90B90, 91B14

JEL **classification number**: C44, D71, Z20

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1 Introduction

On 14 March 2023, the FIFA (Fédération Internationale de Football Association, International Federation of Association Football) Council unanimously amended the format of the 2026 FIFA World Cup with the following commentary (FIFA, 2023): "*The revised format mitigates the risk of collusion and ensures that all the teams play a minimum of three matches, while providing balanced rest time between competing teams.*" However, collusion is not the only threat to the integrity of sports. The recent academic literature has argued that the absence of win incentives is also unfair (Chater et al., 2021; Csató et al., 2024; Devriesere et al., 2024; Guyon, 2022). This can be a problem especially in the last round of group matches. For example, both Brazil and Nigeria in the 1998 FIFA World Cup, as well as Italy in the 2016 UEFA European Championship secured the first place in their group after two rounds—and they all lost their last games (Guyon, 2022).

A match is stakeless for a team if either it has reached its objective (e.g. qualification for the next round), or its advance to the next round has become impossible. An illustration of the former case is France in Group D of the 2022 FIFA World Cup. The French coach *Didier Deschamps*, whose team had already qualified for the knockout stage, made nine changes compared to the previous match, and the second squad performed as if they had never played together before (Le Monde, 2022). Unsurprisingly, they lost to Tunisia despite being the defending champion. Since Canada was also eliminated in Group F before the last round, both France and Canada played a weakly stakeless match (Csató et al., 2024) in the sense that their qualification was decided but this condition did not hold for their opponents, Tunisia and Morocco, respectively.

However, the two matches were fundamentally different: according to the World Football Elo Ratings, a widely used measure of strength in football (Chater et al., 2021; Csató, 2022b; Gásquez and Royuela, 2016; Lasek et al., 2013), France was more likely to win than Canada assuming that all teams exert full effort. In particular, the win expectancy of France was 88.35% (implied by having 352 Elo points more than Tunisia), while the win expectancy of Canada was only 33.51% (implied by having 119 Elo points less than Morocco). Therefore, the first stakeless match between France and Tunisia can be considered more costly for the organiser as the result would be more surprising and would have a higher impact on the other teams if the indifferent team does not play honestly.

The existing literature (Chater et al., 2021; Csató et al., 2024) assumes a uniform cost for stakeless matches. One of our main contributions resides in introducing a weighting scheme for non-competitive games. This idea will be used to demonstrate how the design of a 48-team FIFA World Cup can be improved by creating deliberately imbalanced groups during the draw.

The new format is found to have three crucial advantages:

- It contains fewer matches, especially for the strongest teams whose players have the highest workload (Figure 3);

- It implies more uncertain group games for the strongest teams (Figure 4), more uncertain games in the knockout stage from the quarterfinals (Figure 5), and a higher proportion of games between the strongest teams (Figure 6);

- It drastically reduces the ratio of stakeless matches for the 16 strongest teams (Figure 7).

These benefits seem to outweigh any potential drawback, and present powerful arguments for both researchers and tournament organisers to consider imbalanced competition designs.

Our study is structured as follows. Section 2 gives a literature overview. Section 3 describes two alternative formats for the 2026 FIFA World Cup, the official design and our proposal containing imbalanced groups. The simulation technique, the tournament metrics, and some limitations are also discussed in Section 3. The results are presented and evaluated in Section 4. Finally, Section 5 provides with concluding remarks.

2   Related literature

Tournament design has received serious attention in both economics (Medcalfe, 2024; Palacios-Huerta, 2023; Szymanski, 2003) and operational research (Wright, 2009, 2014; Kendall and Lenten, 2017; Csató, 2021; Devriesere et al., 2024). In particular, the format of the 2026 FIFA World Cup has been extensively investigated. FIFA has approved the expansion of the 2026 FIFA World Cup to 48 teams in January 2017 and decided that the competition would start with 16 groups of three teams each (80 matches in total). According to Truta (2018), this format would not have increased the number of non-competitive matches compared to the traditional design with 32 teams, eight groups of four teams each. Nonetheless, a predetermined schedule where the *a priori* strongest team plays against the second strongest team in the first round and the weakest team in the second round can roughly halve this danger.

Guyon (2020) examines the risk of collusion in the same setting: since the two teams playing the last group game know exactly what results will let them qualify for the knockout stage, a particular result can be easily beneficial for both of them at the expense of the third team. The best solution to minimise the risk of collusion turns out to be if the strongest team plays the first two group matches. However, then only the best team is vulnerable to collusion and none of the 16 favourites play in the last round of the group stage. Furthermore, the risk of collusion in at least one group becomes unacceptably high. The problem cannot be mitigated by forbidding draws during the group stage or using the 3-2-1-0 point system, which gives an additional point to the winner of the penalty shootout after a draw. Hence, Guyon (2020) has proposed seven alternative formats with groups of three, four, or six teams, but has not considered imbalanced groups.

The Monte Carlo simulations of Chater et al. (2021) generally reinforce the results of Guyon (2020) regarding both the high risk of non-competitive matches and the optimal schedule. Perhaps these findings have inspired FIFA to revise the format of the 2026 FIFA World Cup and decide for 12 groups of four teams each (Format 1 in Guyon (2020)).

Some further designs have been proposed for the 48-team tournament. Rennó-Costa (2023) presents a double-elimination structure instead of the group stage in order to produce more competitive and exciting matches such that teams with an early loss can still recover. Guajardo and Krumer (2024) recommend three novel tournament formats. The first, inspired by beach volleyball, contains only two rounds of dynamically scheduled group matches (that is, the set of games played in the second round depends on the outcome of the first round). The second is based on the usual design but the knockout bracket is organised with 24 teams to select three winners, the best directly qualifying for the final, and the other two playing a semifinal. The third proposal is a hybrid of the first two options. The total number of games ranges from 71 to 95, which is considerably lower than the undesirably high 104 games of the current format.

In the following, another format will be suggested for a 48-team FIFA World Cup with imbalanced groups and compared to the official format with 12 groups of four teams each. Although Chater et al. (2021, Section 5.2) has already examined the latter design, their

numerical results (1) are unreliable because the simulation model is estimated on the basis of the 32-team FIFA World Cups; (2) cannot be reproduced since the Elo ratings of the 48 teams are unknown; and (3) are biased upwards as only the worst case is computed.

The expansion to 48 teams raises the issue of how these slots are allocated among the FIFA confederations, too. Krumer and Moreno-Ternero (2023) use standard tools from the fair allocation literature for this purpose. UEFA is found to have a solid basis for claiming additional slots. Csató et al. (2025) extend the methodology of the FIFA World Ranking to evaluate the performance of sets of teams and suggest a transparent slot allocation policy. According to their results, more European and South American teams should play in the (2026) FIFA World Cup.

Our paper is strongly connected to another line of literature that quantifies the probability of collusion and match-fixing. Guyon (2020) calculates the risk of collusion in groups of three if two teams advance to the next phase. Chater et al. (2021) distinguish three types of games: competitive (when neither team is indifferent and their targets are incompatible), collusive (when the targets of both teams are compatible and neither is indifferent), and stakeless (when at least one team is completely indifferent). Their probabilities are determined in various settings of the FIFA World Cup: 8 groups of four teams, 16 groups of three teams, 12 groups of four teams, 8 groups of five teams, and 12 groups of five teams. Stronka (2024) offers two innovative changes for groups of three teams, random tie-breaking based on goal difference and dynamic scheduling. These proposals are able to reduce the expected number of matches with a high risk of collusion from 5.5 to 0.26 in the 2026 FIFA World Cup.

Csató et al. (2024) consider another classification scheme, where the games can be competitive, weakly stakeless (exactly one team is indifferent), and strongly stakeless (both teams are indifferent). Their probabilities are computed for the 12 valid schedules in the UEFA Champions League group stage. Gyimesi (2024) follows this approach with a particular weighting system (0 for competitive, 0.5 for weakly stakeless, 1 for strongly stakeless) to measure the ratio of stakeless games in the league phase of the UEFA Champions League that has been introduced from the 2024/25 season.

Csató (2022b) presents a method to quantify the violation of strategy-proofness through the example of the European Qualifiers for the 2022 FIFA World Cup. The threat of tanking can be substantially mitigated by adding a carefully chosen set of constraints to the group draw. Csató (2023b) demonstrates that tie-breaking rules might affect the occurrence of a situation when the final position of a team is already secured, independently of the results in the last round of group matches. In particular, merely the tie-breaking policy of the 2024 UEFA European Football Championship has increased the risk of match-fixing by more than 10 percentage points (Csató, 2024).

Nevertheless, none of the studies above take the identity of the teams that play these non-competitive matches into account. However, as has been argued in the Introduction, stakeless matches are more threatening for the organiser if they affect the best teams: a weak team is more likely to lose the match anyway, thus, the cost of misaligned incentives is smaller. Introducing that aspect is one of our main contributions to the literature.

3   Methodology

This section summarises the methodology of the study. Section 3.1 provides an overview of two tournament formats for the 2026 FIFA World Cup. The simulation framework is detailed in Section 3.2. Section 3.3 discusses the underlying data, and Section 3.4 defines

the metrics used to compare the two alternative designs. Last but not least, the main limitations of our results are outlined in Section 3.5.

3.1 Tournament formats

The official design of the 2026 FIFA World Cup is detailed in Section 3.1.1, while a novel proposal based on imbalanced groups is specified in Section 3.1.2. Note that the latter has not appeared in the previous literature, even though Guyon (2020) studies eight, Rennó-Costa (2023) one, and Guajardo and Krumer (2024) three reasonable formats.

3.1.1 The official format

As discussed in Section 2, FIFA finally decided to organise the 2026 FIFA World Cup with 12 groups of four teams each, followed by a knockout stage. The first two teams from each group and the eight best third-placed teams qualify for the Round of 32. This structure raises several fairness issues (Guyon, 2018; Csató, 2021), but they are irrelevant to our simulations since the groups are *a priori* (before the draw) equivalent.

The groups are played in a single round-robin format. The ranking in each group is determined by the number of points, followed by goal difference and the number of goals scored. In our simulations, the next tie-breaking criteria are head-to-head records (head-to-head number of points, goal difference, number of goals scored), and, if necessary, a random draw among the remaining teams.

At the moment, it is not known how the seeding will work in the 2026 FIFA World Cup. It is assumed to follow the previous editions (Csató, 2023a): the 48 teams are partitioned into four pots of 12 teams each according to their strength except for the three host nations (Canada, Mexico, United States), which are automatically assigned to the strongest Pot 1, and for the two winners of the play-offs, which are assigned to the weakest Pot 4. The draw chooses one team from each pot to each group. Two teams from the same confederation (other than UEFA) cannot play in the same group and the number of European teams should be between one and two in all groups. The two winners of the play-offs are not taken for any confederation into account. Similar to Stronka (2024), the draw procedure is implemented by a rejection sampler that is—in contrast to the official Skip mechanism (Csató, 2025)—uniformly distributed over the set of valid assignments (Roberts and Rosenthal, 2024).

In the knockout stage, the bracket of the 2024 UEFA European Championship (Guyon, 2018) is essentially "doubled": group G corresponds to Group A, Group H to Group B, and so on. For instance, eight group winners play against the eight third-placed teams, four group winners play against four runners-up, and eight runners-up play against each other in the Round of 32. In particular, the eight best third-placed teams play against the winners of Groups B, C, E, F, H, I, K, L after a random matching. From the Round of 16, the knockout bracket is deterministic.

3.1.2 Our recommendation: imbalanced groups

The format of the 2026 FIFA World Cup has two substantial shortcomings. First, since the design is analogous to the recent UEFA European Championships, the same fairness issues arise: it is impossible to treat the groups in the knockout stage equally Guyon (2018); Csató (2021). Furthermore, both within-group differences (as the number of teams is expanded from 32 to 48) and the ratio of advancing teams (from 1/2 to 2/3) increase

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compared to the previous editions. These changes are expected to make qualification easier for the stronger teams, implying less competitive matches in the group stage.

Therefore, the main motivation behind our proposal is to improve the competitiveness of the group matches. In particular, two types of groups are introduced: eight Tier 1 groups of four stronger teams and four Tier 2 groups of four weaker teams. Instead of the usual Round of 32, an intermediate play-off round is organised, similar to the novel format of UEFA club competitions (Gyimesi, 2024). From Tier 1 groups, the group winner directly qualifies for the Round of 16 and the runner-up enters the play-off round. On the other hand, from Tier 2 groups, both the group winner and the runner-up qualify for the play-off round, which is contested by the eight runners-up of Tier 1 groups besides them.

In this play-off round, a Tier 1 runner-up faces either a Tier 2 group winner or a runner-up. Again, a random matching is assumed. Naturally, the winners of the play-off round are paired against the Tier 1 group winners in the Round of 16. From this point on, the format follows the official FIFA World Cup format.

Seeding is similar to the official format with eight pots, four (Pots 1, 2, 5, 7) containing 8 teams and another four (Pots 3, 4, 6, 8) containing 4 teams each. The three hosts are assigned to Pot 1 together with the five strongest teams. The two winners of the play-offs are assigned to Pot 8 together with the two weakest directly qualified teams. Tier 1 groups receive one team from Pots 1, 2, 5, 7 each, while Tier 2 groups receive one team from Pots 3, 4, 6, 8 each. Following the official format, no group can contain more than one team from the confederations AFC, CAF, CONCACAF, CONMEBOL, OFC, and should contain at least one and at most two UEFA teams that is guaranteed by a rejection sampler. Again, the two winners of the play-offs are not taken for any confederation into account.

Imbalanced groups have already been used in some sports competitions (Devriesere et al., 2024, Section 5.3). The first example is the EHF (men's handball) Champions League between the 2015/16 and 2019/20 seasons, which has been extensively studied by Csató (2020). In particular, the design is found to considerably increase the proportion of high quality and more balanced games. UEFA follows a similar principle in its Nations League launched in 2018, where the national teams are divided into four leagues of different strengths (Csató, 2022b; Scelles et al., 2024). Finally, the 2024 European Water Polo Championships have also consisted of four groups in two divisions (LEN, 2023).

3.2 The simulation model

The outcomes of all group matches are determined by the methodology of Football rankings (2020). The number of goals scored in a match is assumed to follow a Poisson distribution (Maher, 1982; van Eetvelde and Ley, 2019), and the expected number of goals is a quartic polynomial of win expectancy. The function is estimated by the least squares method based on almost 40 thousand matches between national football teams, separately for home-away games and those played on neutral ground (Football rankings, 2020). Win expectancy depends on the World Football Elo ratings (http://eloratings.net/about) and the field of the match.

Denote the expected number of goals scored by team i against team j by $\lambda_{ij}^{(f)}$ if the match is played on field f (home: $f = h$; away: $f = a$; neutral: $f = n$). The probability that team i scores k goals in this match is

$$P_{ij}(k) = \frac{\left(\lambda_{ij}^{(f)}\right)^k \exp\left(-\lambda_{ij}^{(f)}\right)}{k!}.$$

According to the World Football Elo ratings, the win expectancy W_{ij} of team i with Elo E_i against team j with Elo E_j equals

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

Home advantage is accounted for by adding 100 points to the rating of the home team (in our case, Canada, Mexico, United States).

Football rankings (2020) report the following estimations for $\lambda_{ij}^{(f)}$ based on W_{ij}. For games played on a neutral field:

$$\lambda_{ij}^{(n)} = \begin{cases} \begin{aligned} &3.90388 \cdot W_{ij}^4 - 0.58486 \cdot W_{ij}^3 \\ &-2.98315 \cdot W_{ij}^2 + 3.13160 \cdot W_{ij} + 0.33193 \end{aligned} & \text{if } W_{ij} \leq 0.9 \\[2ex] \begin{aligned} &308097.45501 \cdot (W_{ij} - 0.9)^4 - 42803.04696 \cdot (W_{ij} - 0.9)^3 \\ &+2116.35304 \cdot (W_{ij} - 0.9)^2 - 9.61869 \cdot (W_{ij} - 0.9) + 2.86899 \end{aligned} & \text{if } W_{ij} > 0.9. \end{cases}$$

For home-away games played by a host nation H, the expected number of goals scored by the home team equals

$$\lambda_{Hj}^{(h)} = \begin{cases} \begin{aligned} &-5.42301 \cdot W_{Hj}^4 + 15.49728 \cdot W_{Hj}^3 \\ &-12.6499 \cdot W_{Hj}^2 + 5.36198 \cdot W_{Hj} + 0.22863 \end{aligned} & \text{if } W_{Hj} \leq 0.9 \\[2ex] \begin{aligned} &231098.16153 \cdot (W_{Hj} - 0.9)^4 - 30953.10199 \cdot (W_{Hj} - 0.9)^3 \\ &+1347.51495 \cdot (W_{Hj} - 0.9)^2 - 1.63074 \cdot (W_{Hj} - 0.9) + 2.54747 \end{aligned} & \text{if } W_{Hj} > 0.9, \end{cases}$$

while the expected number of goals scored by the away team j equals

$$\lambda_{Hj}^{(a)} = \begin{cases} \begin{aligned} &90173.57949 \cdot (W_{Hj} - 0.1)^4 + 10064.38612 \cdot (W_{Hj} - 0.1)^3 \\ &+218.6628 \cdot (W_{Hj} - 0.1)^2 - 11.06198 \cdot (W_{Hj} - 0.1) + 2.28291 \end{aligned} & \text{if } W_{Hj} < 0.1 \\[2ex] \begin{aligned} &-1.25010 \cdot W_{Hj}^4 - 1.99984 \cdot W_{Hj}^3 \\ &+6.54946 \cdot W_{Hj}^2 - 5.83979 \cdot W_{Hj} + 2.80352 \end{aligned} & \text{if } W_{Hj} \geq 0.1. \end{cases}$$

This simulation methodology has recently been applied in several studies on tournament design (Csató, 2022b, 2023a,b,c, 2024, 2025; Stronka, 2024).

The knockout stage consists of matches where one team qualifies and the other is eliminated. Thus, we directly use formula (1) of win expectancy. Again, the Elo rating of a host is increased by 100. Note that hosts can play against each other in the knockout stage but the exact location of their game is unknown, hence, the rating of both teams is increased (which is equivalent to using the original Elo ratings).

1 million simulation runs are carried out for both the official and the imbalanced formats, as well as for the three possible schedules of group matches (see Section 4.1): one thousand random group draws are generated separately for each design and each of them is simulated one thousand times with each match schedule. This means 6 million simulations in total.

3.3 Data

The same set of 48 teams competes in the two formats to get comparable results. Since simulating the complicated qualification process (Csató, 2023c) would be cumbersome, the
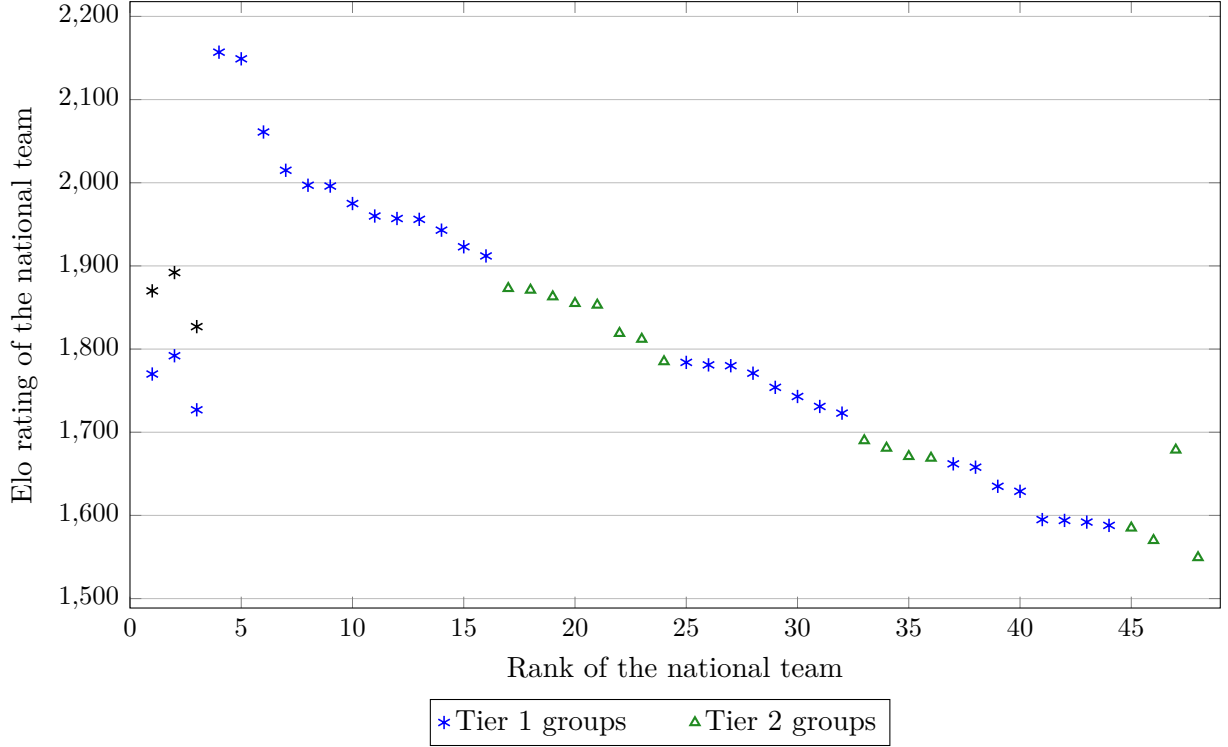
Figure 1: Teams in the imbalanced format for the 2026 FIFA World Cup

Notes: The two winners of the play-offs are represented by their expected Elo ratings.
The black nodes show the three hosts if their Elo ratings are increased by 100 due to home advantage.

top ℓ teams are selected from each confederation similar to Krumer and Moreno-Ternero (2023) and Stronka (2024). There are three hosts, Canada, Mexico, and the United States. The value of ℓ is given by the quotas of the six confederations: AFC (8), CAF (9), CONCACAF (further 3), CONMEBOL (6), OFC (1), and UEFA (16).

Two additional teams can qualify via the inter-confederation play-offs, which will be a tournament played in one or more of the host countries. It includes six teams, one from AFC, CAF, CONMEBOL, OFC each, and two from CONCACAF. The two highest-rated seeded teams play against the winners of the first two knockout clashes between the four unseeded teams, and the two winners qualify for the 2026 FIFA World Cup group stage. In our simulations, the win expectancy formula (1) is used again to determine the winners of these matches played on neutral ground.

The strengths of the teams are given by their Elo ratings of 1 October 2024 and are reported in Table 1. The strengths and the allocation of the teams in the proposed imbalanced format are illustrated in Figure 1, too. Note that the 13 strongest teams and the three hosts are assigned to Tier 1 groups, that is, they can directly qualify for the Round of 16, in contrast to the next eight teams. On the other hand, the latter eight teams play against opponents that have at most 1700 Elo points in Tier 2 groups. The three hosts would be ranked 14th (Mexico), 17th (Canada), and 21st (United States) according to their strength after accounting for home advantage.

3.4 Evaluation metrics

The two alternative formats are assessed primarily on the basis of the likelihood that a group match provides no incentives for the teams to perform. Previous studies analyse stakeless

Table 1: National teams playing in the hypothetical 2026 FIFA World Cup

Team	Elo	Conf.	Pot	Pot*	Team	Elo	Conf.	Pot	Pot*
Canada	1770	CONC	1	1	Morocco	1780	CAF	3	5
Mexico	1792	CONC	1	1	Venezuela	1771	CONM	3	5
United States	1727	CONC	1	1	Senegal	1754	CAF	3	5
Spain	2157	UEFA	1	1	South Korea	1743	AFC	3	5
Argentina	2149	CONM	1	1	Panama	1731	CONC	3	5
Colombia	2061	CONM	1	1	Australia	1723	AFC	3	5
France	2015	UEFA	1	1	Uzbekistan	1690	AFC	3	6
Brazil	1997	CONM	1	1	Tunisia	1681	CAF	3	6
England	1996	UEFA	1	2	Algeria	1671	CAF	3	6
Portugal	1975	UEFA	1	2	Egypt	1669	CAF	3	6
Netherlands	1960	UEFA	1	2	Costa Rica	1662	CONC	4	7
Germany	1957	UEFA	1	2	Iraq	1658	AFC	4	7
Uruguay	1956	CONM	2	2	Ivory Coast	1635	CAF	4	7
Italy	1943	UEFA	2	2	Jordan	1629	AFC	4	7
Belgium	1923	UEFA	2	2	Jamaica	1595	CONC	4	7
Croatia	1912	UEFA	2	2	Mali	1594	CAF	4	7
Japan	1873	AFC	2	3	Nigeria	1592	CAF	4	7
Ecuador	1871	CONM	2	3	Saudi Arabia	1588	AFC	4	7
Denmark	1863	UEFA	2	3	Angola	1585	CAF	4	8
Switzerland	1855	UEFA	2	3	New Zealand	1570	OFC	4	8
Austria	1853	UEFA	2	4	Peru	1714	CONM	PO	PO
Iran	1819	AFC	2	4	Cameroon	1580	CAF	PO	PO
Turkey	1812	UEFA	2	4	Qatar	1574	AFC	PO	PO
Russia	1785	UEFA	2	4	Haiti	1517	CONC	PO	PO
Serbia	1784	UEFA	3	5	Honduras	1506	CONC	PO	PO
Greece	1781	UEFA	3	5	New Caledonia	1234	OFC	PO	PO

Abbreviations: Conf. = Confederation; CONC = CONCACAF; CONM = CONMEBOL.
Seeding is based on the Elo ratings of 1 October 2024. Source: https://www.international-football.net/elo-ratings-table?year=2024&month=10&day=01.
The column Pot/Pot* shows the pot of the team in the official/proposed imbalanced format.
In the official design groups contain one team from Pots 1–4 each.
In the imbalanced design, Tier 1 groups contain one team from Pots 1, 2, 5, 7 each, while Tier 2 groups contain one team from Pots 3, 4, 6, 8 each.
The last six teams play in the inter-confederation play-offs and the two winners are assigned to the last pot (Pot 4 or Pot 8).

matches, where a team is indifferent to the outcome (Chater et al., 2021; Csató et al., 2024; Gyimesi, 2024). Csató et al. (2024) distinguish weakly (if one team is indifferent) and strongly (if both teams are indifferent) stakeless matches. However, neither of these studies deals with the strength or the current position of the opposing teams. To take these aspects into account, stakeless matches are considered at the level of teams, which is our main methodological innovation.

Denote the expected number of stakeless group matches of team i in all simulation runs by S_i. S_i is increased by one if team i plays a match whose outcome does not affect the probability of the following events:

- Being eliminated;

- Qualification for the Round of 32 (in the official format) or the knockout stage play-offs (in the proposed imbalanced format);

- Qualification for the Round of 16 (in the proposed imbalanced format).

It can be shown that only the last round can contain a stakeless match if four teams play a single round-robin competition. In addition, the last round is played simultaneously since the Disgrace of Gijón (Kendall and Lenten, 2017, Section 3.1). Thus, the average value of S_i over all simulation runs gives the probability that the match played by team i in the last round of the group stage becomes stakeless.

The status of the team that plays a stakeless match could be important. An already eliminated team might still exert full effort in a stakeless match as they have no reason to rest their players for the non-existing remaining matches. On the other hand, an already qualified team has to play in the knockout stage, hence, they have a powerful incentive to rest and reserve energy. Therefore, stakeless games can be classified into two categories: matches played by teams already qualified (S_i^A) and matches played by teams already eliminated (S_i^E).

S_i^A is higher if more teams advance from a group to the knockout stage. Consequently, it makes a substantial difference in the official format whether two or three teams qualify from a certain group. We provide a minimum and a maximum value of S_i^A accordingly. In the imbalanced format, the minimum and the maximum coincide as the number of teams advancing is deterministic and does not depend on the results of other groups.

In the official format, the maximum $S_i^{A,\max}$ is reached if the match played by a team that is guaranteed to be in the top three in their group before the last round is called stakeless. However, it does not happen in practice in all groups, only in those where some teams already know that they would certainly advance even if they are ranked third. Contrarily, the minimum $S_i^{A,\min}$ is reached if no team has any information on whether the third position would be sufficient for them to qualify. This also happens in some, but usually not all, groups. Therefore, the true value S_i^A lies somewhere between $S_i^{A,\min}$ and $S_i^{A,\max}$.

The same logic applies to the teams that have already been eliminated. In the imbalanced format, there is no difference between $S_i^{E,\min}$ and $S_i^{E,\max}$. In the official format, $S_i^{E,\max}$ applies if the third place is insufficient to qualify for the Round of 32, and $S_i^{E,\min}$ applies if it might mean qualification.

As we have argued in the Introduction, a stakeless match is less costly if the team without any incentive to perform has *a priori* a lower chance of winning the match. A reasonable weighting factor is the win expectancy W_{ij} according to formula (1). Hence, the expected number of weighted stakeless matches is calculated as

$$S_i^W = S_i \cdot W_{ij}.$$

For instance, the stakeless matches discussed in Section 1 are associated with the weights 0.8835 (France vs Tunisia) and 0.3351 (Canada vs Morocco), respectively.

However, S_i is not properly defined in the official format because the number of teams qualified for the Round of 32 can be either two or three in a group. Therefore, the *minimum* of the expected number of weighted stakeless matches is computed by assuming that the teams do not know in advance whether the third place will be sufficient, that is, three different prizes exist (top 2, third place, fourth place) and a match is stakeless for a team

only if its outcome has no effect on the prize obtained. Our focus on the best case is a more conservative approach compared to Chater et al. (2021), who assess the last round in the last group to play when the third-ranked team exactly knows its target to qualify.

3.5 Limitations

Naturally, a careful interpretation of our results is warranted. We consider only one set of Elo ratings and a different distribution of strengths may change the quantitative findings. This is less sophisticated than the approach of Stronka (2024) who takes these values from three different dates. Second, the match outcomes are assumed to be independent of the schedule, even though the economic literature has found robust evidence for the effect of the order of the games (Laica et al., 2021). In particular, playing in the first and third matches of the group stage leads to a significantly higher probability of qualification in the FIFA World Cup (Krumer and Lechner, 2017). Third, only one reasonable variant of the imbalanced format is studied even though the composition of Tier 1 and Tier 2 groups is not straightforward. Finally, the regression model of Football rankings (2020) may be suboptimal for the FIFA World Cup where the weakest national teams have never played. On the other hand, the methodology of Chater et al. (2021) can also be debated because the results of previous 32-team FIFA World Cups are unlikely to be representative if there are 48 teams.

All probabilities are derived using Monte Carlo simulations. However, the schedule of the FIFA World Cup can be exploited to compute the winning probabilities exactly: Brandes et al. (2025) give an algorithm that is two orders of magnitude faster than any reasonably accurate approximation. It remains to be seen whether this result could be used in our case with 48 teams, one thousand different group draws, and knockout brackets randomised subject to the basic constraints.

To conclude, even if our Elo-based approach is not necessarily the best available simulation model, it is mainly used to choose between two competition formats. Thus, the counterargument of Appleton (1995, p. 534) applies: "*Since our intention is to compare tournament designs, and not to estimate the chance of the best player winning any particular tournament, we may within reason take whatever model of determining winners that we please*".

4 Results

As Section 2 has already discussed, the previous literature agrees that the schedule of matches has a powerful impact on the probability of both collusive (Chater et al., 2021; Guyon, 2020; Stronka, 2024) and stakeless matches (Chater et al., 2021; Csató et al., 2024). This issue is investigated in Section 4.1, which concludes that the optimal order is if the strongest team plays against the weakest team (and the two middle teams play against each other) in the last round. Section 4.2 analyses this schedule from the perspective of the tournament metrics suggested in Section 3.4, as well as from several further aspects.

4.1 Aggregated measures and the impact of the schedule

In a single round-robin tournament with four teams, the number of static schedules is three since the team drawn from Pot 1 can play against one of the remaining three teams

Table 2: Tournament metrics for the two formats under the three schedules

| Schedule | (1-2, 3-4) | | (1-3, 2-4) | | (1-4, 2-3) | |
Format	Official	Imbalanced	Official	Imbalanced	Official	Imbalanced
Avg. Elo diff.	214.4	208.2	214.4	208.2	214.4	208.2
Avg. $S_i^{A,\min}$	0.197	0.058	0.096	0.032	0.074	0.029
Avg. $S_i^{A,\max}$	0.355	0.058	0.281	0.032	0.263	0.029
Avg. $S_i^{E,\min}$	0.000	0.202	0.000	0.084	0.000	0.076
Avg. $S_i^{E,\max}$	0.196	0.202	0.094	0.084	0.072	0.076
Avg. S_i^{W}	>0.106	0.125	>0.064	0.047	>0.053	0.042

Abbreviations: Avg. = Average; diff. = difference.
Schedule 1-k means that the teams drawn from Pots 1 and k play against each other in the last round.
In the official design, the average S_i^W is certainly higher than the given probability if some teams know that the third place will be sufficient for qualification.
The number of simulation runs is 1 million for each format and schedule.

in the last round, and the order of the matches in the first two rounds does not count in the simulation model of Section 3.2.

Table 2 shows that the outcome of group stage matches is, on average, more uncertain in the modified format than in the original, as the difference between the Elo ratings is smaller. The average ratio of stakeless matches is the lowest if the schedule (1-4, 2-3) is used in all groups. The schedule (1-2, 3-4), which organises the most uncertain matches in the last round, performs substantially weaker than the other two.

The imbalanced format provides a substantially lower ratio of stakeless matches for teams that are qualified after two rounds even if the best case is assumed in the official format. On the other hand, the probability of stakeless matches played by eliminated teams does not decrease compared to the official format. This is not surprising since not only 16 but 24 teams are eliminated at the end of the group stage.

Finally, the imbalanced format is clearly better than even the best case in the official format if the stakeless matches are weighted according to the winning probabilities. Thus, the aggregated measures of stakeless matches tend to favour the proposed imbalanced design.

4.2 Detailed comparison of the two tournament formats

In the following, all results are based on the 1-1 million simulations for each format with the optimal schedule identified in Section 4.1.

First, it should be checked whether the imbalanced design is fair and free from misaligned incentives, namely, no team could be better (worse) off by being assigned to a weaker (stronger) pot (Csató, 2020, 2021). This is far from clear because, for example, teams drawn from Pot 4 play against weaker opponents in Tier 2 groups and teams drawn from Pot 5 play against stronger opponents in Tier 2 groups.

Therefore, Figure 2 plots the chance of advancing to the Round of 16 as the function of the Elo rating. No anomaly can be seen. The three host nations benefit from their guaranteed place in Pot 1 as the black nodes lie somewhat above the trend line—but this is a deliberate policy of the organiser. The imbalanced design is more favourable for the three hosts and the 13 strongest teams, while it punishes the other teams compared to the official format. There are no jumps in the probability for teams close to the boundary of
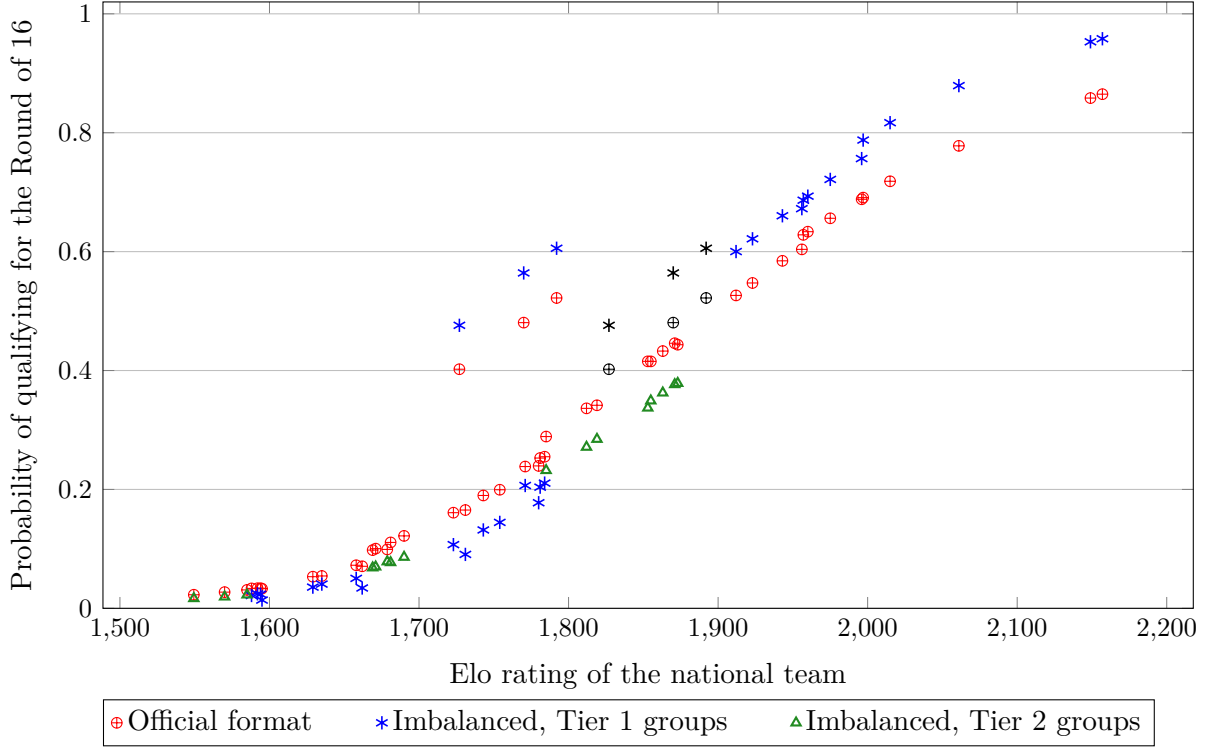
Figure 2: The probability
of qualification for the Round of 16 in the two formats for the 2026 FIFA World Cup

Notes: The two winners of the play-offs are represented by their expected Elo ratings.
The black nodes show the three hosts if their Elo ratings are increased by 100 due to home advantage.

Pots 4 and 5.

On the other hand, three national teams (Panama, Costa Rica, Jamaica) have a lower chance to qualify for the Round of 16 than teams of similar Elo ratings from other confederations, especially in the imbalanced format. The reason is clear: they cannot play in the groups of the hosts that are weaker than the other teams draw from Pot 1. This effect is stronger in the suggested design, which contains eight Tier 1 groups instead of the 12 in the official design. In contrast, Venezuela, the weakest CONMEBOL team, benefits from not playing against the strong South American teams. This observation calls our attention to the non-negligible sporting effects of draw constraints (Csató, 2022a) that are stronger with fewer groups.

The proposed imbalanced format contains the same number of group matches as the official design ($12 \times 6 = 72$) but only 24 knockout games instead of 32. The average number of matches played by each team is presented in Figure 3. All teams play fewer matches, especially the strongest teams and the eight teams assigned to Tier 1 groups from Pot 5 that are more likely to be eliminated in the group stage. The decreased workload is favourable since top level players should play many matches, especially towards the end of the season, which increases the probability of injuries and underperformance in the FIFA World Cup (Ekstrand et al., 2004).

According to Figure 4, the strongest teams and 12 weak teams assigned to Tier 2 groups—from Pots 4, 6, 8—play more interesting matches in the imbalanced format. This is important because the top teams can win their first two matches more easily (such as Brazil, France, or Portugal in the 2022 FIFA World Cup) or qualify even by losing
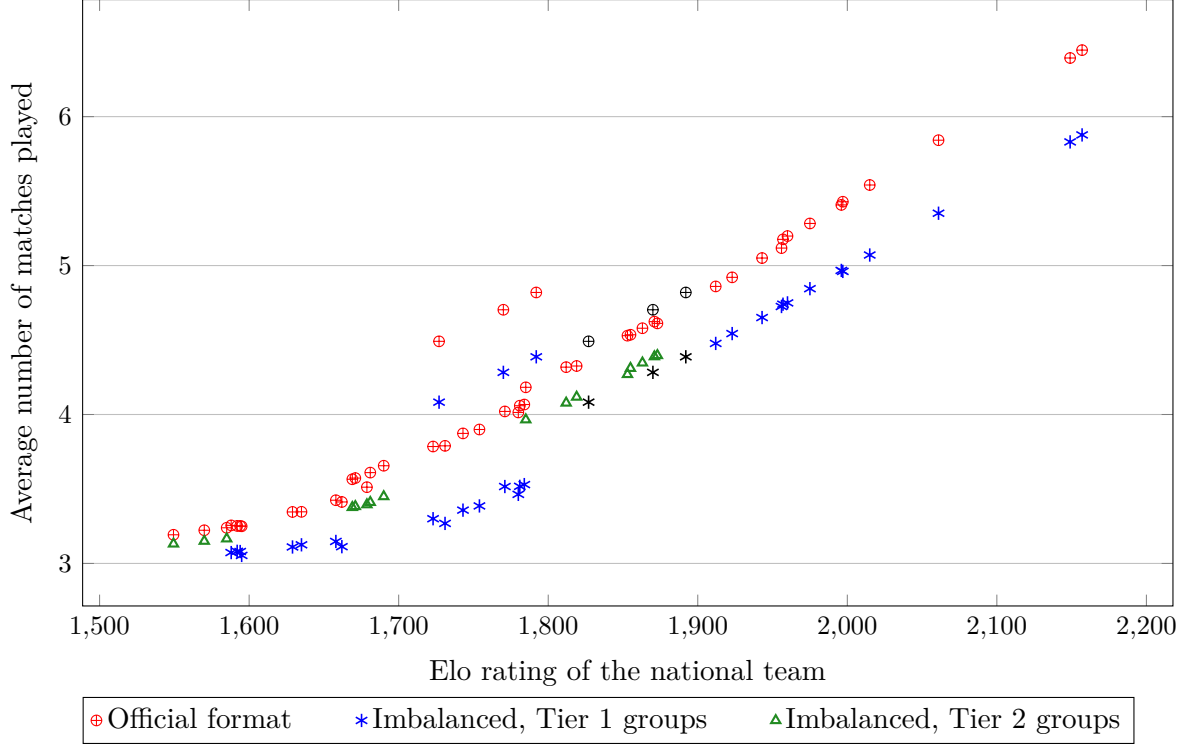
Figure 3: The expected number of matches in the two formats for the 2026 FIFA World Cup

Notes: The two winners of the play-offs are represented by their expected Elo ratings.
The black nodes show the three hosts if their Elo ratings are increased by 100 due to home advantage.

their first match without any consequence (such as Argentina in the 2022 FIFA World Cup). Furthermore, emerging football nations have a lower chance of suffering humiliating defeats.

Figure 5 extends the analysis of match uncertainty to the knockout stage. The imbalanced format implies closer matches in all rounds except for the Round of 16. This is probably caused by the more efficient pairing of stronger versus weaker teams in the Round of 16, where the group winners of Tier 1 groups cannot play against each other. Hence, substantial benefits can be seen in the following two rounds, in the semifinals and the quarterfinals. The measures for the Round of 32 cannot be compared because the imbalanced format contains only eight games here. To summarise, our proposal results in more exciting matches even in the knockout phase.

This finding is supported by Figure 6, which shows the share of matches between the k strongest teams up to $k = 24$. The imbalanced format clearly outperforms the official. Even the expected number of matches (not only their proportion) is higher for all values of k up to 18. Thus, the novel design contains more matches between the top teams, contrary to the lower number of matches.

Finally, Figure 7 conveys probably the most important message of our paper. It provides the probability of a stakeless match played by a team that has already qualified either for the Round of 32 in the official format, or for the Round of 16 in Tier 1 groups of the imbalanced format, or for the knockout round play-offs in Tier 2 groups of the imbalanced format. In the proposed design, this value does not exceed 2.5% for any team except for the eight teams drawn from Pots 3 and 4 in the four Tier 2 groups. Even for these teams, the chance is close to the lower bound $S_i^{A,\min}$ in the official format, which assumes that only the group winners and the runner-up qualify for the Round of 32.
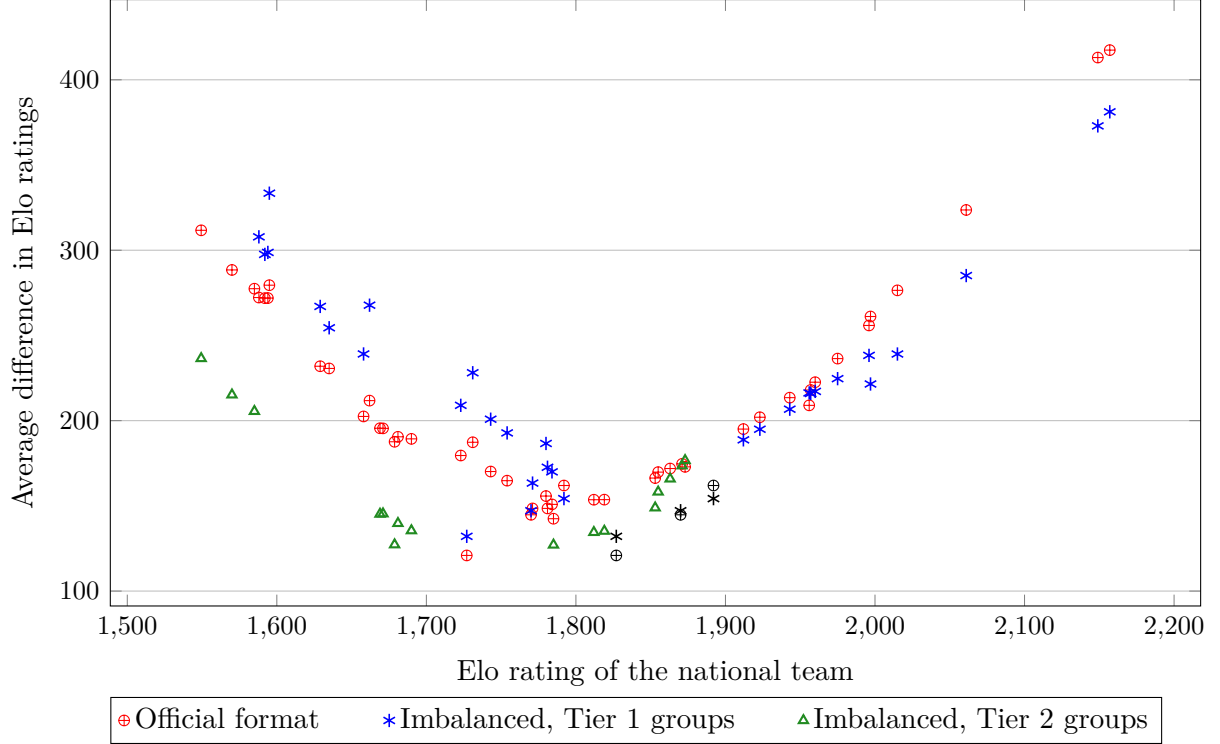
Figure 4: The uncertainty of group
stage matches in the two formats for the 2026 FIFA World Cup for each national team

Notes: The two winners of the play-offs are represented by their expected Elo ratings.
The six black nodes show the three hosts if their Elo ratings are increased by 100 due to home advantage.

On the other hand, the probability of a stakeless game in the official 2026 FIFA World Cup lies somewhere between 39% and 66% even for the 16th strongest team, and the gradually increasing lower and upper bounds reach 64% and 92%, respectively, for the best team Argentina. Our imbalanced design would be highly efficient in avoiding the seriously non-competitive matches such as the ones played three strong national teams (Brazil, France, Portugal) in the 2022 FIFA World Cup—that all were lost by the favourite.

5   Conclusions

The design of the 2026 FIFA World Cup has seen a significant reform with the expansion to 48 teams. The original plan with 16 groups of three teams each received serious criticism (Guyon, 2020; Stronka, 2024), which prompted FIFA to choose a new format in 2023. The revised design contains 12 groups of four teams each, followed by a knockout stage starting from the Round of 32. Although the risk of collusion is decreased and at least three matches are guaranteed for each team, the qualification of two-thirds of the teams and the participation of 16 additional weak teams imply that non-competitive or stakeless matches are highly likely to occur, especially for the strongest teams, as demonstrated by our simulations (Table 2 and Figure 7).

Inspired by examples from handball and water polo, we have suggested an alternative design based on imbalanced groups. The basic idea is to divide the 48 teams into two divisions: eight groups of stronger teams (Tier 1) and four groups of weaker teams (Tier 2). While Tier 1 group winners directly qualify for the Round of 16, Tier 2 group winners
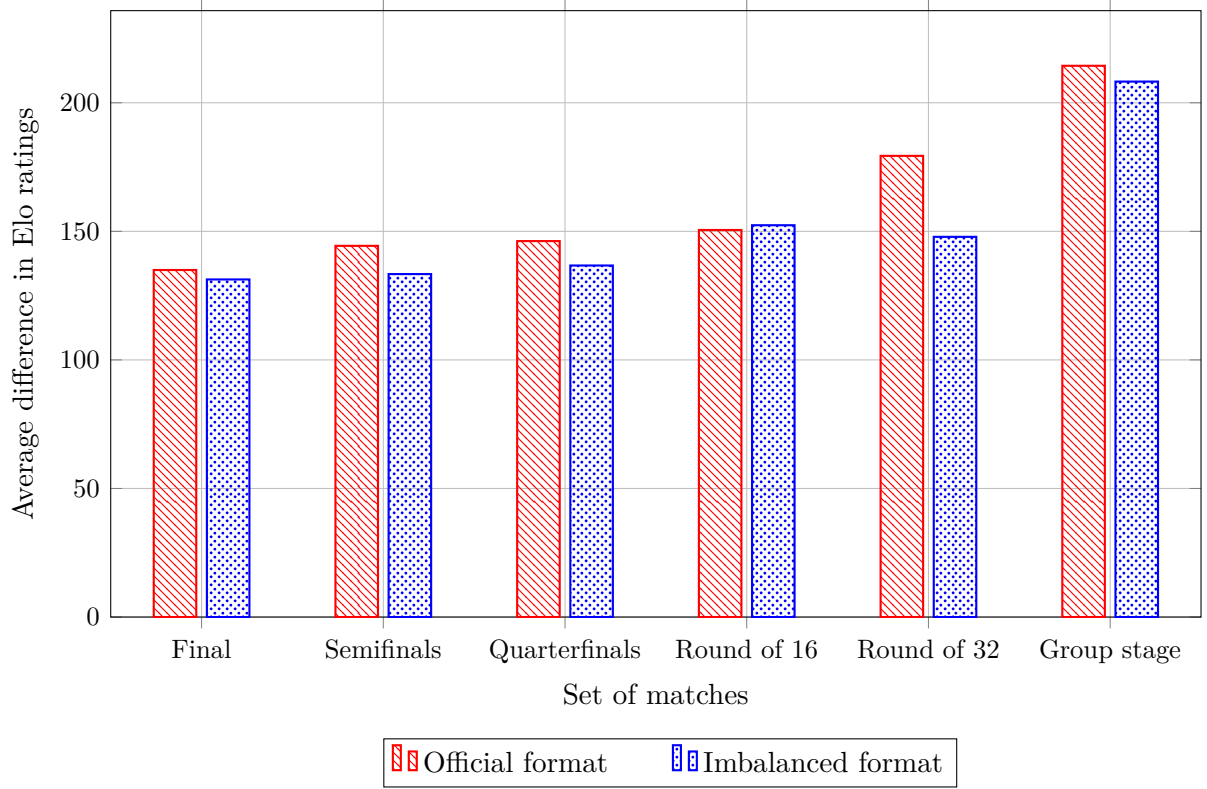
Figure 5: The uncertainty of matches in the two formats for the 2026 FIFA World Cup

Note: Round of 32 in the imbalanced format refers to the play-offs for the Round of 16.

and runners-up compete in a play-off round against Tier 1 runners-up. Future studies should investigate whether this design can improve efficacy, the accuracy of the ranking since existing works (Lasek and Gagolewski, 2018; Sziklai et al., 2022) do not consider imbalanced groups.

The imbalanced group format offers several advantages over the official design. First, it substantially reduces the proportion of stakeless matches, including the more costly cases. Second, it contains fewer matches, especially for the strongest teams whose players have the highest workload at the end of the season. Third, it ensures that the top teams face stronger opponents on average.

The current study demonstrates how the format of the 2026 FIFA World Cup can be improved to contain more competitive matches between top teams. The proposed design with imbalanced groups offers a viable alternative that maintains fairness while maximises attractiveness and excitement. These insights contribute to the rapidly growing literature on tournament design and can inform future discussions on optimising competitions where the strengths of the teams vary to a great extent.
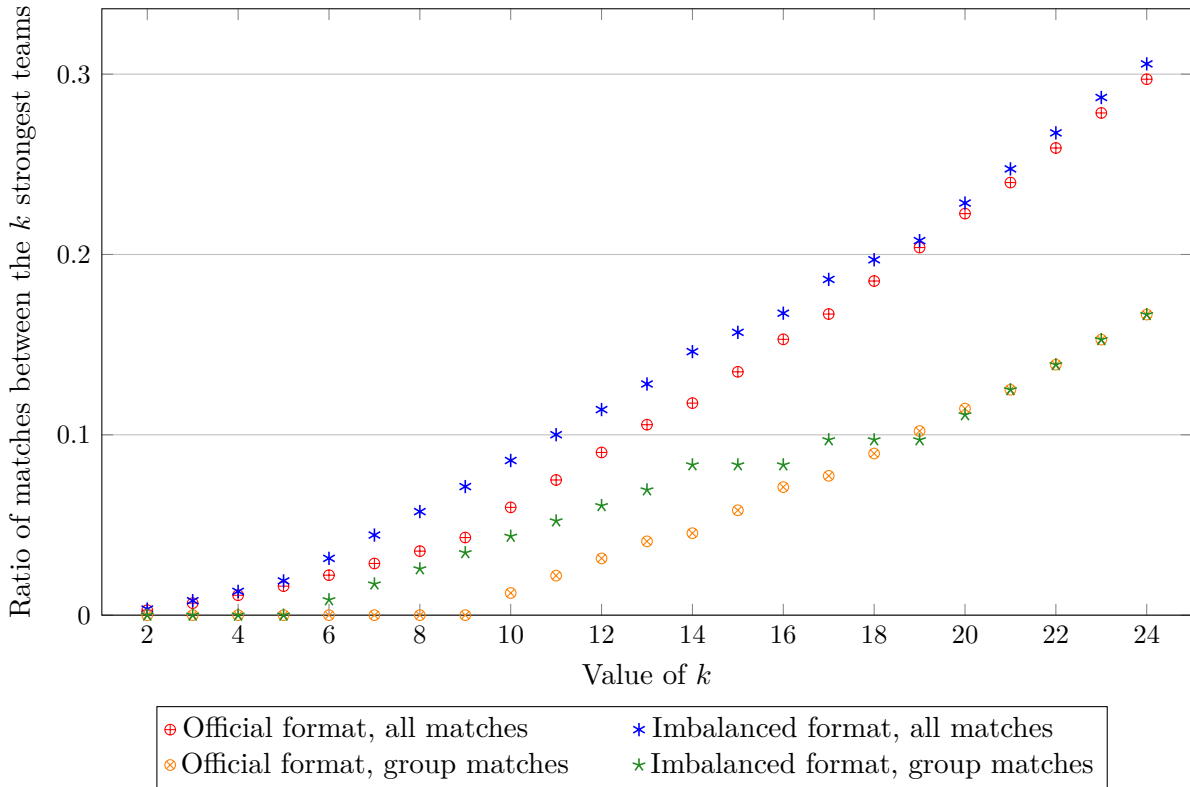
Acknowledgements

Figure 6: The ratio of
matches between the k strongest teams in the two formats for the 2026 FIFA World Cup

Notes: The three hosts are counted according to their Elo rating increased by 100 due to home advantage. The two winners of the play-offs are counted as the 47th and 48th teams.

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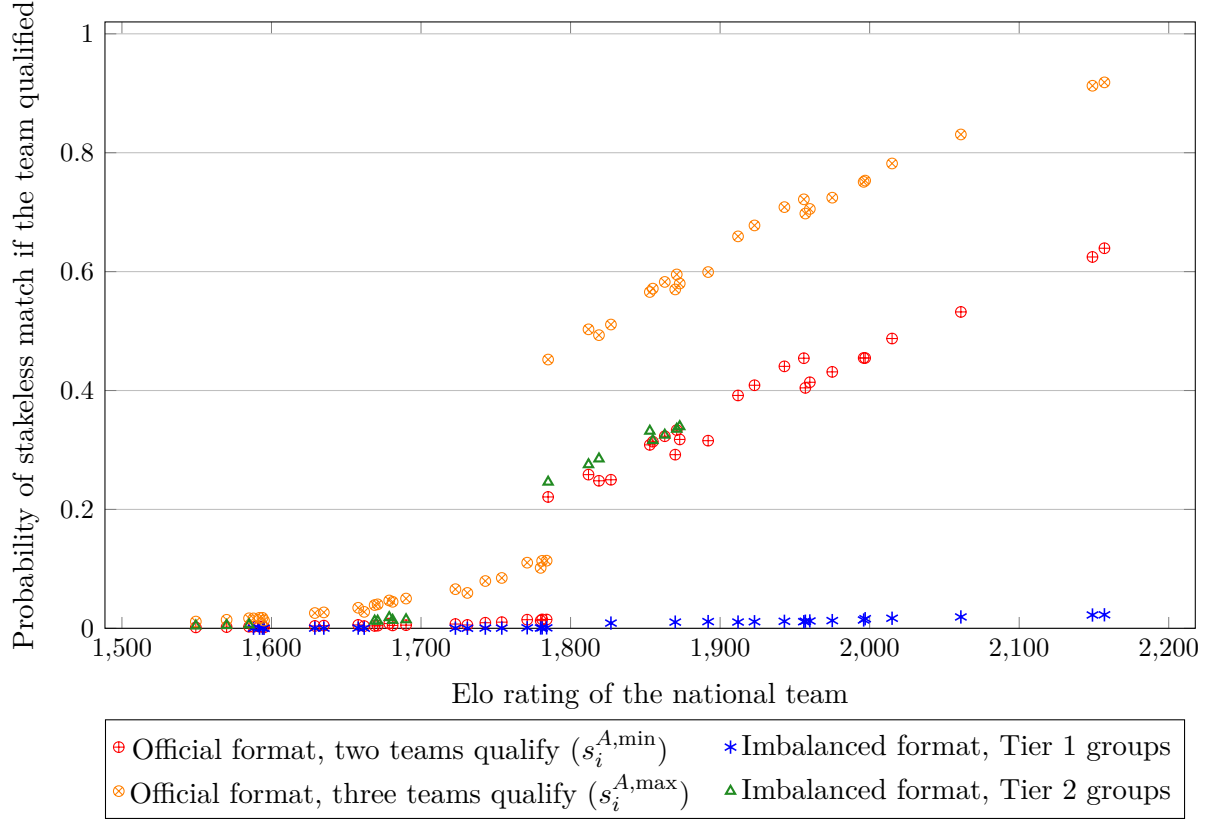
Figure 7: The probability of a stakeless match
played by an already qualified team in the two formats for the 2026 FIFA World Cup

Notes: The two winners of the play-offs are represented by their expected Elo ratings.
The Elo ratings of the three hosts are increased by 100 due to home advantage.

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