

On the non-uniformity of the 2026 FIFA World Cup draw

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“The following draw principles have been established to ensure a competitive balance – both in the group stage and, depending on sporting results, into the knockout stage – while retaining, insofar as possible, the random element inherent in tournament draws (FIFA, 2025).”

Abstract

The group stage of a sports tournament is often made more appealing by introducing additional constraints in the group draw that promote an attractive and balanced group composition. For example, the number of intra-regional group matches is minimised in several World Cups. However, under such constraints, the traditional draw procedure may become non-uniform, meaning that the feasible allocations of the teams into groups are not equally likely to occur. Our paper quantifies this non-uniformity of the 2026 FIFA World Cup draw for the official draw procedure, as well as for 47 reasonable alternatives implied by all permutations of the four pots and two group labelling policies. We show why simulating with a recursive backtracking algorithm is intractable, and propose a workable implementation using integer programming. The official draw mechanism is found to be optimal based on four measures of non-uniformity. Nonetheless, non-uniformity can be more than halved if the organiser aims to treat the best teams drawn from the first pot equally.

Keywords: draw procedure; integer programming; probability; tournament design; uniform distribution

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1 Introduction

The fundamental principle of a group stage draw in sports tournaments is to incorporate a random mechanism that treats all teams equally *ex ante* to the extent possible. In order to ensure balance, namely, to exclude groups of different overall strength *ex post*, usually additional draw constraints are designed, which imply equal treatment only for teams of comparable strength. To enhance the attractiveness of the tournament, further draw constraints can be imposed to guarantee that teams face opponents they would rarely encounter outside the tournament (Csató, 2022). Draw constraints may also be required owing to security reasons (Kobierecki, 2022). However, enforcing all draw constraints with a tractable and transparent random mechanism is far from straightforward (Boczoń and Wilson, 2023; Guyon, 2015; Roberts and Rosenthal, 2024).

The governing body of (association) football, FIFA (Fédération Internationale de Football Association), announced the rules of the 2026 FIFA World Cup draw on 25 November 2025. The draw took place on 5 December 2025. Although the regulation (FIFA, 2025)—similar to the 2018 (FIFA, 2017) and 2022 (FIFA, 2022) editions—does not specify how the draw constraints (see Section 3.1) are enforced, the video of the event uncovers that the so-called Skip mechanism (see Section 3.2) is used for this purpose.

The Skip mechanism is surprisingly challenging to simulate with a computer program (Roberts and Rosenthal, 2024). While neither FIFA, nor UEFA provides an algorithm for this purpose, Roberts and Rosenthal (2024) and Csató (2025a) give recursive backtracking algorithms that do work well for the 2018 and 2022 FIFA World Cups.

Our first main contribution is connected to simulating the 2026 FIFA World Cup draw. We show that, in contrast to previous editions of the tournament, a recursive backtracking algorithm remains hopelessly slow—or requires some non-trivial and case-sensitive pre-filtering—for the 2026 event due to the more restrictive constraints and the greater number of groups (see Section 3.3). Therefore, a more efficient identification of deadlocks in advance is presented, through an integer program, enabling a workable implementation of the Skip mechanism (see Section 3.4). As far as we know, our paper offers the first implementation of the Skip mechanism by an integer program. Although an integer programming approach has recently been suggested to simulate the UEFA Champions League league phase draw (Devriesere et al., 2025b; Guyon et al., 2025), its draw procedure differs from the Skip mechanism.

The Skip mechanism is known to distort the assignment probabilities compared to a uniform draw, which might benefit some teams at the expense of others (Csató, 2025a; Roberts and Rosenthal, 2024). Indeed, as the official description of the draw procedure (FIFA, 2025) admits, the 2026 FIFA World Cup draw “retains the random element” only *insofar as possible*, see the citation above. We consider five measures to quantify this non-uniformity (see Section 3.5).

Our second main contribution resides in investigating whether the draw procedure of the 2026 FIFA World Cup can be improved with respect to these objective functions. We examine using a different order of the four pots from which the teams are drawn, as well as an alternative group labelling policy. Indeed, the non-uniformity of the Skip mechanism depends on the order of the pots (Csató, 2025a), and the pre-assignment of the host(s) can be a source of non-uniformity, too (Roberts and Rosenthal, 2024). These adjustments provide 47 reasonable alternative draw procedures, which are compared in terms of their non-uniformity (see Section 4).

2 Related literature

Fairness has several different interpretations in the design of sports rules. For instance, a shooting sequence is fair if identical teams have the same chance of winning a shootout (Lambers and Spijksma, 2021), and a single-elimination tournament is fair if stronger teams are more likely to reach every stage of the tournament (Prince et al., 2013).

Regarding a group draw, Guyon (2015) calls a procedure fair if it is not biased against any team, that is, no team has a greater chance to end up in a tough group than its peers. Both empirical (Lapr e and Amato, 2025; Lapr e and Palazzolo, 2022, 2023) and theoretical (Cea et al., 2020; Laliena and L opez, 2019, 2025) papers characterise the FIFA World Cup draw as fair if the groups are balanced. Indeed, if the groups are perfectly balanced, the procedure cannot be biased against any team (although the converse does not necessarily hold). Another plausible interpretation of the fairness of a group draw is *uniformity*, when all feasible outcomes of the draw should occur with equal probability. In the following, we adopt the terminology of the recent survey by Devriesere et al. (2025a), which addresses uniformity under the heading fairness of the draw, and calls a draw procedure fair if it has uniform distribution over all valid assignments.

Jones (1990) analysed the fairness of the 1990 FIFA World Cup draw. Here, the two seeded South American teams—Argentina and Brazil—were automatically assigned to Group B and Group C, respectively. Pot 2 contained two South American teams (Colombia, Uruguay) that were not allowed to play in these groups, as well as four UEFA teams (Czechoslovakia, Ireland, Romania, Sweden). Each of these European teams has a probability of $1/4$ ($1/4$) to be assigned to Group B (C) in a uniform draw. In addition, since there were two South American and two UEFA teams from Pot 2 for Groups A and D–F, containing the four seeded UEFA teams, a seeded UEFA team should have a chance of $1/4$ ($1/8$) to play against a given South American (UEFA) team from Pot 2.

However, FIFA decided to assign the six teams from Pot 2 to Group A, containing the seeded team Italy, with an equal probability of $1/6$. If a South American team from Pot 2 had been placed in the same group as Argentina or Brazil, it would have been automatically reallocated to the next group without a South American team. Hence, West Germany (Pot 1)—automatically assigned to Group D—played against UEFA teams from Pot 2 with a cumulated probability of only $4/6 \cdot 3/5 \cdot 2/4 \cdot 1/3 + 2/6 \cdot 4/5 \cdot 3/4 \cdot 2/3 = 1/5$, instead of the fair $1/4 + 1/4 = 1/2$ in a uniform draw.

The 2006 FIFA World Cup draw used an analogous procedure to ensure geographic diversity in the group stage. According to Rathgeber and Rathgeber (2007), the seeded Germany had a chance of 64.29% to play against one of the two South American teams (Ecuador, Paraguay) drawn from Pot 2, in contrast to all other seeded UEFA teams such as Italy, which had a chance of only 27.14%, although these probabilities should be equal in a uniform draw. This was a serious flaw because the two South American teams were considered to be stronger than the other six teams in Pot 2. In Section 3.1, we will see a similar issue regarding Pot 4 in the 2026 FIFA World Cup draw.

After Guyon (2015) identified several problems in the 2014 FIFA World Cup draw, including non-uniform distribution, FIFA decided to reform the draw by allocating the teams into pots based on the FIFA World Ranking, and using the Skip mechanism to enforce draw constraints (Guyon, 2018). Nonetheless, the rules of the 2018 FIFA World Cup draw still implied that some feasible allocations occur with a higher probability. Csat o (2025a) computed this non-uniformity under the 24 possible orders of the four pots via Monte Carlo simulations. Even though the official draw order (Pot 1, Pot 2,

Pot 3, Pot 4) was the best according to the sum of absolute differences in assignment probabilities for all team pairs, it changed the probability of qualification by more than one percentage point for two countries. Analogously, [Roberts and Rosenthal \(2024\)](#) calculated the deviation from a uniform draw for the 2022 FIFA World Cup draw, but the authors did not investigate the role of draw order.

[Guyon \(2015\)](#) proposes a new tractable procedure for the 2014 FIFA World Cup draw that creates eight random, balanced, and geographically diverse groups, is not biased against any team, and makes all outcomes equally likely. [Roberts and Rosenthal \(2024\)](#) present two uniformly distributed draw procedures using balls and bowls to guarantee a nice television show that can be tried at <http://probability.ca/fdraw/>. However, in contrast to the method of [Guyon \(2015\)](#), they involve computer simulations at some point, which threatens transparency.

For the draw of sports tournaments, an integer programming approach has been used to simulate the UEFA Champions League league phase draw in two recent working papers, [Devriesere et al. \(2025b\)](#) and [Guyon et al. \(2025\)](#). But this draw employs a different procedure, the Drop mechanism, that has already received serious attention in the case of the UEFA Champions League Round of 16 draw ([Kiesl, 2013](#); [Klößner and Becker, 2013](#); [Wallace and Haigh, 2013](#); [Boczoń and Wilson, 2023](#); [Csató, 2025c](#)).

3 Methodology

Section 3.1 presents the draw constraints used in the 2026 FIFA World Cup. Section 3.2 introduces the Skip mechanism, the traditional procedure for a group draw in sports tournaments, and illustrates its sensitivity to the group labels. The challenges that emerge in simulating the 2026 FIFA World Cup draw are discussed in Section 3.3. We propose an integer programming implementation of the Skip mechanism in Section 3.4. Last but not least, Section 3.5 defines our measures of non-uniformity.

3.1 The 2026 FIFA World Cup draw

The 2026 FIFA World Cup is the first edition of this competition contested by 48 national teams, allocated into 12 groups of four teams each. Group balance is ensured by seeding the teams into four pots based on the FIFA World Ranking of 19 November 2025. The composition of the four pots is shown in Table 1, together with the confederations of the teams. The three hosts and the nine strongest teams are placed in Pot 1, the next 12 highest-ranked teams are placed in Pot 2, the next 12 are placed in Pot 3, while the six lowest-ranked teams are placed in Pot 4. Pot 4 also contains the four winners of UEFA play-offs and the two winners of intercontinental play-offs that are scheduled to be played only in March 2026, after the draw on 5 December 2025.

Table 1 uncovers that four teams are likely to be much stronger than the other teams in Pot 4: if the highest-ranked teams win the UEFA play-offs, they would fit into Pot 2 or the top of Pot 3 based on the FIFA World Ranking, which could create some strong groups ([Johnson, 2025](#)). Indeed, seeding the winners of play-offs in the weakest Pot 4 was suboptimal in the 2022 FIFA World Cup draw with respect to group balance ([Csató, 2023](#)).

Each group must consist of exactly one team from each pot. Furthermore, three types of draw constraints are imposed ([FIFA, 2025](#)):

Table 1: The seeding for the 2026 FIFA World Cup draw

Country	Confederation	Country	Confederation
Pot 1		Pot 2	
United States (14)	CONCACAF	Croatia (10)	UEFA
Mexico (15)	CONCACAF	Morocco (11)	CAF
Canada (27)	CONCACAF	Colombia (13)	CONMEBOL
Spain (1)	UEFA	Uruguay (16)	CONMEBOL
Argentina (2)	CONMEBOL	Switzerland (17)	UEFA
France (3)	UEFA	Japan (18)	AFC
England (4)	UEFA	Senegal (19)	CAF
Brazil (5)	CONMEBOL	Iran (20)	AFC
Portugal (6)	UEFA	South Korea (22)	AFC
Netherlands (7)	UEFA	Ecuador (23)	CONMEBOL
Belgium (8)	UEFA	Austria (24)	UEFA
Germany (9)	UEFA	Australia (26)	AFC
Pot 3		Pot 4	
Norway (29)	UEFA	Jordan (66)	AFC
Panama (30)	CONCACAF	Cape Verde (68)	CAF
Egypt (34)	CAF	Ghana (72)	CAF
Algeria (35)	CAF	Curaçao (82)	CONCACAF
Scotland (36)	UEFA	Haiti (84)	CONCACAF
Paraguay (39)	CONMEBOL	New Zealand (86)	OFC
Tunisia (40)	CAF	UEFA Path A (12/32/69/71)	UEFA
Ivory Coast (42)	CAF	UEFA Path B (28/31/43/63)	UEFA
Uzbekistan (50)	AFC	UEFA Path C (25/45/47/80)	UEFA
Qatar (51)	AFC	UEFA Path D (21/44/59/65)	UEFA
Saudi Arabia (60)	AFC	IC Path 1 (56/70/149)	Three
South Africa (61)	CAF	IC Path 2 (58/76/123)	Three

The numbers in parenthesis indicate the rank of the countries according to the November 2025 FIFA World Ranking, underlying the seeding. In the case of play-off winners, the ranks of all countries involved are given.

The winner of IC Path 1 may come from CAF, CONCACAF, or OFC. This team is not allowed to be in the same group as any nation from these confederations.

The winner of IC Path 2 may come from AFC, CONCACAF, or CONMEBOL. This team is not allowed to be in the same group as any nation from these confederations.

- *Allocation of hosts:* Mexico is automatically assigned to Group A, Canada to Group B, and the United States to Group D.
- *Balanced distribution of the highest-ranked teams:* The top four seeds, Spain, Argentina, France, and England, are treated differently from the other teams drawn from Pot 1. Spain and Argentina, as well as France and England, should play in opposite pathways in order to guarantee that, if they win their groups, they can only meet in the final. These four teams should also play in different quarters; if they win their respective groups, they can only meet in the semifinals. The quarters and pathways are determined by the labels of the groups. The first pathway consists of the first quarter $\{E, F, I\}$ and the second quarter $\{D, G, H\}$.

The second pathway consists of the third quarter $\{A, C, L\}$ and the fourth quarter $\{B, J, K\}$.

- *Geographic separation:* No group could have more than one team from the same confederation, except for UEFA, which has 16 teams in the 2026 FIFA World Cup. Each group needs to contain at least one, but no more than two UEFA teams. The placeholders of the play-offs are considered for each confederation from which the winner may come.

3.2 The Skip mechanism

Tournament organisers traditionally use the so-called Skip mechanism to create a valid group assignment (Csató, 2025c). This works as follows:

- The order of the pots from which the teams are drawn is chosen;
- The groups are labelled;
- The team drawn currently is assigned to the first available group in alphabetic order such that at least one feasible assignment remains for the teams still to be drawn;
- The above procedure is repeated until all pots are sequentially emptied in the given order.

A simulator of the Skip mechanism for the 2018 and 2022 FIFA World Cup draws is available at <http://probability.ca/fdraw/>. The video of the 2026 FIFA World Cup draw can be found at https://www.youtube.com/watch?v=9HX_tQBA-Iw.

Let us see an example illustrating when a group is skipped.

Example 1. Belgium is drawn first from Pot 1, and assigned to Group C since Group A is occupied by Mexico and Group B by Canada. Argentina is drawn second from Pot 1, and assigned to Group E since Group D is occupied by the United States. Then Spain is drawn third from Pot 1, and assigned to Group J: even though Groups F, G, H, I still have an empty slot for a team from Pot 1, Spain cannot play in the same pathway as Argentina.

Naturally, the problem is not always as simple to solve as in Example 1, since the draw needs to avoid any deadlock, when it is no longer possible to complete the draw.

Example 2. Continue Example 1. Portugal is drawn fourth, and assigned to Group F. Brazil is drawn fifth, and assigned to Group G. Germany is drawn sixth, and assigned to Group I—even though Group H also has an empty slot. Why? The remaining teams in Pot 1 are France, England, and the Netherlands. Slots are available in Groups H, I, L, and K. France and England cannot be assigned to Group I since they are not allowed to play in the same quarter with Argentina (which plays in Group E). Analogously, they cannot be assigned to Group K because Spain is in Group J. Consequently, the team drawn first (second) from the set of France and England should be in Group H (L); thus, Germany cannot be placed in Group H.

The assignment probabilities of the Skip mechanism depend on the order of the pots (Csató, 2025a). Even though the increasing order Pot 1, Pot 2, Pot 3, Pot 4 is followed in the 2026 FIFA World Cup draw (FIFA, 2025), any permutation of the four pots can be

implemented with minimal modifications to the draw procedure. For instance, a reversed order was chosen for the 2020/21 (UEFA, 2020) and the 2022/23 (UEFA, 2021) UEFA Nations League league phase draws, while the quite arbitrary order Pot 4, Pot 3, Pot 1, Pot 2 was used in the 2025 World Men’s Handball Championship (IHF, 2020).

The following example shows that the Skip mechanism is also sensitive to the labels of the groups.

Example 3. Consider a draw where Pot 1 contains teams 1–3 and Pot 2 contains teams 4–6. There is one restriction: teams 2 and 5 cannot be assigned to the same group.

In the absence of the draw constraint, $3! \cdot 3! = 36$ feasible assignments exist if the group labels are taken into account. However, teams 2 and 5 are in the same group in $3 \cdot 2! \cdot 2! = 12$ assignments, which is prohibited. Among the 24 valid assignments, team 1 is placed in the same group as teams 4 and 6 in six cases each (one case each if group labels are ignored), and in the same group as team 5 in 12 cases (two cases if group labels are ignored), since no constraint applies to the remaining four teams 2, 3, 4, and 6. Hence, team 1 plays against team 5 with a probability of $1/2$, and against teams 4 and 6 each with a probability of $1/4$ in a uniform draw.

If team 1 is pre-assigned to Group A, then it has a probability of $1/3$ to play against each of teams 4, 5, 6 in the group stage under the Skip mechanism.

Now see the case when team 1 is drawn from Pot 1 randomly. It is drawn first and placed in Group A with a probability of $1/3$. It is drawn second and placed in Group B with a probability of $1/3$. If team 2 is in Group A, which has an overall probability of $1/6$, team 1 is assigned to the same group as team 5 with a probability of $2/3$ (if team 5 is drawn first or second from Pot 2). Analogously, if team 2 is in Group C, team 1 is assigned to the same group as team 5 with a probability of $2/3$ (if team 5 is drawn second or third from Pot 2). Finally, if team 1 is drawn third and placed in Group C, team 2 is in Group A (B) with an overall probability of $1/6$ ($1/6$), and team 1 is assigned to the same group as team 5 with a probability of $1/3$ ($2/3$). Therefore, teams 1 and 5 are assigned to the same group with a chance of $1/3 \cdot 1/3 + 1/6 \cdot (2/3 + 2/3) + 1/6 \cdot (1/3 + 2/3) = 1/9 + 2/9 + 1/6 = 1/2$.

To summarise, the Skip mechanism is non-uniform if team 1 is pre-assigned to Group A, but uniform if team 1 is drawn randomly from Pot 1.

According to Example 3, pre-assigning a team to a group—or, more generally, imposing constraints that depend on the group labels—can influence the non-uniformity of the draw. However, the groups could be labelled accordingly even *after* the group draw. For instance, if the organiser wants to guarantee the assignment of Mexico to Group A, then the group of Mexico is simply called Group A once the group composition is obtained.

Based on these arguments, the official draw procedure for the 2026 FIFA World Cup has 47 reasonable alternatives by changing the order of the pots and labelling the groups ex-ante (before the draw) or ex-post (after the draw). They will be compared and evaluated in Section 4 with respect to their non-uniformity, quantified by the five measures that will be defined in Section 3.5.

3.3 Challenges of simulating the 2026 FIFA World Cup draw

A uniform draw selects any feasible allocation of the teams into groups with equal probability, which can be achieved by a *rejection sampler* (Roberts and Rosenthal, 2024, Section 2.1). In the first step, a draw is generated uniformly and randomly without the draw constraints. In the second step, this assignment is accepted if all restrictions are satisfied, and rejected if at least one restriction is violated.

Note that checking all possible cases in the 2026 FIFA World Cup is hopeless as the number of draws equals $9! \cdot (12!)^3 \approx 3.99 \cdot 10^{31}$. Therefore, the rejection sampler is used repeatedly until the required number of draws is obtained.

In the case of the 2018 FIFA World Cup, about one out of 161 random draws is accepted (Csató, 2025a). The analogous ratio for the 2022 FIFA World Cup draw is one out of 560 (Roberts and Rosenthal, 2024).

The constraints of the 2026 FIFA World Cup draw are substantially more restrictive. In Pot 4, the placeholders of the UEFA play-offs are treated analogously as UEFA teams in the other pots. The winner of the first inter-continental play-off cannot be assigned to a group with a CAF, CONCACAF, or OFC team. The first three pots contain seven CAF and four CONCACAF teams; hence, at least one group remains available for this placeholder even if all constraints related to IC Path 1 are ignored until Pot 3 is emptied.

However, the winner of the second inter-continental play-off can come from AFC, CONCACAF, or CONMEBOL, which gives $7 + 4 + 6 = 17$ deadlocking nations in Pots 1–3, while there are 12 groups. Thus, the draw can be completed only if the placeholder of IC Path 2 is assigned to a group with one CAF and two UEFA countries (Johnson, 2025).

As a result, the rejection sampler accepts about one out of 1 million random draws for the 2026 FIFA World Cup. We generated 100 million uniformly distributed valid assignments, using R (R Core Team, 2025) with the additional packages `doRNG` (Gaujoux, 2025) and `kableExtra` (Zhu, 2024). This took just under 11 days on 100 parallel threads.

The Skip mechanism should consider $9! \cdot (12!)^3 \approx 3.99 \cdot 10^{31}$ scenarios for each order of the pots with ex-ante group labelling, and $(12!)^4 \approx 5.26 \cdot 10^{34}$ scenarios for each order of the pots with ex-post group labelling. Therefore, only a simulation remains feasible.

Based on our experience with the 2018 (Csató, 2025a) and 2022 (Csató, 2023) FIFA World Cup draws, this computation was expected to be trivial. Indeed, both Roberts and Rosenthal (2024) and Csató (2025a) suggested recursive backtracking algorithms to simulate the Skip mechanism, which produces one million random draws for any order of the pots in about 1-2 hours for these examples.

Definition 1. *Recursive backtracking algorithm:* Given a partial draw and a random order in which the teams are drawn from the pots, it assigns the next team to the next available slot, and checks *all* permutations of the remaining teams to see whether the draw can be completed. If yes, the randomly selected team is assigned accordingly. If not, it attempts to assign this team to the subsequent available slot, and so on.

Figure 1 shows a recursive backtracking algorithm. It can reliably detect any subsequent conflict, no matter where the conflict occurs—but requires trying all possible permutations of the teams still to be drawn in case of a conflict.

A recursive backtracking algorithm is attractive because it can be easily implemented in any program, without any other tool such as a linear programming solver. However, it struggles with the 2026 FIFA World Cup draw due to the placeholder of IC Path 2.

Claim 1. *Simulating the 2026 FIFA World Cup is intractable with a recursive backtracking algorithm.*

In order to verify Claim 1, we show that a recursive backtracking algorithm is extremely unlikely to generate a sufficient number of random draws for the 2026 FIFA World Cup.

Consider the situation presented in Table 2, a possible assignment of the teams from Pots 1–2 to the 12 groups by ignoring all restrictions that apply to the teams drawn from Pots 3–4. This draw cannot be completed since no group contains either two UEFA teams,

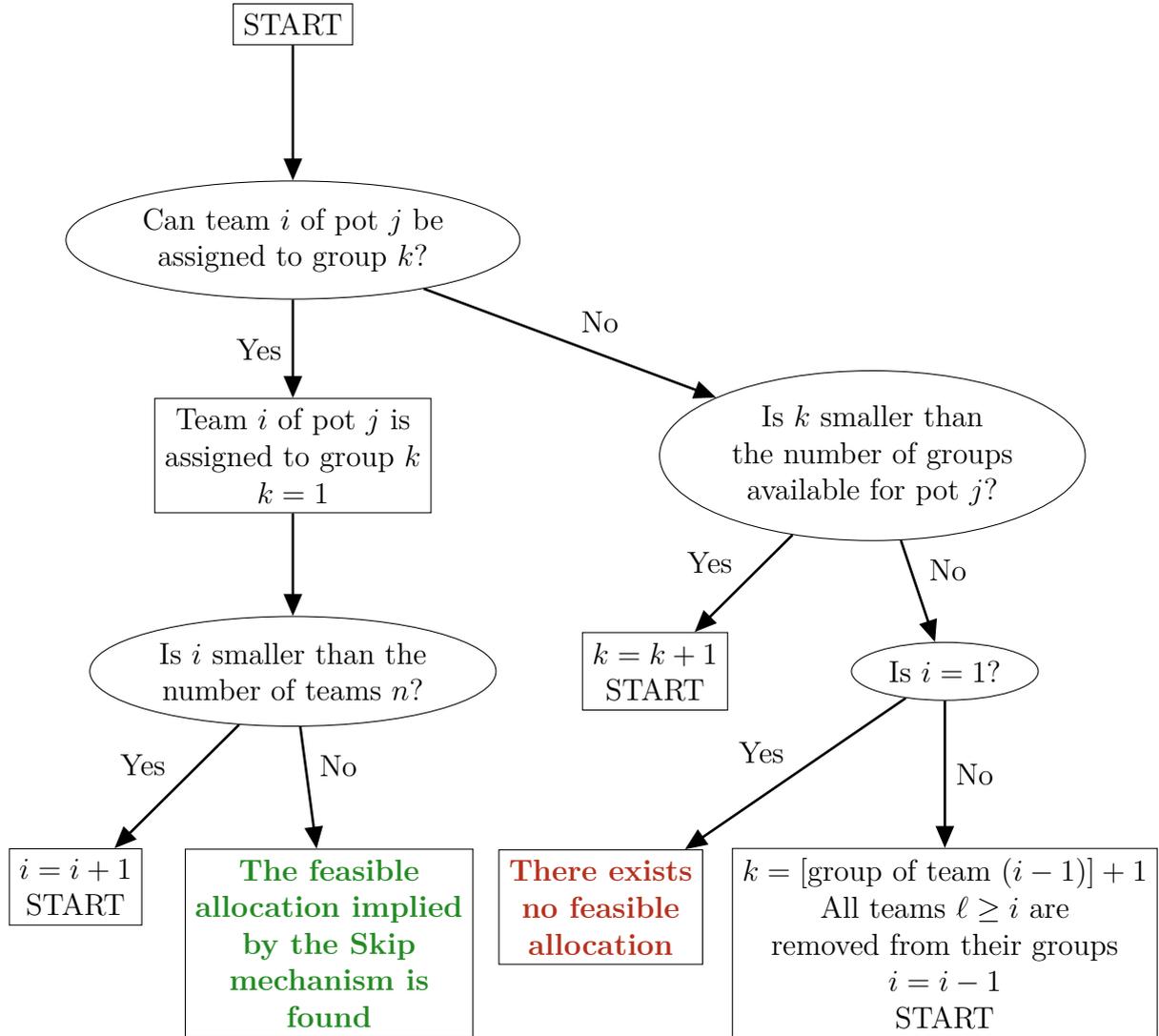


Figure 1: A recursive backtracking algorithm that finds the feasible group composition corresponding to a given random order of the teams

or one CAF and one UEFA team. A recursive backtracking algorithm is able to recognise the problem only after checking all possible orders of the 24 teams drawn from Pots 3–4. This requires $(12!)^2 \approx 2.29 \cdot 10^{17}$ steps, which is roughly the total number of draws in the 2018 and 2022 FIFA World Cups. Hence, recursive backtracking is guaranteed to get stuck, even on a supercomputer, if it encounters a situation analogous to Table 2.

By simulating random draws from Pots 1–2, we have estimated the probability of such a scenario that turns out to be about $p = 0.2315\%$. Therefore, a recursive backtracking algorithm can avoid the problem of Table 2 with a chance of merely $(1-p)^{10,000} \approx 8.6 \cdot 10^{-11}$ if the draw is simulated only 10 thousand times, but this is insufficient for a robust approximation of the assignment probabilities.

This barrier can perhaps be solved by devising appropriate constraints that can recognise a deadlock analogous to Table 2 earlier. However, such a manual modification would be burdensome and depend on the given set of draw constraints. Consequently, simulating the 2026 FIFA World Cup draw calls for a different approach.

Table 2: A possible start of the 2026 FIFA World Cup draw if the constraints for the teams drawn from Pots 3–4 are ignored

Group	Pot 1		Pot 2	
	Country	Confederation	Country	Confederation
A	Mexico	CONCACAF	Morocco	CAF
B	Canada	CONCACAF	Austria	UEFA
C	Belgium	UEFA	Australia	AFC
D	United States	CONCACAF	Croatia	UEFA
E	England	UEFA	Iran	AFC
F	France	UEFA	Japan	AFC
G	Argentina	CONMEBOL	Switzerland	UEFA
H	Brazil	CONMEBOL	Senegal	CAF
I	Germany	UEFA	South Korea	AFC
J	Netherlands	UEFA	Columbia	CONMEBOL
K	Portugal	UEFA	Ecuador	CONMEBOL
L	Spain	UEFA	Uruguay	CONMEBOL

3.4 A novel implementation using integer programming

Let T be the set of teams, G be the set of groups, P be the set of pots, and C be the set of confederations. Let T_c be the set of teams from confederation $c \in C$, and let T_p be the set of teams drawn from Pot $p \in P$. We define the following sets based on Section 3.1:

- $Q_1 = \{E, F, I\}$, $Q_2 = \{D, G, H\}$, $Q_3 = \{A, C, L\}$, $Q_4 = \{B, J, K\}$;
- $H_1 = Q_1 \cup Q_2$, $H_2 = Q_3 \cup Q_4$;
- $T^* = \{\text{Spain, Argentina, France, England}\}$;
- $\mathcal{F} = \{\{\text{Spain, Argentina}\}, \{\text{France, England}\}\}$.

Set Q_k represents the k th quarter of the knockout bracket. Set H_1 (H_2) is the first (second) pathway, consisting of the first and second (third and fourth) quarters. The four highest-ranked national teams are given by set T^* .

Any draw is determined by $48 \cdot 12 = 576$ binary variables $x_{i,g}$, which equals 1 if team $i \in T$ is assigned to group $g \in G$, and 0 otherwise. A feasible draw should satisfy the following integer program:

$$\sum_{i \in T_c} x_{i,g} \leq 1 \quad \forall g \in G, \forall c \in C \setminus \{\text{UEFA}\} \quad (1)$$

$$\sum_{i \in T_{\text{UEFA}}} x_{i,g} \geq 1 \quad \forall g \in G \quad (2)$$

$$\sum_{i \in T_{\text{UEFA}}} x_{i,g} \leq 2 \quad \forall g \in G \quad (3)$$

$$\sum_{g \in G} x_{i,g} = 1 \quad \forall i \in T \quad (4)$$

$$\sum_{i \in T_p} x_{i,g} = 1 \quad \forall g \in G, \forall p \in P \quad (5)$$

$$\sum_{g \in H_k} x_{i,g} + \sum_{g \in H_k} x_{j,g} \leq 1 \quad \forall \{i, j\} \in \mathcal{F}, \forall k \in \{1, 2\} \quad (6)$$

$$\sum_{g \in Q_k} \sum_{i \in T^*} x_{i,g} \leq 1 \quad \forall k \in \{1, 2, 3, 4\} \quad (7)$$

$$x_{\text{Mexico,A}} = x_{\text{Canada,B}} = x_{\text{United States,D}} = 1 \quad (8)$$

$$x_{i,g} \in \{0, 1\} \quad \forall i \in T, \forall g \in G \quad (9)$$

Constraints (1) state that no group contains more than one team from the same confederation, except for UEFA. Constraints (2)–(3) enforce that every group contains at least one and at most two teams from UEFA. Constraints (4) ensure that every team is assigned to exactly one group, and constraints (5) guarantee that each group contains exactly one team from each pot. Constraints (6) imply that, for every pair in \mathcal{F} , the two teams should be in opposite pathways. Constraints (7) enforce that the four teams in T^* play in different quarters. Constraints (8) show the pre-assignment of the three host nations. Finally, expressions (9) give the domains of the variables.

If the official ex-ante group labelling is used, we directly follow the Skip mechanism described in Section 3.2. An unallocated team is drawn randomly from the actual pot. It is checked whether assigning this team to the first available group, in alphabetical order, allows a solution to constraints (1)–(9). If yes, the given team is assigned to this group (the corresponding variable is set to 1), and we draw a new team from the set of unassigned teams. If no feasible solution exists by assigning the given team to this group, the draw cannot be completed without violating a constraint now or later. Then, it is checked whether assigning the given team to the next available group results in a feasible solution. Analogously to the Skip mechanism, this procedure is repeated until the given team can be assigned to a group such that the draw can be completed—which should be possible, since the assignment of the previous team was verified to leave at least one feasible outcome. Hence, the corresponding binary variable is fixed at 1, and the next unallocated team is drawn according to the fixed order of the pots, until all teams are assigned to a group.

If the group labelling is done only ex-post, constraints (6) and (7) are ignored because they can be satisfied by appropriately labelling the groups containing the four teams in set T^* . Similarly, there is no need for constraints (8), and the three hosts are treated similarly to the other nine teams drawn from Pot 1.

With each order of the pots and group labelling policy, 1.2 million random draws were simulated. We used a GNU/Linux-based system with an AMD EPYC 7532 32-Core Processor running at 3.3GHz, provided with 8 threads and 64GB of RAM. The integer programming models were solved by Gurobi 12.0 (<https://www.gurobi.com/>). This

resulted in a computation time of about 14 hours on average for each of the 48 draw procedures.

3.5 Quantifying the non-uniformity of a draw procedure

In the absence of draw constraints, each team has 36 possible opponents in the group stage, which leads to 864 team pairs with a positive probability of occurring. If a confederation (except for UEFA) has p and q teams in two pots, respectively, $p \cdot q$ team pairs are prohibited. Therefore, the number of team pairs that cannot play against each other in the group stage is $4 \cdot 3 + 4 \cdot 2 + 3 \cdot 2 = 26$ for AFC, $1 \cdot 5 + 1 \cdot 3 + 5 \cdot 3 = 23$ for CAF, $3 \cdot 1 + 3 \cdot 4 + 1 \cdot 4 = 19$ for CONCACAF, and $2 \cdot 3 + 2 \cdot 1 + 2 \cdot 1 + 3 \cdot 1 + 3 \cdot 1 + 1 \cdot 1 = 17$ for CONMEBOL. It is zero for OFC since the only OFC team and the winner of the first intercontinental play-off are both assigned to Pot 4. Finally, any two UEFA teams can be assigned to the same group if they are drawn from different pots.

Let p_{ij}^U be the probability of assigning teams i and j to the same group under a uniform draw U . $i < j$ is assumed in the following to avoid double counting. The number of team pairs with a non-zero probability, $P_{>0} = \#\{p_{ij}^U : p_{ij}^U > 0\}$, equals $864 - 26 - 23 - 19 - 17 = 779$. A draw procedure D changes p_{ij}^U to p_{ij}^D ; these differences need to be aggregated to measure the non-uniformity of D .

Denote the set of all teams by $T = \{i : 1 \leq i \leq 48\}$, the set of teams in Pot 1 by $T_1 = \{i : 1 \leq i \leq 12\}$, the set of teams in Pots 1–3 by $T_{123} = \{i : 1 \leq i \leq 36\}$, and the set of UEFA teams drawn from Pot 4 by $T_{4U} = \{i : 43 \leq i \leq 46\}$, respectively. Denote the k th highest element of a set by superscript (k) .

We consider five different metrics to quantify the non-uniformity of a draw procedure:

- The mean of absolute differences in assignment probabilities for all team pairs with a non-zero probability:

$$M_1 = \frac{\sum |p_{ij}^D - p_{ij}^U| : i, j \in T}{P_{>0}};$$

- The highest absolute difference in assignment probabilities for all team pairs:

$$M_2 = \left\{ |p_{ij}^D - p_{ij}^U| : i, j \in T \right\}^{(1)};$$

- The mean of the eight highest differences in assignment probabilities for all team pairs:

$$M_3 = \frac{\sum_{k=1}^8 \left\{ |p_{ij}^D - p_{ij}^U| : i, j \in T \right\}^{(k)}}{8};$$

- The mean of absolute differences in assignment probabilities for all team pairs containing a UEFA team drawn from Pot 4:

$$M_4 = \frac{\sum |p_{ij}^D - p_{ij}^U| : i \in T_{123} \text{ and } j \in T_{4U}}{36 \cdot 4};$$

- The mean of absolute differences in assignment probabilities for all team pairs containing a team drawn from Pot 1 and a UEFA team drawn from Pot 4:

$$M_5 = \frac{\sum |p_{ij}^D - p_{ij}^U| : i \in T_1 \text{ and } j \in T_{4U}}{12 \cdot 4}.$$

All measures M_1 – M_5 are multiplied by 100 to get them in percentage points.

M_1 is perhaps the most convenient way of aggregation, but the average may mask large changes for individual teams. M_2 focuses on the largest deviation from a uniform draw, while M_3 considers the eight largest differences in assignment probabilities. Finally, M_4 and M_5 are motivated by the strange policy of assigning the four winners of UEFA play-offs to the weakest Pot 4. As a result, each team in Pots 1–3 has a strong preference to avoid a UEFA team from Pot 4. Any difference in these assignment probabilities may be substantially more costly for the organiser than one affecting other team pairs, which motivates the use of M_4 . Analogously, M_5 restricts attention to the teams in Pot 1 and Pot 4, by assuming that the strongest teams and the hosts should primarily be “defended” against the imbalance existing in Pot 4. In the formulas of M_4 and M_5 , no difference in assignment probabilities equals zero by definition, since every team in Pots 1–3 can play against a UEFA team in Pot 4 with a non-zero probability.

4 Results

Table 3 shows the non-uniformity of the Skip mechanism with the 24 possible draw orders and ex-ante group labelling for the 2026 FIFA World Cup draw, according to the five measures. Usually, all metrics remain similar if only the first two pots are exchanged. Crucially, the official draw order of Pot 1, Pot 2, Pot 3, Pot 4 performs best with respect to M_1 and M_3 , and the possible improvement is quite limited for measures M_2 and M_4 . The order of the pots plays a non-negligible role: the value of M_1 can be doubled by choosing another version of the Skip mechanism, and the situation is even worse for the other three measures. The maximal difference M_2 can exceed 20 percentage points under the draw order 4-2-1-3, when the assignment probability of Paraguay (the only CONMEBOL team in Pot 3) and the winner of the first inter-continental play-off (IC Path 1) equals 18.2% in a uniform draw but 39.1% under the Skip mechanism. However, the official draw procedure is suboptimal with respect to measure M_5 ; it is dominated by 10 draw orders, in some cases by more than 40%.

The non-uniformity of the 2026 FIFA World Cup draw seems to be more favourable than in the case of the previous two editions, where the same draw procedure was used. The value of M_1 is about 0.82 and 1.43 for the 2018 and 2022 World Cups, respectively, while the maximal difference M_2 reaches 10.24 and 10.49, respectively (Csató, 2025b). The latter is decreased to roughly one-third of what is seen for eight groups. The reason is partially the 50% increase in the number of groups that reduces all assignment probabilities by one-third in an unconstrained draw. In addition, having 12 groups instead of eight decreases the role of prohibited pairs imposed by the constraints for all confederations except for UEFA. To conclude, the expansion to 48 teams with the same structure of draw restrictions has greatly improved the non-uniformity of the group draw, at least for the 2026 FIFA World Cup with its given set of geographic (and competitive balance) restrictions.

Table 4 presents the differences in assignment probabilities compared to a uniform draw for all pairs of countries if the official draw procedure is used. The largest values can be seen for Mexico and the two African nations drawn from Pot 4: their assignment probability equals 9.1% in a uniform draw, but remains only 5.3% in the actual draw. The non-European teams in Pot 1, especially the two South American nations, Argentina and Brazil, are more likely to play against the winners of UEFA play-offs; the chance is about 14% instead of 11.3% for each of the four teams. This is caused by the short-sightedness

Table 3: Measures of non-uniformity in the 2026 FIFA World Cup draw under all draw orders of the Skip mechanism: ex-ante group labelling

Measure Order	Average (M_1)		Maximal (M_2)		Maximal 8 (M_3)		Pot 4 (M_4)		Pots 1/4 (M_5)	
	Value	Chg.	Value	Chg.	Value	Chg.	Value	Chg.	Value	Chg.
1-2-3-4	0.64	—	3.85	—	3.51	—	0.70	—	1.64	—
1-2-4-3	0.97	▲ 50%	15.83	▲ 351%	8.70	▲ 148%	0.97	▲ 311%	1.36	▼ 17%
1-3-2-4	0.71	▲ 10%	4.52	▲ 29%	4.05	▲ 15%	0.73	▲ 17%	1.68	▲ 2%
1-3-4-2	1.09	▲ 69%	8.70	▲ 148%	6.62	▲ 89%	0.98	▲ 126%	1.64	▲ 0%
1-4-2-3	1.18	▲ 83%	16.52	▲ 371%	9.06	▲ 158%	1.59	▲ 329%	3.19	▲ 94%
1-4-3-2	1.23	▲ 91%	6.40	▲ 82%	6.21	▲ 77%	1.59	▲ 66%	3.19	▲ 94%
2-1-3-4	0.64	▲ 0%	3.92	▲ 12%	3.52	▲ 0%	0.72	▲ 2%	1.62	▼ 1%
2-1-4-3	0.95	▲ 48%	15.38	▲ 338%	8.79	▲ 150%	0.99	▲ 299%	1.39	▼ 15%
2-3-1-4	0.71	▲ 11%	3.92	▲ 12%	3.42	▲ 3%	0.78	▲ 2%	1.68	▲ 2%
2-3-4-1	0.71	▲ 11%	4.40	▲ 25%	3.75	▲ 7%	0.67	▼ 14%	0.97	▼ 41%
2-4-1-3	1.13	▲ 76%	19.38	▲ 452%	9.68	▲ 176%	1.49	▲ 403%	1.61	▼ 2%
2-4-3-1	1.23	▲ 91%	17.47	▲ 398%	9.63	▲ 174%	1.35	▲ 354%	1.61	▼ 2%
3-1-2-4	0.72	▲ 11%	4.53	▲ 29%	4.07	▲ 16%	0.74	▲ 18%	1.68	▲ 2%
3-1-4-2	1.08	▲ 68%	8.72	▲ 148%	6.68	▲ 90%	0.97	▲ 126%	1.62	▼ 2%
3-2-1-4	0.74	▲ 15%	3.69	▼ 4%	3.46	▲ 1%	0.73	▲ 4%	1.65	▲ 1%
3-2-4-1	0.79	▲ 23%	4.17	▲ 19%	3.61	▲ 3%	0.77	▲ 8%	0.96	▼ 42%
3-4-1-2	1.01	▲ 57%	8.79	▲ 150%	6.91	▲ 97%	1.15	▲ 128%	1.54	▼ 6%
3-4-2-1	1.11	▲ 73%	8.79	▲ 150%	7.66	▲ 118%	0.97	▲ 128%	1.40	▼ 15%
4-1-2-3	1.18	▲ 84%	16.39	▲ 367%	9.02	▲ 157%	1.59	▲ 326%	3.20	▲ 95%
4-1-3-2	1.24	▲ 92%	6.40	▲ 82%	6.20	▲ 77%	1.59	▲ 66%	3.20	▲ 95%
4-2-1-3	1.24	▲ 92%	20.91	▲ 495%	10.01	▲ 185%	1.65	▲ 443%	2.09	▲ 28%
4-2-3-1	1.35	▲ 110%	19.12	▲ 445%	10.07	▲ 187%	1.53	▲ 396%	2.09	▲ 28%
4-3-1-2	1.18	▲ 84%	6.40	▲ 82%	6.16	▲ 75%	1.47	▲ 66%	2.09	▲ 28%
4-3-2-1	1.31	▲ 103%	8.94	▲ 155%	7.75	▲ 121%	1.25	▲ 132%	2.09	▲ 28%

In columns Chg., the arrow/number shows the direction/size of the change in the non-uniformity of the draw compared to the official draw order 1-2-3-4 with ex-ante group labelling (see the first row).

of the Skip mechanism, which considers the upper bound for UEFA nations only after two UEFA teams are assigned to the same group, in contrast to a uniform draw that “knows” the presence of four UEFA teams in Pot 4. Since the eight non-UEFA teams in Pot 4 are weaker than the four UEFA teams, the seven strongest European teams benefit from using the Skip mechanism. Argentina and Brazil have a lower probability to play against the five European teams drawn from Pots 2 and 3 in the actual draw.

The three host nations are treated differently due to their pre-assignment to the groups because the Skip mechanism is not independent of the group labels. Mexico—assigned automatically to Group A—has a higher chance to play against a strong opponent drawn from Pot 4 ($4 \cdot 19.3\%$) than Canada ($4 \cdot 18\%$), and, especially, the United States ($4 \cdot 17.2\%$).

This source of non-uniformity can be avoided by labelling the groups only after their composition is determined. Thus, Table 5 reports the results with ex-post group labelling. Unsurprisingly, the highest difference(s) in assignment probabilities is (are) lower compared to the official draw (see M_2 and M_3) as Mexico, Canada, and the United States have only 17.4% chance to play against a given winner of the UEFA play-offs. On the other

Table 5: Measures of non-uniformity in the 2026 FIFA World Cup draw under all draw orders of the Skip mechanism: ex-post group labelling

Measure Order	Average (M_1)			Maximal (M_2)			Maximal 8 (M_3)			Pot 4 (M_4)			Pots 1/4 (M_5)		
	Value	Chg.		Value	Chg.		Value	Chg.		Value	Chg.		Value	Chg.	
1-2-3-4	0.76	▲	19%	3.44	▼	11%	3.15	▼	10%	0.78	▲	12%	1.35	▼	18%
1-2-4-3	0.96	▲	50%	15.51	▲	303%	6.94	▲	98%	1.02	▲	47%	1.23	▼	25%
1-3-2-4	0.78	▲	22%	4.53	▲	18%	3.90	▲	11%	0.87	▲	25%	1.49	▼	9%
1-3-4-2	1.04	▲	61%	6.13	▲	59%	5.55	▲	58%	1.05	▲	51%	1.82	▲	11%
1-4-2-3	1.15	▲	78%	16.13	▲	319%	7.96	▲	127%	1.65	▲	138%	3.20	▲	95%
1-4-3-2	1.11	▲	73%	6.31	▲	64%	5.96	▲	70%	1.62	▲	133%	3.20	▲	95%
2-1-3-4	0.77	▲	20%	3.41	▼	12%	3.13	▼	11%	0.78	▲	12%	1.31	▼	20%
2-1-4-3	0.97	▲	51%	15.53	▲	303%	6.99	▲	99%	1.04	▲	49%	1.25	▼	24%
2-3-1-4	0.91	▲	41%	3.66	▼	5%	3.60	▲	2%	0.85	▲	22%	1.34	▼	18%
2-3-4-1	0.85	▲	33%	4.93	▲	28%	4.41	▲	25%	0.69	▼	0%	0.79	▼	52%
2-4-1-3	1.05	▲	64%	17.10	▲	344%	9.04	▲	157%	1.38	▲	99%	0.82	▼	50%
2-4-3-1	1.03	▲	60%	8.70	▲	126%	7.11	▲	103%	1.18	▲	70%	1.17	▼	29%
3-1-2-4	0.79	▲	23%	4.57	▲	19%	3.88	▲	11%	0.86	▲	24%	1.46	▼	11%
3-1-4-2	1.04	▲	62%	6.23	▲	62%	5.60	▲	59%	1.06	▲	53%	1.82	▲	11%
3-2-1-4	0.91	▲	42%	3.67	▼	5%	3.62	▲	3%	0.87	▲	25%	1.36	▼	17%
3-2-4-1	0.84	▲	30%	4.71	▲	22%	4.33	▲	23%	0.69	▼	1%	0.83	▼	49%
3-4-1-2	1.00	▲	55%	5.98	▲	55%	5.06	▲	44%	1.38	▲	99%	1.79	▲	9%
3-4-2-1	0.82	▲	28%	3.37	▼	12%	3.17	▼	10%	1.13	▲	63%	1.14	▼	31%
4-1-2-3	1.15	▲	79%	15.64	▲	306%	7.87	▲	124%	1.66	▲	139%	3.20	▲	95%
4-1-3-2	1.13	▲	75%	6.30	▲	63%	5.99	▲	71%	1.62	▲	133%	3.20	▲	95%
4-2-1-3	1.04	▲	62%	16.94	▲	340%	8.94	▲	155%	1.35	▲	94%	0.74	▼	55%
4-2-3-1	1.02	▲	59%	8.61	▲	124%	7.03	▲	100%	1.20	▲	73%	1.25	▼	24%
4-3-1-2	0.99	▲	54%	5.92	▲	54%	5.01	▲	43%	1.37	▲	97%	1.70	▲	3%
4-3-2-1	0.83	▲	30%	3.50	▼	9%	3.25	▼	7%	1.16	▲	67%	1.26	▼	23%

In columns Chg., the arrow/number shows the direction/size of the change in the non-uniformity of the draw compared to the official draw order 1-2-3-4 with ex-ante group labelling (see the first row in Table 3).

hand, the value of M_1 increases by almost 20%, and ex-post group labelling is not effective under any draw order with respect to measure M_1 . The maximal reduction of about 10% in M_2 and M_3 probably does not compensate for the worsening average difference in all assignment probabilities.

However, the original value of M_4 can be retained, and M_5 — the mean difference in the assignment probability of a team in Pot 1 and a UEFA team in Pot 4—can be more than halved by choosing the draw order 2-3-4-1 or 3-2-4-1. Ex-post group labelling is worth using with one of these draw orders if the organiser is willing to accept a decline of 25–30% in measures M_1 – M_3 in order to mitigate the impact of the imbalanced Pot 4 on the seeded teams in Pot 1. Even though draw orders 2-4-3-1 and 4-2-3-1 also lead to a comparable reduction in M_5 , they greatly increase M_3 and, especially, M_2 , by distorting at least eight assignment probabilities by 9–17 percentage points compared to a uniform draw.

5 Policy implications and conclusions

The organisers of sports tournaments appear to pay limited attention to the non-uniformity of the group draw, despite its non-negligible sporting effects (Csató, 2025a). This is suboptimal since the Skip mechanism, which is currently the most popular procedure used to enforce various constraints in a group draw (Csató, 2025c), has several variants with possibly different levels of non-uniformity. In the case of the 2026 FIFA World Cup draw, the decision-makers can choose 48 reasonable designs—depending on the order of the four pots and the group labelling policy—that require only marginal modifications in the draw procedure.

The framework proposed above allows finding the optimal mechanism according to the given objective function. In particular, while the official draw procedure can barely be improved with respect to most measures of non-uniformity, it systematically favours the UEFA teams and punishes the non-UEFA teams, including the three hosts, drawn from Pot 1. The degree of non-uniformity can be reduced by more than 50% using a different order of the pots and switching to ex-post group labelling.

As it has turned out during our research, the 2026 FIFA World Cup draw is substantially more difficult to simulate than the 2018 and 2022 FIFA World Cup draws due to the higher number of teams and the complexity of the draw restrictions. Hence, the previously suggested recursive backtracking algorithms become intractable even on a supercomputer. We have developed a novel implementation of the Skip mechanism via integer programming to solve this problem.

These challenges suggest that a stronger collaboration between policy-makers and the academic community is indispensable to optimise the rules of group draws in sports tournaments. Hopefully, the current paper will inspire future projects with this aim.

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