Why FIFA should re-draw the 2022 World Cup

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Wir behaupten aber, daß, wo es auf die Feststellung einer neuen oder einer zweifelhaften Meinung ankommt, ein einziges gründlich dargestelltes Ereignis belehrender ist als zehn bloß berührte.¹

(Carl von Clausewitz: Vom Kriege)

Abstract
The draw for the 2022 FIFA World Cup takes place in April 2022 when three winners of the play-offs remain unknown. Seeding is based on the FIFA World Ranking released on 31 March 2022 and these three teams are drawn from the weakest Pot 4. This paper shows that the official seeding policy does not balance the difficulty levels of the groups to the extent possible: a better alternative would be to assign the placeholders according to the highest-ranked potential winner, similar to the rule used in the UEFA Champions League qualification. The questionable decision of FIFA has harmed certain nations. In particular, Ukraine should play against stronger opponents if it manages to qualify for the World Cup after the Russian invasion has forced a rescheduling of its match(es). In the spirit of fairness and solidarity, FIFA is strongly encouraged to repeat the group stage draw following our proposal.

Keywords: draw procedure; fairness; FIFA World Cup; OR in sports; simulation

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¹ “But we maintain that when the object is to establish a new or doubtful opinion, one single example, thoroughly analysed, is far more instructive than ten which are superficially treated.” (Source: Carl von Clausewitz: On War, Book 2, Chapter 6 [On Examples]. Translated by Colonel James John Graham, London, N. Trübner, 1873. http://clausewitz.com/readings/OnWar1873/TOC.htm)
1 Introduction

Inspired by the criticism of Guyon (2014) and Guyon (2015), FIFA has reformed the draw of the 2018 World Cup in order to produce balanced groups (Guyon, 2018): according to the classical scheme, the 32 national teams have been divided into four pots based on the FIFA World Ranking (except for favouring the host Russia by assigning it to the strongest pot), and each group has consisted of a team from each group. In contrast to the 2018 edition, FIFA has been forced to draw the groups of the 2022 World Cup when the identity of three teams remains unknown. The draw takes place on 1 April 2022, while the two intercontinental play-offs are contested in June 2022 and the qualification match(es) of Ukraine have been rescheduled to the same month due to the Russian invasion of that country.

This raises a problem since seeding is based on the FIFA World Ranking released on 31 March 2022. The Organising Committee for FIFA Competitions has decided to assign the two placeholders for the intercontinental play-off winners and the team for the UEFA play-off slot winner to Pot 4, that is, among the weakest teams.

Here we show that this questionable policy unnecessarily worsens the balance in the strengths of the groups. A better outcome can be provided by assigning the unknown placeholders according to the highest-ranked remaining team in each undecided contest. The proposed rule is currently used in the qualifications for the European club competitions (Csató, 2022d). It is also absolutely fair if a lower-ranked team effectively takes the coefficient of its higher-ranked opponent after winning against the latter.

The solution chosen by FIFA aggrieves some national teams, including Ukraine, a nation that deserves support in the spirit of solidarity. Therefore, FIFA is strongly encouraged to re-draw the 2022 World Cup in order to ensure balancedness and fairness. This would be important because the FIFA World Cup draw generates a lot of public interest, illustrated by articles in popular dailies (Guyon, 2022; Guyon and Veillerot, 2022).

Naturally, our paper has antecedents in the extant literature. The uneven distribution of the 1990 (Jones, 1990), 2006 (Rathgeber and Rathgeber, 2007), 2014 (Guyon, 2015), and 2018 FIFA World Cups (Csató, 2022a) have already been demonstrated. Cea et al. (2020), Guyon (2015), and Laliena and López (2019) have proposed draw systems for sports tournaments in the presence of geographical or seeding restrictions to create balanced groups with roughly the same competitive level. However, all these suggestions require a fundamentally new draw procedure, which is unlikely to be adopted soon. On the other hand, our recommendation builds on a principle already used by the Union of European Football Associations (UEFA).

The remainder of the work is structured as follows. Section 2 summarises the rules of the draw. The methodology of our analysis is described in Section 3, and the findings are presented in Section 4. Section 5 concludes.

2 Draw systems for the 2022 FIFA World Cup

This section describes the draw procedure to be used in the 2022 FIFA World Cup draw on 1 April 2022, which has been announced on 22 March 2022 (FIFA, 2022b). It determines the allocation of 29 qualified teams, the winners of two inter-confederation play-offs, and the placeholder of a UEFA play-off slot into eight groups of four teams each. In addition, we argue for an alternative draw procedure.
2.1 The official rules

The 32 teams are divided into four pots on the basis of the FIFA World Ranking released on 31 March 2022 that already takes the results of qualification games played in the March 2022 international match window into account:

- Pot 1 contains the host Qatar, automatically assigned to Group A, and the seven highest-ranked teams;
- Pot 2 contains the teams ranked 8th to 15th;
- Pot 3 contains the teams ranked 16th to 23rd;
- Pot 4 includes the teams ranked 24th to 28th plus the two placeholders from the two inter-confederation play-offs and the winner of the UEFA play-off Path A.

The intercontinental play-offs are scheduled to be played on 13–14 June 2022 in Qatar. Two matches in the UEFA play-off Path A should have been postponed due to the Russian invasion of Ukraine as one semifinal and possibly the final involves Ukraine.

The draw sequence starts with Pot 1 and ends with Pot 4. Each pot is emptied before moving on to the next one. Some draw conditions apply to ensure geographic separation (FIFA, 2022b):

- No group could have more than one team from any continental confederation except for UEFA (AFC, CAF, CONMEBOL, CONCACAF).
- Each group should consist of at least one but no more than two European teams.

Since the 2022 World Cup will be contested by 13 UEFA members, five out of the eight groups are guaranteed to include two teams from Europe. The allocation of the two intercontinental play-offs is based on the confederation of both potential winners.

Even though the official overview of the draw procedures (FIFA, 2022b) does not specify how the draw constraints will be met, it is assumed that the standard procedure of the FIFA/UEFA (Csató, 2022a) is used. In particular, the team drawn is placed in the first available group in alphabetical order as indicated by the computer such that any deadlock situation (when the teams still to be drawn cannot be allocated into the remaining slots without violating a draw condition) is prevented. The procedure is explained in a video available at https://www.youtube.com/watch?v=jDkn83FwioA through the example of the 2018 FIFA World Cup.

This draw mechanism has first been proposed in Guyon (2014) for the FIFA World Cup draw and has been adopted by the FIFA in 2018 (Guyon, 2018). It has already received serious attention in the literature (Boczoń and Wilson, 2018; Csató, 2022a; Klößner and Becker, 2013).

2.2 A reasonable alternative seeding policy

The assignment of the three placeholders representing the winners of the play-offs to the weakest pot is a questionable decision since they can be relatively strong teams as we will see later. The same problem arises in the qualification stages of the UEFA Champions League and the UEFA Europa Conference League but it is treated differently: “If, for any reason, any of the participants in such rounds are not known at the time of the draw, the coefficient of the club with the higher coefficient of the two clubs involved in an undecided
According to this policy, the placeholders of the play-offs that are still to be contested for the FIFA World Cup should be placed in a pot based on the highest-ranked potential winner instead of Pot 4.

3 Methodology

Due to the assignment of the host in Group A, the 2022 FIFA World Cup draw has $7 \times (8!)^3 \approx 3.3 \times 10^{17}$ possible outcomes without accounting for geographic restrictions. Even though these criteria significantly decrease the number of feasible solutions, it is still impossible to exactly calculate the probability of each assignment. Furthermore, the consequences of choosing a particular seeding regime can only be uncovered if the results of matches played in the play-offs and the groups are determined. To that end, computer simulations will be used as recommended in the literature on tournament design (Scarf et al., 2009).

Since two teams from each group advance to the Round of 16, a group is usually judged to be tough when three teams have high rankings, even if the fourth one is much weaker (Guyon, 2015; Laliena and López, 2019). Hence, our measure of group strength will be the weighted average of the ratings of the four participants, where the weight of the strongest, the second strongest, and the third strongest team is two, whereas the weight of the weakest team is one.

The abilities of the teams will be quantified in two ways. The first is the rating points in the FIFA World Ranking of March 2022, underlying the pot allocation. Although FIFA has adopted the Elo method of calculation after the 2018 FIFA World Cup (FIFA, 2018a,b), the current FIFA World Ranking does not take home advantage and the margin of victory into account. Both factors are considered in the World Football Elo Ratings (http://eloratings.net), which is a widely used benchmark in the literature (Cea et al., 2020; Csató, 2022b; Guyon, 2014, 2015; Lasek et al., 2013, 2016). This will provide the second measure for the strengths of the teams.

As the FIFA ranking is somewhat slow to react to the changing skill level of the teams (the example of Canada and Ecuador will be seen later) and is still influenced by the transformation from the old ranking method in 2018 (Ecuador has a real difficulty gaining enough points to climb substantially since it mainly plays against other South American teams), the outcomes of all matches will be simulated on the basis of the World Football Elo Ratings. A traditional choice for the distribution of the number of goals in soccer is the Poisson distribution (Chater et al., 2021; Maher, 1982; Van Eetvelde and Ley, 2019). Then the probability that team $i$ scores $k$ goals against team $j$ is

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

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

Football rankings (2020) determines parameter $\lambda_{ij}^{(f)}$ as a quartic polynomial of the win expectancy $W_{ij}$ of team $i$ against team $j$, which is

$$W_{ij} = \frac{1}{1 + 10^{-(E_i - E_j)/400}},$$
with $E_i$ and $E_j$ being the Elo ratings of the two teams, respectively. The rating of the home team is increased by 100 to reflect home advantage. The exact formulas are estimated by a least squares regression based on more than 29 thousand home-away matches and almost 10 thousand games played on neutral ground between national football teams. In addition, they contain a regime change at $W_{ij} = 0.9$ since unbalanced games usually mean an excessive number of goals.

Most of the games are played on neutral ground where the expected number of goals for team $i$ against team $j$ is

\[
\lambda_{ij}^{(a)} = \begin{cases} 
3.90388 \cdot W_{ij}^4 - 0.58486 \cdot W_{ij}^3 \\
-2.98315 \cdot W_{ij}^2 + 3.13160 \cdot W_{ij} + 0.33193 \\
308097.45501 \cdot (W_{ij} - 0.9)^4 - 42803.04696 \cdot (W_{ij} - 0.9)^3 \\
+2116.35304 \cdot (W_{ij} - 0.9)^2 - 9.61869 \cdot (W_{ij} - 0.9) + 2.86899 
\end{cases} \quad \text{if } W_{ij} \leq 0.9
\]

with $R^2 = 0.976$.

However, there are some home-away matches (two in the UEFA play-offs and the three group matches of Qatar) to be simulated, where the expected number of goals for the home team $i$ equals

\[
\lambda_{ij}^{(b)} = \begin{cases} 
-5.42301 \cdot W_{ij}^4 + 15.49728 \cdot W_{ij}^3 \\
-12.6499 \cdot W_{ij}^2 + 5.36198 \cdot W_{ij} + 0.22862 \\
231098.16153 \cdot (W_{ij} - 0.9)^4 - 30953.10199 \cdot (W_{ij} - 0.9)^3 \\
+1347.51495 \cdot (W_{ij} - 0.9)^2 - 1.63074 \cdot (W_{ij} - 0.9) + 2.54747 
\end{cases} \quad \text{if } W_{ij} > 0.9
\]

with $R^2 = 0.984$, and the expected number of goals for the away team $j$ is given by

\[
\lambda_{ij}^{(a)} = \begin{cases} 
90173.57949 \cdot (W_{ij} - 0.1)^4 + 10064.38612 \cdot (W_{ij} - 0.1)^3 \\
+218.6628 \cdot (W_{ij} - 0.1)^2 - 11.06198 \cdot (W_{ij} - 0.1) + 2.28291 
\end{cases} \quad \text{if } W_{ij} < 0.1
\]

\[
+1.25010 \cdot W_{ij}^4 - 1.99984 \cdot W_{ij}^3
\]

\[
+6.54946 \cdot W_{ij}^2 - 5.83979 \cdot W_{ij} + 2.80352 
\quad \text{if } W_{ij} \geq 0.1
\]

with $R^2 = 0.955$.

The same simulation model has been used recently to quantify the incentive incompatibility of the European Qualifiers for the 2022 FIFA World Cup (Csató, 2022b) and the unfairness of the 2018 FIFA World Cup qualification (Csató, 2022c).

The play-offs contain single-game matches, hence draws are not allowed. If the two teams score the same number of goals, the winner is chosen randomly. This effectively means that there is no goal in extra time and the penalty shootout provides equal chances for the two teams, independently of the field of the game.

The ranking of the teams in the groups is determined according to the following criteria: (a) greatest number of points obtained in all group matches; (b) goal difference in all group matches; (c) greatest number of goals scored in all group matches; (d) drawing of lots.

Table 1 shows the composition of the pots, as well as the two measures of strengths for the teams.

Three play-off paths are not yet finished at the time of the draw. The corresponding matches are listed in Table 2.

Finally, the alternative pot allocation is presented in Table 3.

A simulation run consists of the following steps:
Table 1: National teams qualified for the 2022 FIFA World Cup before the draw

| Country       | Confederation | Points | Elo  |
|---------------|---------------|--------|------|
| Qatar         | AFC           | 1441.41| 1662 |
| Brazil        | CONMEBOL      | 1832.69| 2155 |
| Belgium       | UEFA          | 1827.00| 2069 |
| France        | UEFA          | 1789.85| 2116 |
| Argentina     | CONMEBOL      | 1765.13| 2018 |
| England       | UEFA          | 1761.71| 2039 |
| Spain         | UEFA          | 1709.19| 2039 |
| Portugal      | UEFA          | 1674.78| 1984 |
| Mexico        | CONCACAF      | 1658.82| 1848 |
| Netherlands   | UEFA          | 1658.66| 1938 |
| Denmark       | UEFA          | 1653.60| 1936 |
| Germany       | UEFA          | 1650.53| 1966 |
| Uruguay       | CONMEBOL      | 1635.73| 1923 |
| Switzerland   | UEFA          | 1635.32| 1920 |
| United States | CONCACAF      | 1633.72| 1822 |
| Croatia       | UEFA          | 1621.11| 1855 |
| Senegal       | CAF           | 1584.16| 1729 |
| Iran          | AFC           | 1564.49| 1820 |
| Japan         | AFC           | 1553.44| 1796 |
| Morocco       | CAF           | 1551.88| 1738 |
| Serbia        | UEFA          | 1547.43| 1845 |
| Poland        | UEFA          | 1544.20| 1799 |
| South Korea   | AFC           | 1519.54| 1800 |
| Tunisia       | CAF           | 1499.80| 1612 |
| Cameroon      | CAF           | 1480.48| 1631 |
| Canada        | CONCACAF      | 1479.00| 1798 |
| Ecuador       | CONMEBOL      | 1452.63| 1840 |
| Saudi Arabia  | AFC           | 1444.69| 1634 |
| Ghana         | CAF           | 1387.36| 1541 |

Horizontal lines indicate the boundaries of the pots.

The column Points shows the strength of the teams according to the FIFA World Ranking as of 31 March 2022, see https://www.fifa.com/fifa-world-ranking/men?dateId=id13603.

The column Elo shows the strength of the teams according to the World Football Elo Ratings as of 31 March 2022, see https://www.international-football.net/elo-ratings-table?year=2022&month=03&day=31.

1. The winners of the remaining matches in the play-offs are determined;

2. The groups of the 2022 FIFA World Cup are drawn according to both seeding rules (official and alternative): the teams in each pot are ordered randomly and assigned sequentially to the first available group in alphabetical order such that all draw conditions are satisfied;

3. The expected strength of each group is computed according to both measures (rating points in the FIFA World Ranking and World Football Elo Ratings, see
Table 2: Matches for the three available FIFA World Cup slots

| Match   | Team 1               | Points | Elo   | Team 2              | Points | Elo | Field  |
|---------|----------------------|--------|-------|---------------------|--------|-----|--------|
| AFC PO  | Australia            | 1462.29| 1677  | United Arab Emirates| 1356.99| 1515| Qatar  |
| ICT PO1 | Winner of AFC PO     |        |       | Peru                | 1562.32| 1856| Qatar  |
| ICT PO2 | Costa Rica           | 1503.09| 1743  | New Zealand         | 1206.07| 1558| Qatar  |
| UEFA SF | Scotland             | 1472.66| 1730  | Ukraine             | 1535.08| 1817| Scotland|
| UEFA PO | Wales                | 1588.08| 1841  | Winner of UEFA SF   |        |     | Wales  |

The column Points shows the strength of the teams according to the FIFA World Ranking as of 31 March 2022, see https://www.fifa.com/fifa-world-ranking/men?dateId=id13603.
The column Elo shows the strength of the teams according to the World Football Elo Ratings as of 31 March 2022, see https://www.international-football.net/elo-ratings-table?year=2022&month=03&day=31.

Table 3: The alternative seeding for the 2022 FIFA World Cup draw

| Country | Confederation | Country | Confederation |
|---------|---------------|---------|---------------|
|         | Pot 1         | Pot 2   |
| Qatar   | AFC           | Mexico  | CONCACAF      |
| Brazil  | CONMEBOL      | Netherlands | UEFA |
| Belgium | UEFA          | Denmark | UEFA          |
| France  | UEFA          | Germany | UEFA          |
| Argentina | CONMEBOL | Uruguay | CONMEBOL      |
| England | UEFA          | Switzerland | UEFA |
| Spain   | UEFA          | United States | CONCACAF |
| Portugal | UEFA         | Croatia | UEFA          |
|         | Pot 3         | Pot 4   |
| Senegal | CAF           | Cameroon | CAF     |
| Iran    | AFC           | Canada  | CONCACAF      |
| Japan   | AFC           | Ecuador | CONMEBOL      |
| Morocco | CAF           | Saudi Arabia | AFC   |
| Serbia  | UEFA          | Ghana   | CAF          |
| Poland  | UEFA          | South Korea | AFC   |
| W/ICT PO1 | AFC/CONMEBOL | W/ICT PO2 | CONCACAF/OFC |
| W/UEFA PO | UEFA        | Tunisia  | CAF          |

Tables 1 and 2);

4. All group matches are played, group rankings and the set of qualified teams are obtained.

All simulations are carried out 1 million times to the effect of random fluctuations.

4 Results

This section describes the findings of our research. In particular, Section 4.1 addresses the balance across groups by quantifying their competitive level. The consequences of the official seeding regime with respect to the probability of qualification are uncovered in
Section 4.2. Finally, Section 4.3 provides an instructive case study: how the rescheduling of the UEFA play-offs due to the Russian invasion of Ukraine has affected the (possible) contestants, in particular, Ukraine.

4.1 Group balance

Two seeding rules have been outlined in Section 2 and two measures of group strength have been suggested in Section 3. In each simulation run, the groups have been ordered according to their strength, and the averages of these values over the 1 million iterations have been computed. Group A is treated separately since it is guaranteed to contain Qatar.

Figure 1 focuses on the expected difficulty levels of the groups. The alternative seeding regime implies a smaller variance in the average strength of Groups B–H under both measures: the blue squares (green triangles) are closer to each other than the red stars (brown pentagons). It is substantially easier to qualify from Group A. However, this is caused by assigning the host Qatar there, a decision that is not debated in the current paper. Even though the advantage of the recommended allocation rule is small, it improves balance at a minimal cost, if at all.

Figures 2 and 3 reinforce this message by presenting the distribution of group strengths according to the two measures. The probability of a “group of death” is substantially diminished if it is identified by the FIFA World Ranking. Note the case of Group A again, which accounts for having two modes.
4.2 Distortions in the probability of qualification

Advancement to the Round of 16 is a zero-sum game. Consequently, if there are two competitive draw procedures, one of them will prefer some nations compared to the other. Figure 4 presents the effect of the official seeding rule compared to our proposal that
provides a more balanced outcome as can be seen in Figures 1–3. Five countries (Mexico, the United States, Serbia, Poland, and the winner of the AFC vs CONMEBOL play-off) lose more than one percentage point in the probability of qualification. South Korea and Tunisia benefit from being assigned to Pot 3 rather than Pot 4. The relative effects are mitigated for the strongest teams drawn from Pots 1 and 2 but reach or exceed 3-4% for weaker teams. There is a positive correlation among nations from the same association and the same pot: Mexico and the United States, the five European teams in Pot 2 (the Netherlands, Denmark, Germany, Switzerland, Croatia), Iran and Japan, Senegal and Morocco, Serbia and Poland, Cameroon and Ghana. This reinforces that the results are mainly driven by the seeding policy.

4.3 Does the seeding rule chosen by FIFA harm Ukraine?

Ukraine has qualified for Path A in the UEFA play-offs after being the runner-up in the first round of the qualifiers. It first match in the semifinal against Scotland has been scheduled to 24 March 2022, followed by the possible final on 29 March 2022. Therefore,
Ukraine could have qualified for FIFA World Cup before the draw in the absence of the Russian invasion.

The Ukrainian Association of Football has requested on 3 March 2022 that its qualification match(es) be rescheduled owing to the impossibility of organising both the travel and training of a team under the warlike circumstances (FIFA, 2022a). Naturally, all stakeholders have unanimously agreed to accept this request in the spirit of solidarity—but FIFA has decided to draw Ukraine from Pot 4 despite that it should have deserved a place in Pot 3.

Therefore, a reasonable benchmark is to consider Path A in the UEFA play-offs as finished. Figure 5 reveals how the postponement of the two matches played there and the implied modifications in the seeding influence the probability of advancement to the Round of 16 for each contestant, assuming that Ukraine qualifies for the World Cup. This can be a potential measure of the sporting effects of the Russian invasion on the 2022 FIFA World Cup.

The consequences are not negligible: four nations (Serbia, Poland, Canada, Ukraine)
face a reduction of at least 0.9 percentage points in the probability of qualification, Argentina and Uruguay are also worse off. On the other hand, the winner of the AFC vs CONMEBOL play-off, Senegal, Morocco, and Tunisia benefit from the postponement of Path A in the UEFA play-offs if Ukraine qualifies for the World Cup. In relative terms, the biggest winners are Tunisia (drawn from Pot 3 instead of Pot 4) and Cameroon. The pattern of changes, including the geographical arrangement (except for Cameroon and Ghana), is somewhat analogous to Figure 4. Consequently, the suggested seeding policy would have been affected less by the inevitable request of Ukraine.

However, the most important lesson from Figure 5 is that the solidarity of FIFA towards Ukraine remains limited: even though the postponement of its qualification matches has been approved, the draw procedure effectively punishes Ukraine for fighting against Russia. Our proposal is not able to fully compensate Ukraine but the reduction in its qualifying probability declines from 0.91 to 0.16 percentage points. This provides another argument for choosing the alternative seeding regime.

5 Conclusions

The current paper has examined the draw system of the 2022 FIFA World Cup. The official seeding rule has been demonstrated to violate an important principle by failing to balance the competitive levels across the groups. Allocating the winners of the unfinished play-offs according to the highest-ranked candidate does provide a fairer outcome. The questionable decision of FIFA has harmed some countries, including Ukraine, a nation that deserves support.

Although the methodology used to simulate the outcome of the matches played in the play-offs and the FIFA World Cup is relatively simple, it is worth noting that we have mainly focused on the difference between the official and the alternative seeding rules. Hence, the direction of the effects (the variation in the strengths of the groups and the set of countries that benefit/suffer from the official pot allocation) might remain unchanged under a wide set of prediction models.

Our study will probably inspire other researchers to analyse sports rules. We also hope that FIFA will begin extensive consultation with the academic community before similar decisions. Nonetheless, there is still an opportunity to improve the fairness of the 2022 FIFA World Cup draw by repeating the event.

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