The unfairness of the UEFA Euro 2020 qualifying

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Wer, von inneren Kräften angeregt, sich ein solches Werk vorzusetzen will, der rüste sich zu
dem frommen Unternehmen mit Kräften wie zu einer weiten Pilgerfahrt aus. Er opfere Zeit
und scheue keine Anstrengung, er fürchte keine zeitliche Gewalt und Größe, er erhebe sich
über eigene Eitelkeit und falsche Scham, um nach dem Ausdruck des französischen Kodex
die Wahrheit zu sagen, nichts als die Wahrheit, die ganze Wahrheit.

(Carl von Clausewitz: Vom Kriege)

Abstract

The qualification for the UEFA European Championship 2020 is strongly connected
to the inaugural season 2018-19 of the UEFA Nations League. The latter competition
divides the 55 UEFA national teams into four leagues of different strength. We find
that being a top team in the lowest-ranked League D can substantially increase the
probability of qualification for the UEFA European Championship 2020 compared
to being a bottom team in League C because the chance of direct qualification
is negligible for these teams, but the qualifying play-offs guarantee at least one
place for the best four teams of each league. This can undermine credibility as the
current rules might punish stronger performance in certain matches, and create
incentives for strategic manipulation. The Union of European Football Associations
(UEFA) is encouraged to reconsider the format of qualifications to eliminate the
unfair advantage enjoyed by the top teams of UEFA Nations League D.

Keywords: OR in sports; fairness; football; simulation; tournament design

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1 “Whoever, stirred by ambition, undertakes such a task, let him prepare himself for his pious
undertaking as for a long pilgrimage; let him give up his time, spare no sacrifice, fear no temporal rank or
power, and rise above all feelings of personal vanity, of false shame, in order, according to the French
code, to speak the Truth, the whole Truth, and nothing but the Truth.” (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/T0C.htm)
1 Introduction

The governing bodies of major sports often face difficulties when they try to enhance competitive balance in an ill-designed way: giving an advantage to underdogs may make losing a profitable strategy for certain teams. Such tournaments can be called unfair because every sports rule should give appropriate incentives to perform (Preston and Szymanski, 2003; Szymanski, 2003).

The danger of similar misalignments is especially serious after recent rule changes as illustrated by several historical cases (Kendall and Lenten, 2017). In this paper, we deal with an unfair competition design from (association) football, probably the most popular sports in the world. In particular, it will be demonstrated that the qualification for the UEFA European Championship 2020 contains a powerful incentive for strategic manipulation, which can be exploited by some teams in the future unless the issue is identified and adequately solved by the administrators.

The problem is rooted in a recent decision of the Union of European Football Associations (UEFA), supposedly introduced to increase the diversity of the UEFA European Championship 2020. Its qualifying process starts with the 2018-19 UEFA Nations League, the inaugural season of this tournament. It divides the 55 national teams into four leagues such that the best 12 teams are in League A, the next 12 in League B, the next 15 in League C, and the last 16 in League D. However, our simulations show that a given team is considerably better off at the top of League D than at the bottom of League C with respect to the probability of qualification since at least one group winner from each league is guaranteed to compete in the UEFA European Championship 2020.

The current paper is probably the first detailed documentation of this unfairness. Nevertheless, the format has been criticised for allowing weaker teams to qualify through the Nations League in the media (Dunbar, 2017), and a webpage – written by the Romanian computer programmer Eduard Ranghiuc – provides some preliminary calculations that losing could improve the chances of participating in the final tournament (Ranghiuc, 2017).

In terms of organisation, Section 2 gives a concise review of related literature. The qualification for the UEFA European Championship 2020 is outlined in Section 3, and Section 4 describes our simulation technique. Section 5 presents quantitative results with a sensitivity analysis, and Section 6 concludes.

2 Literature review

Examples of tanking, the act of deliberately dropping points or losing a game to gain some other advantage, occur in several sports (Kendall and Lenten, 2017).

In the 2012 London Olympics, eight women players were disqualified from the doubles badminton competition, charged with “not using one’s best efforts to win a match” and “conducting oneself in a manner that is clearly abusive or detrimental to the sport” (Kendall and Lenten, 2017, Section 3.3.1). The reason was that they wanted to be second rather than first in their round-robin groups in order to get (perceived) easier draws in the knockout stage. This event has inspired at least two papers discussing mathematical models of strategic manipulation (Pauly, 2014; Vong, 2017).

It is a well-known fact that sports using player drafts with the traditional set-up of reverse order sometimes make losing a profitable strategy because teams might decrease efforts to win after they have no more chance to progress (Taylor and Trogdon, 2002;
Balsdon et al., 2007; Lenten, 2016; Lenten et al., 2018). Furthermore, a concrete strategy can be found behind losing (Fornwagner, 2018).

Similar opportunities for manipulation can emerge in football, too: Lasek et al. (2016) present some strategies to improve a team’s position in the official FIFA ranking.

The situation can be even worse when a team is strictly better off by losing, not only in expected terms. According to Dagaev and Sonin (2018), tournament systems consisting of multiple round-robin and knockout tournaments with noncumulative prizes generally do not satisfy strategy-proofness. Their central result reveals the incentive incompatibility of the UEFA Europa League qualification before the 2015-16 season (Dagaev and Sonin, 2018), and the violation of strategy-proofness by the UEFA Champions League in three seasons (Csató, 2019c).

Naturally, unfairness is a more general issue than incentive incompatibility. Guyon (2015) highlights obvious mistakes of the FIFA World Cup draw, resulting from the way of enforcing the geographical constraints. Laliena and López (2019) propose two fair draw systems that outperform the solution of Guyon (2015). Durán et al. (2017) suggest a fairer schedule for the South American qualifiers to the 2018 FIFA World Cup, which was unanimously approved by the South American Football Confederation. Guyon (2018) identifies a number of flaws in the design of the knockout bracket of the UEFA European Championship 2016 and provides two fairer procedures. According to Krumner (2019), match kick-off time affects performance in the group stage of the UEFA Europa League.

For the purpose of demonstrating and quantifying the unfairness of the UEFA European Championship 2020 qualifying, we will use simulations, which is a standard procedure in the comparison and evaluation of tournament designs (Scarf et al., 2009; Scarf and Yusof, 2011; Goossens et al., 2012; Boczoń and Wilson, 2018; Lasek and Gagolewski, 2018; Corona et al., 2019; Csató, 2019b; Dagaev and Rudyak, 2019).

3 Qualification for the UEFA Euro 2020

The 2020 UEFA European Football Championship, or shortly UEFA Euro 2020, is the 16th international men’s football championship of Europe. For the first time, it will be spread over 12 cities in 12 countries across the continent, so no national team gets an automatic qualifying berth. Although similarly to the UEFA Euro 2016, 24 teams participate in the final tournament, the qualification competition is fundamentally different from the previous ones as it is strongly connected to the inaugural season the new competition called UEFA Nations League.

The whole process of qualification for the UEFA Euro 2020 is described in two official documents (UEFA, 2018a,b). It starts with the 2018-19 UEFA Nations League. In the first step, the 55 UEFA national teams are divided into four divisions called leagues. In particular, the teams are ordered according to their UEFA national team coefficients at the end of the 2018 FIFA World Cup qualifiers without the play-offs, and the 12 highest-ranked teams form League A, the next 12 form League B, the next 15 form League C, and the remaining 16 form League D. The leagues are divided into four groups of three (Leagues A and B), four groups of four (League D), and three groups of four plus one group of three teams (League C) according to the traditional seeding regime: the best four teams are placed into Pot 1, the second best four teams are placed into Pot 2, the next four into Pot 3, the remaining teams (if any) into Pot 4, and each group gets one team from each pot. The groups are organised as a home-away (double) round-robin tournament, therefore each team plays four or six matches.
After ranking the teams in each group, four league rankings are established, and aggregated into the overall UEFA Nations League ranking: the 12 teams of League A occupy positions 1st to 12th according to the ranking in League A, the 12 teams of League B occupy positions 13th to 24th according to the ranking in League B, the 15 teams of League C occupy positions 25th to 39th according to the ranking in League C, and the 16 teams of League D occupy positions 40th to 55th according to the ranking in League D.

This is followed by the next stage, called the UEFA Euro 2020 qualifying. The 55 teams are divided into five groups of five (Groups A-E) and five groups of six teams (Groups F-J) such that the teams are seeded according to the overall UEFA Nations League ranking: teams 1-4 (from League A) are placed into the UNL Pot, teams 5-10 (from League A) are placed into Pot 1, teams 11-20 (from Leagues A and B) are placed into Pot 2, teams 21-30 (from Leagues B and C) are placed into Pot 3, teams 31-40 (from Leagues C and D) are placed into Pot 4, teams 41-50 (from League D) are placed into Pot 5, and teams 51-55 (from League D) are placed into Pot 6. Then Groups A-D get one team from the UNL Pot each, and one team from Pots 2-5 each, Group E gets one team from Pots 1-5, while Groups F-J get one team from Pots 1-6 each. To summarise, the draw applies a standard procedure but the best four teams are guaranteed to be in the smaller groups of five. There are also specific restrictions due to host nations, prohibited team clashes (because of political reasons), winter venue, and excessive travel (UEFA, 2018c). The groups are organised in a home-away (double) round-robin scheme with the first two teams advancing to the UEFA Euro 2020.

After the qualifying group stage, the four remaining berths are filled by the UEFA Euro 2020 qualifying play-offs. 16 teams, that did not qualified for the UEFA Euro 2020 directly, are selected on the basis of the overall UEFA Nations League ranking and are divided into four paths containing four teams each. Each path consists of three matches, two semifinals and a final, hosted by a participating nation drawn randomly, and the winner of the final qualifies for the UEFA Euro 2020.

The selection and allocation of the 16 teams is carried out according to a complicated procedure which guarantees that at least one team from each league qualifies for the final tournament: the UEFA Nations League group winners participate in a play-off path of their league without facing any team from a higher-ranked league (unless they are directly qualified). The procedure is explained in UEFA (2017). Nonetheless, the rules are contradictory and may lead to an unfair formulation of play-off paths (Csató, 2019a).

To summarise, the qualification process has the following stages:

1. The 55 teams are allocated into Leagues A–D on the basis of the ranking from UEFA national team coefficients;
2. Four groups in each league are drawn on the basis of the ranking from UEFA national team coefficients;
3. Matches of the 2018-19 UEFA Nations League are played, and the results determine the overall UEFA Nations League ranking;
4. Groups of the UEFA Euro 2020 qualifiers are drawn on the basis of the overall UEFA Nations League ranking;
5. Matches of the UEFA Euro 2020 qualifiers are played, the first two teams from each group qualify (altogether 20 teams);
### Table 1: An overview of qualification for the UEFA Euro 2020

| Rank from UEFA national team coefficient | League in the UEFA Nations League | UEFA Nations League rank | Place in the seeding of the UEFA Euro 2020 qualifiers | Remark |
|-----------------------------------------|----------------------------------|-------------------------|------------------------------------------------------|--------|
| 1–12                                    | A                                | 1–4 (GW)                | UNL Pot                                              | participates in a group of five assured of at least play-offs |
| 1–12                                    | A                                | 5–10                    | Pot 1                                                |        |
| 1–12                                    | A                                | 11–12                   | Pot 1                                                |        |
| 13–24                                   | B                                | 13–16 (GW)              | Pot 2                                                | assured of at least play-offs |
| 13–24                                   | B                                | 17–20                   | Pot 2                                                |        |
| 13–24                                   | B                                | 21–24                   | Pot 3                                                |        |
| 25–39                                   | C                                | 25–28 (GW)              | Pot 3                                                | assured of at least play-offs |
| 25–39                                   | C                                | 29–30                   | Pot 3                                                |        |
| 25–39                                   | C                                | 31–39                   | Pot 4                                                |        |
| 40–55                                   | D                                | 40 (GW)                 | Pot 4                                                | assured of at least play-offs |
| 40–55                                   | D                                | 41–43 (GW)              | Pot 5                                                | assured of at least play-offs |
| 40–55                                   | D                                | 44–50                   | Pot 5                                                |        |
| 40–55                                   | D                                | 51–55                   | Pot 6                                                |        |

GW stands for group winner (in the UEFA Nations League)

6. 16 teams, that failed to directly qualify for the UEFA Euro 2020, are selected on the basis of the overall UEFA Nations League ranking, and contest the UEFA Euro 2020 qualifying play-offs (further 4 teams qualify).

Table 1 provides a short overview of the 2018-19 UEFA Nations League and the UEFA Euro 2020 qualifiers.

### 4 Implementation

In the following, we attempt to quantify the probability of qualification for the UEFA Euro 2020 for each UEFA member via a simulational methodology. This aim immediately gives the tournament metric to be analysed.

Our computer code closely follows the relevant UEFA regulations (UEFA, 2018a,b) with some negligible differences:

- The first four places (1st to 4th) of the overall UEFA Nations League ranking are determined as in the other three leagues, that is, based on the UEFA Nations League group results, and not through the (2019) UEFA Nations League Finals. However, the draw of the groups in the UEFA Euro 2020 qualifying shows that this does not affect the outcome of any simulation run.

- The specific restrictions in the draw of the UEFA Euro 2020 qualifying (UEFA, 2018c) are ignored.

- The contradiction in the rules of the play-offs is avoided through the proposal Csató (2019a, Section 4.1).
The last two modifications might have only a marginal effect on the results.

Since the focus is on the (really complicated) qualification process and not on the accurate modelling of match outcome, the probability with which a given team defeats its opponent is fixed \textit{a priori}. Draws (ties) in the matches are prohibited, and every tie-breaking is resolved randomly.

The fixed winning probabilities are derived from the World Football Elo Ratings, published regularly on the website \texttt{eloratings.net}. Although there exists no single nor any official Elo ranking for football teams, Elo rankings seem to have the highest prediction power (Lasek et al., 2013). The overhauled formula for the FIFA/Coca-Cola World Ranking, used from June 2018, also applies the Elo method of calculation (FIFA, 2018). Furthermore, Elo rating directly gives win expectancy $W_e$ according to the following formula:

$$W_e = \frac{1}{1 + 10^{-d/s}},$$

where $d$ is the difference between the Elo ratings of the two teams that play the match, and $s = 400$ is a scaling parameter.

In particular, we have used Elo ratings as of 6 December 2017 since the seeding pots of the 2018-19 UEFA Nations League were announced on 7 December 2017. They are reported in Table 2, together with the ranking from the UEFA national team coefficients used for the seeding of the 2018-19 UEFA Nations League.

Each simulation has been run one million times.

5 Results

![Figure 1: The probability of qualification for the UEFA Euro 2020](image)

Figure 1 plots the probability of qualification for each team as a function of its Elo rating.
Table 2: The strength of UEFA national teams

| Team            | UEFA rank | Elo rating | Elo rank |
|-----------------|-----------|------------|----------|
| **League A**    |           |            |          |
| Germany         | 1         | 2109       | 1        |
| Portugal        | 2         | 1995       | 3        |
| Belgium         | 3         | 1927       | 6        |
| Spain           | 4         | 2031       | 2        |
| France          | 5         | 1989       | 4        |
| England         | 6         | 1933       | 5        |
| Switzerland     | 7         | 1866       | 9        |
| Italy           | 8         | 1906       | 7        |
| Poland          | 9         | 1842       | 11       |
| Iceland         | 10        | 1811       | 14       |
| Croatia         | 11        | 1856       | 10       |
| Netherlands     | 12        | 1895       | 8        |
| **League B**    |           |            |          |
| Austria         | 13        | 1710       | 24       |
| Wales           | 14        | 1763       | 16       |
| Russia          | 15        | 1697       | 25       |
| Slovakia        | 16        | 1748       | 17       |
| Sweden          | 17        | 1825       | 13       |
| Ukraine         | 18        | 1737       | 18       |
| Ireland         | 19        | 1732       | 19       |
| Bosnia and Herzegovina | 20   | 1723       | 20       |
| Northern Ireland| 21        | 1674       | 27       |
| Denmark         | 22        | 1842       | 12       |
| Czech Republic  | 23        | 1713       | 22       |
| Turkey          | 24        | 1712       | 23       |
| **League C**    |           |            |          |
| Hungary         | 25        | 1611       | 32       |
| Romania         | 26        | 1688       | 26       |
| Scotland        | 27        | 1720       | 21       |
| Slovenia        | 28        | 1639       | 29       |
| Greece          | 29        | 1661       | 28       |
| Serbia          | 30        | 1769       | 15       |
| Albania         | 31        | 1609       | 33       |
| Norway          | 32        | 1581       | 35       |
| Montenegro      | 33        | 1614       | 31       |
| Israel          | 34        | 1534       | 36       |
| Bulgaria        | 35        | 1620       | 30       |
| Finland         | 36        | 1595       | 34       |
| Montenegro      | 33        | 1614       | 31       |
| Israel          | 34        | 1534       | 36       |
| Lithuania       | 39        | 1406       | 43       |
| **League D**    |           |            |          |
| Azerbaijan      | 40        | 1400       | 44       |
| North Macedonia | 41        | 1520       | 37       |
| Belarus         | 42        | 1497       | 39       |
| Georgia         | 43        | 1483       | 40       |
| Armenia         | 44        | 1480       | 41       |
| Latvia          | 45        | 1362       | 46       |
| Faroe Islands   | 46        | 1281       | 50       |
| Luxembourg      | 47        | 1321       | 49       |
| Kazakhstan      | 48        | 1340       | 47       |
| Moldova         | 49        | 1332       | 48       |
| Liechtenstein   | 50        | 1150       | 52       |
| Malta           | 51        | 1216       | 51       |
| Andorra         | 52        | 1012       | 54       |
| Kosovo          | 53        | 1371       | 45       |
| Gibraltar       | 54        | 1079       | 53       |
| San Marino      | 55        | 852        | 55       |

Date: 6 December 2017
Source of the Elo rating: [https://www.international-football.net/elo-ratings-table?year=2017&month=12&day=06&confed=UEFA](https://www.international-football.net/elo-ratings-table?year=2017&month=12&day=06&confed=UEFA)
rating. It can be seen that a team allocated into a lower-ranked league (League B instead of League A, or League C instead of League B) has a smaller chance to qualify for the UEFA Euro 2020 *ceteris paribus*.

Figure 2: The decomposed probability of qualification for the UEFA Euro 2020

(a) Probability of direct qualification

(b) Probability of qualification through the play-offs
On the other hand, this difference is completely reversed in the comparison of Leagues C and D. Figure 2 reveals that being in a lower-ranked league has two separate effects:

- the probability of direct qualification decreases because being in a weaker league decreases (eliminates) the probability of obtaining a place in a stronger Pot (see Table 1), so the team should play against stronger teams on average in the groups of the UEFA Euro 2020 qualifying tournament (see Figure 2.a); but

- the probability of qualification through the play-offs increases because the team can easier win its Nations League group, which guarantees a place in the play-off path of its own league (see Figure 2.b).

When the probability of direct qualification is low, that is, in the comparison of the bottom of League C and the top of League D for the given distribution of teams’ strength, the second effect dominates the first, hence having a worse rank at the beginning of the 2018-19 UEFA Nations League raises the probability of qualification for the UEFA Euro 2020.

Figure 3: The probability of qualification for teams at the boundary of two leagues

To further illustrate this fact, Figure 3 presents the actual and hypothetical probabilities of qualification for three countries:

- the Netherlands as the worst team in League A (12th) and the best team in League B (13th);

- Turkey as the worst team in League B (24th) and the best team in League C (25th);

- Lithuania as the worst team in League C (39th) and the best team in League D (40th).

By being in a lower-ranked league, the probability of qualification has decreased by about 2.2% for the Netherlands and it has decreased by about 10% for Turkey, but it has increased more than seven-fold for Lithuania. While the probability of direct qualification has become lower and the probability of qualification through play-offs has become higher in each case, the latter effect dominates the former in the comparison of Leagues C and D, which seems to be unfair and may create an opportunity for strategic manipulation. We will return to this issue in the final section of the paper.

The robustness of this result can be checked by modifying the scaling parameter $s$ in expression (1). Its original value of 400 may be judged excessive: for example, it implies
that the best team, Germany defeats the 10th (Croatia) with a probability of 81.1%, and wins against the 30th (Bulgaria) with a probability of 93.4%. Besides, we compare the worst place of League C (39th) to the fifth place of League D (44th) as obtaining the 40th position by a strategic manipulation of the UEFA national team coefficient cannot be guaranteed. Note that there is no difference in the probability of qualification between the 37th-39th places and the 40th-43rd places because of the seeding procedure in the UEFA Nations League.

Thus, three more competitive distributions of teams’ strength have been considered and plotted in Figure 4. Although the advantage of the 44th over the 39th place decreases when inequality is reduced, it remains substantial, so any team has a strong incentive to avoid being the 37th, the 38th, and the 39th in the UEFA ranking underlying the formation of the UEFA Nations League.

6 Discussion

Our paper has revealed a clear flaw of the qualification process for the UEFA European Championship 2020: it is unfair in the sense that obtaining a worst position in the ranking of the national teams used for the seeding of 2018-19 UEFA Nations League can considerably increase the probability of participation in the final tournament. This feature endangers the sport’s credibility and integrity because certain teams may aim to manipulate the ranking in the future.

The 55 UEFA members have been divided into the four leagues according to their UEFA national team coefficients after the conclusion of the 2018 FIFA World Cup qualifiers without the play-offs. They are calculated as a weighted average:

- 20% of the average ranking points collected in the 2014 FIFA World Cup qualification and final;
- 40% of the average ranking points collected in the UEFA Euro 2016 qualification and final;
- 40% of the average ranking points collected in the 2018 FIFA World Cup qualification.

The allocation of match points is explained in UEFA (2009).
The last nine matches (three matches each in the UEFA groups A, B, and H) that influence this ranking were played at the end of the 2018 FIFA World Cup qualifiers on 10 October 2017. In particular, Belgium vs Cyprus was 4-0, resulting in 19,491.08 points for Cyprus, which corresponds to the 37th position. The 40th was Azerbaijan with 17,760.82 points. However, Cyprus would be better off on the 40th place concerning the probability of qualification for the UEFA Euro 2020. A conceded goal in any match means $-500$ points, which should be divided by 10 (the number of matches in the 2018 FIFA World Cup qualification), and has a weight of 0.4 in the UEFA national team coefficient considered. Consequently, Cyprus would be only the 40th after kicking $1740/20 = 87$ own goals against Belgium because the point difference between Azerbaijan and Cyprus was 1730.82.

While an application of this strategy can be easily identified and probably sanctioned by the UEFA, if a team is willing to sacrifice a whole FIFA World Cup qualification – where the probability of its success is marginal anyway –, then it can achieve the 40th-43th positions in a relatively simple way. For instance, Lithuania obtained only six points in UEFA Group F during the 2018 FIFA World Cup qualification, while 18 was still not enough for the qualification. If Lithuania would have played a draw of 2-2 against Malta on 11 October 2016 instead of winning by 2-0, then it would have $18100.74 - 1640.08 + 800.08 = 17260.74$ points, guaranteeing the 40th position in the UEFA national team coefficient ranking used for the draw of the 2018-19 UEFA Nations League. Consequently, as we have seen in Section 5, Lithuania was severely punished for its win against Malta by the controversial format of the UEFA Euro 2020 qualifying.

In our view, the simulation above convincingly presents how certain teams might strategically manipulate the UEFA Nations League if it remains linked with the qualification for some tournaments in an inappropriate way such as in the UEFA Euro 2020 qualifying. Fortunately, it is not yet decided how the FIFA World Cup 2022 and UEFA Euro 2024 qualifying will be organised (the latter cannot directly follow the format of the UEFA Euro 2020 qualifying because Germany will automatically qualify as the host). UEFA is strongly encouraged to consider our results in setting the rules for the future.

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References

Balsdon, E., Fong, L., and Thayer, M. A. (2007). Corruption in college basketball? Evidence of tanking in postseason conference tournaments. *Journal of Sports Economics*, 8(1):19–38.

Boczoń, M. and Wilson, A. J. (2018). Goals, constraints, and public assignment: A field study of the UEFA Champions League. Technical Report 18/016, University of Pittsburgh, Kenneth P. Dietrich School of Arts and Sciences, Department of
Corona, F., Forrest, D., Tena, J. D., and Wiper, M. (2019). Bayesian forecasting of UEFA Champions League under alternative seeding regimes. *International Journal of Forecasting*, 35(2):722–732.

Csató, L. (2019a). A note on the UEFA Euro 2020 qualifying play-offs. Manuscript. arXiv: 1905.03325.

Csató, L. (2019b). A simulation comparison of tournament designs for the World Men’s Handball Championships. *International Transactions in Operational Research*, in press. DOI: 10.1111/itor.12691.

Csató, L. (2019c). UEFA Champions League entry has not satisfied strategyproofness in three seasons. *Journal of Sports Economics*, 20(7):975–981.

Dagaev, D. and Rudyak, V. (2019). Seeding the UEFA Champions League participants: Evaluation of the reform. *Journal of Quantitative Analysis in Sports*, 15(2):129–140.

Dagaev, D. and Sonin, K. (2018). Winning by losing: Incentive incompatibility in multiple qualifiers. *Journal of Sports Economics*, 19(8):1122–1146.

Dunbar, G. (2017). As World Cup hope fades, Europeans turn to Nations League. USA Today. Associated Press. 24 March 2017. https://eu.usatoday.com/story/sports/soccer/2017/03/24/as-world-cup-hope-fades-europeans-turn-to-nations-league/99575410/.

Durán, G., Guajardo, M., and Sauré, D. (2017). Scheduling the South American Qualifiers to the 2018 FIFA World Cup by integer programming. *European Journal of Operational Research*, 262(3):1109–1115.

FIFA (2018). Media Release: 2026 FIFA World Cup™: FIFA Council designates bids for final voting by the FIFA Congress. 10 June 2018. https://www.fifa.com/about-fifa/news/y=2018/m=6/news=2026-fifa-world-cuptm-fifa-council-designates-bids-for-final-voting-by-the-fifa-.html.

Fornwagner, H. (2018). Incentives to lose revisited: The NHL and its tournament incentives. *Journal of Economic Psychology*, in press. DOI: 10.1007/10.1016/j.joep.2018.07.004.

Goossens, D. R., Beliën, J., and Spieksma, F. C. R. (2012). Comparing league formats with respect to match importance in Belgian football. *Annals of Operations Research*, 194(1):223–240.

Guyon, J. (2015). Rethinking the FIFA World Cup™ final draw. *Journal of Quantitative Analysis in Sports*, 11(3):169–182.

Guyon, J. (2018). What a fairer 24 team UEFA Euro could look like. *Journal of Sports Analytics*, 4(4):297–317.

Kendall, G. and Lenten, L. J. A. (2017). When sports rules go awry. *European Journal of Operational Research*, 257(2):377–394.
Krumner, A. (2019). Testing the effect of kick-off time in the UEFA Europa League. *European Sport Management Quarterly*, in press. DOI: 10.1080/16184742.2019.1598456.

Laliena, P. and López, F. J. (2019). Fair draws for group rounds in sport tournaments. *International Transactions in Operational Research*, 26(2):439–457.

Lasek, J. and Gagolewski, M. (2018). The efficacy of league formats in ranking teams. *Statistical Modelling*, 18(5-6):411–435.

Lasek, J., Szlávik, Z., and Bhulai, S. (2013). The predictive power of ranking systems in association football. *International Journal of Applied Pattern Recognition*, 1(1):27–46.

Lasek, J., Szlávik, Z., Gagolewski, M., and Bhulai, S. (2016). How to improve a team’s position in the FIFA ranking? A simulation study. *Journal of Applied Statistics*, 43(7):1349–1368.

Lenten, L. J. A. (2016). Mitigation of perverse incentives in professional sports leagues with reverse-order drafts. *Review of Industrial Organization*, 49(1):25–41.

Lenten, L. J. A., Smith, A. C. T., and Boys, N. (2018). Evaluating an alternative draft pick allocation policy to reduce ‘tanking’ in the Australian Football League. *European Journal of Operational Research*, 267(1):315–320.

Pauly, M. (2014). Can strategizing in round-robin subtournaments be avoided? *Social Choice and Welfare*, 43(1):29–46.

Preston, I. and Szymanski, S. (2003). Cheating in contests. *Oxford Review of Economic Policy*, 19(4):612–624.

Ranghiuc, E. (2017). UEFA Nations League: Losing could improve your chances. 14 July 2017. http://www.football-rankings.info/2017/07/uefa-nations-league-losing-could.html.

Scarf, P., Yusof, M. M., and Bilbao, M. (2009). A numerical study of designs for sporting contests. *European Journal of Operational Research*, 198(1):190–198.

Scarf, P. A. and Yusof, M. M. (2011). A numerical study of tournament structure and seeding policy for the soccer World Cup Finals. *Statistica Neerlandica*, 65(1):43–57.

Szymanski, S. (2003). The economic design of sporting contests. *Journal of Economic Literature*, 41(4):1137–1187.

Taylor, B. A. and Trogdon, J. G. (2002). Losing to win: Tournament incentives in the national basketball association. *Journal of Labor Economics*, 20(1):23–41.

UEFA (2009). *National Team Coefficient Ranking. Technical explanation*. October 2009. https://www.uefa.com/MultimediaFiles/Download/uefa/KeyTopics/90/14/57/901457_DOWNLAOD.pdf.

UEFA (2017). UEFA Nations League Media Briefing. Nyon, 20 September 2017. https://web.archive.org/web/20180905214902/http://files.footballseeding.com/200002130-9283c937e4/UNL%20media%20briefing%20PDF%20version.pdf.
UEFA (2018a). *Regulations of the UEFA European Football Championship 2018-20.* [https://www.uefa.com/MultimediaFiles/Download/Regulations/uefaorg/Regulations/02/54/36/05/2543605_DOWNLOAD.pdf](https://www.uefa.com/MultimediaFiles/Download/Regulations/uefaorg/Regulations/02/54/36/05/2543605_DOWNLOAD.pdf).

UEFA (2018b). *Regulations of the UEFA Nations League 2018-19.* [https://www.uefa.com/MultimediaFiles/Download/Regulations/uefaorg/Regulations/02/50/54/37/2505437_DOWNLOAD.pdf](https://www.uefa.com/MultimediaFiles/Download/Regulations/uefaorg/Regulations/02/50/54/37/2505437_DOWNLOAD.pdf).

UEFA (2018c). UEFA EURO 2020 qualifying draw. 2 December 2018. [https://www.uefa.com/european-qualifiers/news/newsid=2573388.html](https://www.uefa.com/european-qualifiers/news/newsid=2573388.html).

Vong, A. I. K. (2017). Strategic manipulation in tournament games. *Games and Economic Behavior,* 102:562–567.