Fair tournament design: a flaw of the UEFA Euro 2020 qualification

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Which country will play in the 2020 UEFA European Championship?

Note: there are 24 participants

- **1** Georgia (current Elo ranking in the UEFA: **34**)
- 2 North Macedonia (current Elo ranking in the UEFA: 35)
- **3** Kosovo (current Elo ranking in the UEFA: **39**)
- 4 Belarus (current Elo ranking in the UEFA: 40)
- **5** Hungary (current Elo ranking in the UEFA: **30**)
- 6 None of them

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Outline

Introduction

- Background: qualification for the UEFA Euro 2020
- Simulation: the quantification of qualifying probabilities

Results

- Baseline calculations
- Sensitivity analysis
- Theoretical confirmation
- How to achieve fairness?
- Discussion

Summary

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What does fairness mean in this talk?

Problems that can undermine the integrity of sport

- Match-fixing
- Illegal gambling
- Doping
- Tanking: deliberately dropping points or losing a game in order to gain some other advantage

Strategic manipulation is not so rare as you think

- Preferred competitor: badminton women's doubles, 2012 Olympics
- Some sports use player drafts with the traditional set-up of reverse order: a team tanks after it has no more chance to progress
- Sometimes a contestant may be strictly better off by losing
- The problem is well discussed in social choice theory but not in sports
- This presentation is about manipulation in a probabilistic environment

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Qualification for the UEFA Euro 2020

Characteristics

- The 2020 UEFA European Championship is the 16th international men's football championship of Europe
- ► For the first time, it will be spread over 12 cities in 12 host countries across the continent
- No national team gets an automatic qualifying berth
- 24 teams participate in the final tournament, similarly to the UEFA Euro 2016
- The qualification is different from the previous ones as it is connected to the inaugural season the new competition UEFA Nations League

Overview

- 2018/19 UEFA Nations League
- 2 UEFA Euro 2020 qualifying competition
- **3** UEFA Euro 2020 qualifying play-offs

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First stage: 2018/19 UEFA Nations League

Main features

- ▶ 55 UEFA national teams are divided into four divisions called *leagues*
- 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
- The 12 (4 × 3) highest-ranked teams form League A, the next 12 (4 × 3) form League B, the next 15 (3 × 4; 1 × 3) form League C, and the remaining 16 (4 × 4) form League D (55 = 12 + 12 + 15 + 16)
- Traditional seeding regime for the four groups in each league
- Groups are home-away (double) round-robin tournaments

Overall UEFA Nations League ranking

- ► Four league rankings (A, B, C, D) are established
- ▶ Teams of League A \rightarrow 1–12, Teams of League B \rightarrow 13–24 Teams of League C \rightarrow 25–39, Teams of League D \rightarrow 40–55

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Second stage: UEFA Euro 2020 qualifying

Summary

- The 55 teams are divided into five groups of five (Groups A-E) and five groups of six teams (Groups F-J)
- Teams are seeded according to the overall UEFA Nations League ranking
- UNL Pot: 1-4; Pot 1: 5-10; Pot 2: 11-20; Pot 3: 21-30; Pot 4: 31-40; Pot 5: 41-50; Pot 6: 51-55
- ► Groups A-D: one team from the UNL Pot, one team from Pots 2-5
- ► Group E: one team from Pots 1–5
- ► Groups F-J: one team from Pots 1-6
- (Specific seeding restrictions due to host nations, prohibited team clashes, winter venue, and excessive travel)
- Groups are home-away (double) round-robin tournaments
- ▶ The top two teams from a group advance to the UEFA Euro 2020

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Third stage: UEFA Euro 2020 qualifying play-offs

Summary

- 16 teams, which do not qualify for the UEFA Euro 2020 directly, are selected on the basis of the overall UEFA Nations League ranking
- They are divided into four paths containing four teams each
- Each path consists of three matches, two semifinals and a final
- The semifinals are hosted by the higher-ranked team, the host of the final is drawn randomly
- The winner of the final qualifies for the UEFA Euro 2020
- ► 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) ⇒ at least one group winner from each league qualifies for the final tournament
- The selection and allocation rules of the 16 teams are contradictory and may lead to an unfair formation of play-off paths [Csató, 2020c]

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Qualification for the UEFA Euro 2020: overview I

- The 55 teams are allocated into Leagues A-D on the basis of the ranking from UEFA national team coefficients
- Pour 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
- Groups of the UEFA Euro 2020 qualifiers are drawn on the basis of the overall UEFA Nations League ranking
- Matches of the UEFA Euro 2020 qualifiers are played, the top two teams from each group qualify (altogether 20 teams)
- I6 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 four teams qualify

Qualification for the UEFA Euro 2020: overview II

Rank 1	League	Rank 2	Seeding	Remark
1–12	А	1–4 (GW)	UNL Pot	drawn into a group of five assured of at least play-offs
1-12	А	5-10	Pot 1	
1-12	А	11-12	Pot 2	
13-24	В	13–16 (GW)	Pot 2	assured of at least play-offs
13-24	В	17–20	Pot 2	
13-24	В	21-24	Pot 3	
25–39	С	25–28 (GW)	Pot 3	assured of at least play-offs
25–39	С	29–30	Pot 3	
25–39	С	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	

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How the probability of qualifying is determined?

Main features

- Our computer code closely follows the relevant UEFA regulations but the specific restrictions in the draw are ignored
- The focus is on the (really complicated) qualification process and not on the accurate modelling of match outcomes
- The probability with which a team defeats another is fixed a priori

Winning probability: World Football Elo Ratings (eloratings.net)

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

- d is the difference between the Elo ratings of the two team
- s = 400 is a scaling parameter (it will be used for sensitivity analysis)
- We use Elo ratings as of 6 December 2017 (the seeding pots of the 2018/19 UEFA Nations League were announced on 7 December 2017)

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The probability of qualification (UEFA Euro 2020)



The probability of direct qualification



The probability of qualification through play-offs



Results Baseline calculations

The probability of qualification at the boundary of two leagues: the Netherlands, Leagues A and B



The probability of qualification at the boundary of two leagues: Turkey, Leagues B and C



The probability of qualification at the boundary of two leagues: Lithuania, Leagues C and D



Sensitivity analysis I: the probability of qualification for Lithuania, s = 600



Sensitivity analysis II: the probability of qualification for Lithuania, s = 800



Sensitivity analysis III: the probability of qualification for Lithuania, s = 1200



What is the root of unfairness?

The above finding of unfairness can be driven by the dataset (the actual distribution of teams' strength) and not by the competition format itself

Three theoretical models

- The Elo rating of the 28th ranked middle team is fixed at 1500
- Team *i* has an Elo rating of $1500 + (28 i)\Delta$
- $\blacktriangleright \ \Delta \in \{0,10,20\}$ corresponds to the name of the probabilistic model

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Theoretical model: qualifying probability with regular path formation



Alternative designs of the qualification

 Only the last step of the qualification, the path formation policy of the UEFA Euro 2020 qualifying play-offs is modified

Three options for path formation

- Regular path formation: Nations League group winners cannot face any team from a higher-ranked league
- Random path formation: the 16 teams of the play-offs are divided randomly into four paths

Seeded path formation: the 16 teams of the play-offs are divided into four paths based on the overall UEFA Nations League ranking under the traditional seeding regime The four highest-ranked teams are drawn randomly from Pot 1, the next four from Pot 2, the next four from Pot 3, and the four lowestranked from Pot 4.

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Theoretical model: qualifying probability with random path formation



Theoretical model: qualifying probability with seeded path formation



The probability of qualification for Lithuania: regular path formation



The probability of qualification for Lithuania: random path formation



The probability of qualification for Lithuania: seeded path formation



An implication: unfair punishment for winning

Formation of the 2018/19 UEFA Nations League

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

This is calculated as a weighted average:

- 2014 FIFA World Cup qualification + final: 20% of the average points
- UEFA Euro 2016 qualification + final: 40% of the average points
- 2018 FIFA World Cup qualification: 40% of the average points

The case of Lithuania

- ► Lithuania obtained only six points in UEFA Group F during the 2018 FIFA World Cup qualification, while 18 points was still not enough for the qualification ⇒ qualification is almost hopeless
- 11 October 2016: Lithuania vs. Malta 2-0
- A draw of 2-2 would lead to 18100.74 1640.08 + 800.08 = 17260.74 points, corresponding to the 40th place (instead of the 39th)

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Conclusions

Key points of the research

- We have first documented the unfairness of the qualification for the UEFA Euro 2020 (credit for *Eduard Ranghiuc* and *my father*)
- Being a top team in the lowest-ranked League D of the 2018/19 UEFA Nations League can substantially increase the probability of qualification compared to being a bottom team in League C of the 2018/19 UEFA Nations League
- Certain teams might strategically manipulate the UEFA Nations League and/or the rules might punish a team for winning

Future

- ▶ 2020/21 UEFA Nations League: revised format of 16+16+16+7 = 55
- Qualification for the FIFA World Cup 2022: only two play-off slots
- UEFA is strongly encouraged to consider our results in setting the rules for the future

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Take-home message

Increasing diversity by favouring underdogs can easily lead to unfairness, so it always requires a careful analysis in advance

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Related papers I



Csató, L. (2020a).

A simulation comparison of tournament designs for the World Men's Handball Championships.

International Transactions in Operational Research, in press.



Csató, L. (2020b).

Optimal tournament design: lessons from the men's handball Champions League. *Journal of Sports Economics*, 21(8): 848–868.

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Csató, L. (2020c).

Two issues of the UEFA Euro 2020 qualifying play-offs. *International Journal of Sport Policy and Politics*, in press.

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Csató, L. and Petróczy, D. G. (2020).
Miért igazságtalan a 2020-as labdarúgó-Európa-bajnokság kvalifikációja?
Közgazdasági Szemle, LXVII(7-8): 734–747.
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Related papers II

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Csató, L. (2020d).
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Fair tournament design: A flaw of the UEFA Euro 2020 qualification. *arXiv*: 1905.03325.

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Csató, L. (2020e).
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A 2020-as labdarúgó-Európa-bajnokság pótselejtezőjének problémái. *Szigma*, LI(2): 81–94.

Csató, L. and Petróczy, D. G. (2018).

Néhány gondolat a labdarúgás rangsorolási szabályairól a 2018. évi labdarúgóvilágbajnokság európai selejtezője kapcsán.

Közgazdasági Szemle, LXV(6): 632–649.

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Csató, L. (2019).
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Csalásbiztosságot sértő sportszabályok.

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Szigma, L(1-2): 17–33.
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Wer, von inneren Kräften angeregt, sich ein solches Werk vorsetzen 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 Koder die Wahrheit zu sagen, nichts als die Wahrheit, die ganze Wahrheit.

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.

(Carl von Clausewitz: Vom Kriege)

Thank for your attention!