Fifa World Cup 2022 and Gini Coefficient up to the Round of Sixteen

Anindya Kumar Biswas, Department of Physics;

North-Eastern Hill University, Mawkynroh-Umshing, Shillong-793022.

email:anindya@nehu.ac.in

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Abstract

In this paper we study the Fifa World Cup 2022 matches up to the Round of Sixteen. We find that the empirical evidence of lower Gini coefficient is continuing to decide the higher probability of winning of a country in a match in the FIFA World Cup 2022 up to the Round of Sixteen. Moreover, in the Group Stage, probability to win with lower HDI was 18/37 or, 1/2.06 i.e. less than half. In the Round of Sixteen stage probability to win with lower HDI has swung to the opposite direction to 5/8 i.e. more than half, as in the previous World Cup.

I. INTRODUCTION

There is not a single place, probably, in this world where football has not been played. The motion of a football from time immemorial has mesmerised and baffled laymen as well as scientists. It is here comes a footballer who uses his/her empirical knowledge of the motion of a football and combines with his/her physical/mental ability to the advantage of the team over the other team. Fifa World Cup is the pinnacle of all settings where the above combinations are in full display. A Fifa World Cup, [1], especially of the menfolk, is one of the few life time experiences. Starting at Uruguay in 1930, it is now the most viewed tournament on this earth. This tournament is organised by FIFA(Federation Internatioale de Football Association) after a gap of four years. Thirty two countries of different strata, from six Fifa continental zones on this earth, Europe, North and Central America and Caribbean, South America, Africa, Asia, Oceania, come to this tournament. Those countries differ from each other in respective Gini Coefficient[2] and HDIs[3]. Gini Coefficient and HDI are important economic indicators for a country. Whether there is any correlation between winning in a match in the tournament and economic indicators of the contending teams, is a natural question which crops up in our discourses. To find, if any, we undertook in [4] a simple-minded analysis of matches of 2014 Fifa World Cup and 2018 Fifa World Cup. In this article, we go on studying ongoing matches of 2022 Fifa World Cup, being held in the Middle East, in the country Qatar, in and around the capital Doha.

Corrado Gini, an Italian sociologist and statistician, following work of Max Lorenz and improving on work of Vilfredo Pareto, developed, [5] an index for income inequality for a country. Gini index,[6], measures the extent to which the distribution of income among individuals or, households within an economy deviates from perfectly equal distribution. A Lorenz curve plots the cumulative percentage of total income received against the cumulative number of recipients starting with the poorest individual or, household. The Gini coefficient measures the ratio of the area between the Lorenz curve and a hypothetical line of absolute equality and the area below the hypothetical line of absolute equality. Equivalent mathematical definition, [7], of Gini coefficient is

$$G = \frac{\Sigma_{i=1}^n \Sigma_{j=1}^n |x_i - x_j|}{2(n-1)\Sigma_{j=1}^n x_j},$$

where, n is the number of people of a country and income of j-th person is x_j. Gini coefficient of a country can vary from zero to one. If income of all the people of a country is the same, Gini coefficient is zero. If one person of a country has income, rest other income-less, Gini coefficient of that country is one. In u.k., for example, Gini coefficient is measured by Office of the National Statistics of u.k.. UN(United Nations) quotes Gini coefficient as one of the important indices for measuring inequality.

Under the auspices of United Nations General Assembly, was founded on 22-nd November, 1965, UNDP(United Nations Development Programme), United Nations' global development network with headquarter at New York. Since 1990, UNDP has published each year the Human Development Report containing aspects on Human Development and the annual Human Development Index(HDI). In 1990, Mahbub ul Haq, working with a group of leading economists, put forward the first Human Development Report. Pakistani economist, Mahbub ul Haq, had been developing the concept of Human Development Index(HDI) starting from 1970. Compared to the definition in 1990, the mathematical definition of HDI underwent change. From 2010 onwards, the Human Development Index(HDI), is defined [3] mathematically as

$$HDI = (LEI.EI.II)^{1/3},$$

where,

Life Expectancy Index(LEI)= $\frac{LE-20}{85-20}$, Education Index(EI)= $\frac{MYSI+EYSI}{2}$, Mean Years of Schooling index(MYSI)= $\frac{MYS}{15}$, Expected Years of Schooling index(EYSI)= $\frac{EYS}{18}$, with each entry in year and Income index(II)= $\frac{ln(GNI_{pc})-ln100}{ln(75000)-ln100}$ with each entry in dollar. LE is Life expectancy at birth, MYS is mean years of schooling (i.e. years that a person aged twenty five or, older has spent in formal education), EYS is expected years of schooling (i.e. total expected years of schooling for children under eighteen years of age), GNI_{pc} is Gross national income at purchasing power parity per capita.

We organise the paper as follows. In the next section, section II, we study the games of FIFA WORLD CUP 2022. For analysing, we collect the datas from [1], [5], [3], likes of [8]. All the relevant scores, we have gathered from [1], [8], percentage Gini coefficients i.e. Gini coefficients multiplied by hundred from, [9], [10] and if not available from other sources from [5], HDI from [3], [11]. The section III is conclusion. The section IV is bibliography.

II. FIFA WORLD CUP 2022

The FIFA WORLD CUP 2022 is being held in Qatar from 20-th November to 18-th December. This is the 22-nd FIFA WORLD CUP. Teams qualified to play are the host nation Qatar, Saudi Arabia, Uruguay, Morocco, IR Iran, Portugal, Spain, France, USA, Canada, Cameroon, Australia, Argentina, Denmark, Croatia, Costa Rica, Serbia, Germany, Mexico, Brazil, Switzerland, Korea Republic, Belgium, Tunisia, Ghana, u.k., Wales, Japan, Poland, Belgium, Ecuador, Senegal respectively. These thirty two teams were divided into eight groups, Group A to Group H for the Group Stage matches. Each match was of ninety minutes duration.

In Group A, Qatar, Ecuador, Senegal, Netherland were the teams. Each team played with the rest three in the group. For a team, winning contributed to three points, draw to one point and defeat to zero point. Two teams from each group with higher points went to the next stage, Round of sixteen. From Group A, Netherlands with seven points and Senegal with six points went to the Round of sixteen. From Group B, u.k. and USA; from Group C, Argentina and Poland; from Group D, France and Australia; from Group E, Japan and Spain; from Group F, Morocco and Croatia; from Group G, Brazil and Switzerland; from Group H, Portugal and Korea Republic went to the Round of sixteen knockout matches.

Group A and Group B were clubbed together for the Round of sixteen matches. Similarly, Group C with Group D, Group E with Group F, Group G with Group H were put in the same brackets for the Round of sixteen matches. Group A highest pointer played with next-highest pointer of Group B. Group A next-highest pointer played with highest pointer of Group B. Netherlands played with USA, u.k. played with Senegal. In the second bracket, Argentina played with Australia, France played with Poland. In the third bracket, Japan played with Croatia, Morocco played with Spain. In the last bracket, Brazil played with Korea Republic and Portugal played with Switzerland. Each match went to the decision level, if not in ninety minutes, in thirty minutes extra time. If the match was not decided in extra time, it was decided in penalty shoot-out. Japan-Croatia, Morocco-Spain matches were decided through penalty shoot-outs.

Following is the matches, results and Gini, HDI analysis.

A. Group Stage

match number	teams	goals	percentage Gini	HDI	Winners
1	Qatar	0	2007 Gini 58.9	2021 HDI 0.855	Gini lower
	Ecuador	2	2020 Gini 47.3	2021 HDI 0.740	HDI lower
2	u.k.	6	2017 Gini 35.1	2021 HDI 0.929	Gini lower
	Iran	2	2019 Gini 40.9	2021 HDI 0.774	HDI higher
3	Senegal	0	2018 Gini 38.1	2021 HDI 0.511	Gini lower
	Netherlands	2	2019 Gini 29.2	2021 HDI 0.941	HDI higher
4	USA	1	2019 Gini 41.5	2021 HDI 0.921	
	Wales	1	2019 Gini 32	2021 HDI 0.901	
5	Argentina	1	2020 Gini 42.3	2021 HDI 0.842	Gini higher
	Saudi Arabia	2	2013 Gini 54.1	2021 HDI 0.875	HDI higher
6	Denmark	0	2019 Gini 27.7	2021 HDI 0.948	
	Tunisia	0	2015 Gini 32.8	2021 HDI 0.740	
7	Mexico	0	2020 Gini 45.4	2021 HDI 0.758	
	Poland	0	2018 Gini 30.2	2021 HDI 0.876	
8	France	4	2018 Gini 32.4	2021 HDI 0.903	Gini lower
	Australia	1	2018 Gini 34.3	2021 HDI 0.951	HDI lower
9	Morocco	0	2013 Gini 39.5	2021 HDI 0.683	
	Croatia	0	2019 Gini 28.9	2021 HDI 0.858	
10	Germany	1	2018 Gini 31.7	2021 HDI 0.942	Gini higher
	Japan	2	2013 Gini 32.9	2021 HDI 0.925	HDI lower
11	Spain	7	2019 Gini 34.3	2021 HDI 0.905	Gini lower
	Costa Rica	0	2020 Gini 49.3	2021 HDI 0.809	HDI higher
12	Belgium	1	2019 Gini 27.2	2021 HDI 0.937	Gini lower
	Canada	0	2017 Gini 33.3	2021 HDI 0.936	HDI higher
13	Switzerland	1	2018 Gini 33.1	2021 HDI 0.962	Gini lower
	Cameroon	0	2014 Gini 46.6	2021 HDI 0.576	HDI higher
14	Korea Republic	0	2016 Gini 31.4	2021 HDI 0.925	
	Uruguay	0	2020 Gini 40.2	2021 HDI 0.809	
15	Portugal	3	2019 Gini 32.8	2021 HDI 0.866	Gini lower
	Ghana	2	2016 Gini 43.5	2021 HDI 0.632	HDI higher
16	Brazil	2	2020 Gini 48.9	2021 HDI 0.754	Gini higher
	Serbia	0	2019 Gini 34.5	2021 HDI 0.802	HDI lower
17	Wales	0	2019 Gini 32	2021 HDI 0.901	Gini higher
	Iran	2	2019 Gini 40.9	2021 HDI 0.774	HDI lower

match number	teams	goals	percentage Gini	HDI	Winners
18	Qatar	1	2007 Gini 58.9	2021 HDI 0.855	Gini lower
	Senegal	3	2018 Gini 38.1	2021 HDI 0.511	HDI lower
19	Netherlands	1	2019 Gini 29.2	2021 HDI 0.941	
	Ecuador	1	2020 Gini 47.3	2021 HDI 0.740	
20	u.k.	0	2017 Gini 35.1	2021 HDI 0.929	
	USA	0	2019 Gini 41.5	2021 HDI 0.921	
21	Tunisia	0	2015 Gini 32.8	2021 HDI 0.740	
	Australia	1	2018 Gini 34.3	2021 HDI 0.951	
22	Poland	2	2018 Gini 30.2	2021 HDI 0.876	Gini lower
	Saudi Arabia	0	2013 Gini 54.1	2021 HDI 0.875	HDI higher
23	France	2	2018 Gini 32.4	2021 HDI 0.903	Gini higher
	Denmark	1	2019 Gini 27.7	2021 HDI 0.948	HDI lower
24	Argentina	2	2020 Gini 42.3	2021 HDI 0.842	Gini lower
	Mexico	0	2020 Gini 45.4	2021 HDI 0.758	HDI higher
25	Japan	0	2013 Gini 32.9	2021 HDI 0.925	Gini higher
	Costa Rica	1	2020 Gini 49.3	2021 HDI 0.809	HDI lower
26	Belgium	0	2019 Gini 27.2	2021 HDI 0.937	Gini higher
	Morocco	2	2013 Gini 39.5	2021 HDI 0.683	HDI lower
27	Croatia	4	2019 Gini 28.9	2021 HDI 0.858	Gini lower
	Canada	1	2017 Gini 33.3	2021 HDI 0.936	HDI lower
28	Spain	1	2019 Gini 34.3	2021 HDI 0.905	
	Germany	1	2018 Gini 31.7	2021 HDI 0.942	
29	Cameroon	3	2014 Gini 46.6	2021 HDI 0.576	
	Serbia	3	2019 Gini 34.5	2021 HDI 0.802	
30	Korea Republic	2	2016 Gini 31.4	2021 HDI 0.925	Gini higher
	Ghana	3	2016 Gini 43.5	2021 HDI 0.632	HDI lower
31	Brazil	1	2020 Gini 48.9	2021 HDI 0.754	Gini higher
	Switzerland	0	2018 Gini 33.1	2021 HDI 0.962	HDI lower
32	Portugal	2	2019 Gini 32.8	2021 HDI 0.866	Gini lower
	Uruguay	0	2020 Gini 40.2	2021 HDI 0.809	HDI higher
33	Ecuador	1	2020 Gini 47.3	2021 HDI 0.740	Gini lower
	Senegal	2	2018 Gini 38.1	2021 HDI 0.511	HDI lower
34	Netherlands	2	2019 Gini 29.2	2021 HDI 0.941	Gini lower
	Qatar	0	2007 Gini 58.9	2021 HDI 0.855	HDI higher
35	Iran	0	2019 Gini 40.9	2021 HDI 0.774	Gini higher
	USA	1	2019 Gini 41.5	2021 HDI 0.921	HDI higher
36	Wales	0	2019 Gini 32	2021 HDI 0.901	Gini higher
	u.k.	3	2017 Gini 35.1	2021 HDI 0.929	HDI higher
37	Australia	1	2018 Gini 34.3	2021 HDI 0.951	Gini higher
	Denmark	0	2019 Gini 27.7	2021 HDI 0.948	HDI higher
38	Tunisia	1	2015 Gini 32.8	2021 HDI 0.740	Gini higher
	France	0	2018 Gini 32.4	2021 HDI 0.903	HDI lower

match number	teams	goals	percentage Gini	HDI	Winners
39	Poland	0	2018 Gini 30.2	2021 HDI 0.876	Gini higher
	Argentina	2	2020 Gini 42.3	2021 HDI 0.842	HDI lower
40	Saudi Arabia	1	2013 Gini 54.1	2021 HDI 0.875	Gini lower
	Mexico	2	2020 Gini 45.4	2021 HDI 0.758	HDI lower
41	Canada	1	2017 Gini 33.3	2021 HDI 0.936	Gini higher
	Morocco	2	2013 Gini 39.5	2021 HDI 0.683	HDI lower
42	Croatia	0	2019 Gini 28.9	2021 HDI 0.858	
	Belgium	0	2019 Gini 27.2	2021 HDI 0.937	
43	Japan	2	2013 Gini 32.9	2021 HDI 0.925	Gini lower
	Spain	1	2019 Gini 34.3	2021 HDI 0.905	HDI higher
44	Costa Rica	2	2020 Gini 49.3	2021 HDI 0.809	Gini lower
	Germany	4	2018 Gini 31.7	2021 HDI 0.942	HDI higher
45	Korea Republic	2	2016 Gini 31.4	2021 HDI 0.925	Gini lower
	Portugal	1	2019 Gini 32.8	2021 HDI 0.866	HDI higher
46	Ghana	0	2016 Gini 43.5	2021 HDI 0.632	Gini lower
	Uruguay	2	2020 Gini 40.2	2021 HDI 0.809	HDI higher
47	Serbia	2	2019 Gini 34.5	2021 HDI 0.802	Gini lower
	Switzerland	3	2018 Gini 33.1	2021 HDI 0.962	HDI higher
48	Cameroon	1	2014 Gini 46.6	2021 HDI 0.576	Gini lower
	Brazil	0	2020 Gini 48.9	2021 HDI 0.754	HDI lower

TABLE I. Matches of the Group Stages : scores, percentage Gini, HDI, winner's Gini and HDI relative to the other team

In the Group Stage, we notice from the table, TableI, for the decided matches probability [12] for a team with lower relative Gini coefficient to win is $\frac{22}{37}$ i.e.$\sim \frac{2}{3}$, probability for a team with lower relative HDI to win is $\frac{1}{2.06}$ i.e.$\sim \frac{1}{2}-$.

match number	teams	goals	percentage Gini	HDI	Winners
1	Netherlands	3	2019 Gini 29.2	2021 HDI 0.941	Gini lower
	USA	1	2019 Gini 41.5	2021 HDI 0.921	HDI higher
2	Argentina	2	2020 Gini 42.3	2021 HDI 0.842	Gini higher
	Australia	1	2018 Gini 34.3	2021 HDI 0.951	HDI lower
3	France	3	2018 Gini 32.4	2021 HDI 0.903	Gini higher
	Poland	1	2018 Gini 30.2	2021 HDI 0.876	HDI higher
4	u.k.	3	2017 Gini 35.1	2021 HDI 0.929	Gini lower
	Senegal	0	2018 Gini 38.1	2021 HDI 0.511	HDI higher
5	Japan	1(1)	2013 Gini 32.9	2021 HDI 0.925	Gini lower
	Croatia	1(3)	2019 Gini 28.9	2021 HDI 0.858	HDI lower
6	Brazil	4	2020 Gini 48.9	2021 HDI 0.754	Gini higher
	Korea Republic	1	2016 Gini 31.4	2021 HDI 0.925	HDI lower
7	Morocco	0(3)	2013 Gini 39.5	2021 HDI 0.683	Gini higher
	Spain	0(0)	2019 Gini 34.3	2021 HDI 0.905	HDI lower
8	Portugal	6	2019 Gini 32.8	2021 HDI 0.866	Gini lower
	Switzerland	1	2018 Gini 33.1	2021 HDI 0.962	HDI lower

TABLE II. Matches of the Round of Sixteen : scores, percentage Gini, HDI, winner's Gini and HDI relative to the other team

B. Round of sixteen

In the Round of Sixteen stage we notice from the table, TableII, probability for a team with lower relative Gini coefficient to win is $\frac{4}{8}$ or, $\frac{1}{2}$, probability for a team with lower relative HDI to win is $\frac{5}{8}$ i.e.$\frac{1}{2}+$.

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