Fifa World Cup and Gini Coefficient

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Abstract

In this paper we have found empirical evidence of a rising trend of lower Gini coefficient deciding the higher probability of winning of a country in a match in the FIFA World Cup. We have also studied the role of HDI in different stages of the football cup.

I. INTRODUCTION

Fifa World Cup football[1] is intensely followed throughout the world. Beginning 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, in this article, undertake a simple-minded analysis of matches of 2014 Fifa World Cup and 2018 Fifa World Cup.

Corrado Gini, an Italian sociologist and statistician, following work of Max Lorenz and improving on work of Vilfredo Pareto, developed, [4] an index for income inequality for a country. Gini index,[5], 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, [6], 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 England, for example, Gini coefficient is measured by Office of the National Statistics of England. 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 develop-

ment 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 2018. For analysing, we collect the datas from [1], [4], [3], likes of [7]. In the following section, section III, we deal with all matches of FIFA WORLD CUP 2014. All the relevant scores, percentage Gini coefficients i.e. Gini coefficients multiplied by hundred, HDI, we have gathered from [1], [5], [3], [8]. Section IV is conclusion. Section V is discussion about what can we study more with time.

II.   FIFA WORLD CUP 2018

The FIFA WORLD CUP 2018 was being held in Russia from 14-th June to 15-th July. This is the 21st FIFA WORLD CUP. Teams qualified to play were host nation Russia, Saudi Arabia, Egypt, Uruguay, Morocco, IR Iran, Portugal, Spain, France, Australia, Argentina, Iceland, Peru, Denmark, Croatia, Nigeria, Costa Rica, Serbia, Germany, Mexico, Brazil, Switzerland, Sweden, Korea Republic, Belgium, Panama, Tunisia, England, Colombia, Japan, Poland, Senegal. 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, Uruguay, Russia, Saudi Arabia, Egypt 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, Uruguay with nine points and Russia with six points went to the Round of sixteen. From Group B, Spain and Portugal; from Group C, France and Denmark; from Group D, Croatia and Argentina; from Group E, Brazil and Switzerland; from Group F, Sweden and Mexico; from Group H, Colombia and Japan 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. Uruguay played with Portugal. Russia played with Spain. In the second bracket, France played with Argentina, Denmark played with Croatia. In the third bracket, Brazil played with Mexico, Switzerland played with Sweden. In the last bracket, Belgium played with Japan and England played with Colombia. 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. Russia-Spain, Denmark-Croatia, England-Colombia matches were decided through penalty shoot-outs.

Eight winners of the Round of sixteen went to the Quarter-Final stage. Quarter-Final stage was also a knockout phase. Round of sixteen winners of first and second brackets competed with each other whereas, Round of sixteen winners of third and fourth brackets played with each other. Uruguay played with France, Russia played with Croatia. Brazil played with Belgium, Sweden played with England. Croatia won in Russia-Croatia match in the penalty time.

Winners of the Quarter-Final stage went to the semi-finals. France played with Belgium and Croatia played with England. Croatia-England match was concluded in extra-time.

Winners of the semi-final matches met in the final and the loosers in the third place play-off. France and Croatia took the final stage and Belgium, England participated for the third place play-off. France went back with the trophy from Luzhniki stadium in Moscow.

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

A.   Group Stage

match number	teams	goals	percentage Gini	HDI	Winners
1	Russia	5	2015 Gini 37.7	2015 HDI 0.804	Gini lower
	Saudi Arabia	0	2013 Gini 45.9	2015 HDI 0.847	HDI lower
2	Egypt	0	2008 Gini 30.8	2015 HDI 0.691	Gini higher
	Uruguay	1	2013 Gini 38.2	2015 HDI 0.795	HDI higher
3	Morocco	0	2007 Gini 40.9	2015 HDI 0.647	Gini lower
	Iran	1	2013 Gini 37.4	2014 HDI 0.766	HDI higher
4	Portugal	3	2016 Gini 33.5	2015 HDI 0.843	
	Spain	3	2016 Gini 34.5	2015 HDI 0.884	
5	France	2	2013 Gini 30.1	2015 HDI 0.897	Gini lower
	Australia	1	2012 Gini 33.6	2015 HDI 0.939	HDI higher
6	Argentina	1	2014 Gini 42.7	2015 HDI 0.827	
	Iceland	1	2013 Gini 24.0	2015 HDI 0.921	
7	Peru	0	2015 Gini 44.3	2015 HDI 0.740	Gini lower
	Denmark	1	2015 Gini 28.8	2015 HDI 0.925	HDI higher
8	Croatia	2	2018 Gini 29.7	2015 HDI 0.827	Gini lower
	Nigeria	0	2010 Gini 43.0	2015 HDI 0.514	HDI higher
9	Costa Rica	0	2015 Gini 48.2	2015 HDI 0.776	Gini lower
	Serbia	1	2013 Gini 29.6	2015 HDI 0.776	HDI same
10	Germany	0	2016 Gini 29.5	2015 HDI 0.926	Gini higher
	Mexico	1	2014 Gini 48.2	2015 HDI 0.762	HDI lower
11	Brazil	1			
	Switzerland	1			
12	Sweden	1	2015 Gini 25.4	2015 HDI 0.913	Gini lower
	South Korea	0	2015 Gini 29.5	2015 HDI 0.901	HDI higher
13	Belgium	3	2011 Gini 26.3	2015 HDI 0.896	Gini lower
	Panama	0	2015 Gini 51.0	2015 HDI 0.788	HDI higher
14	Tunisia	1	2010 Gini 36.1	2015 HDI 0.725	Gini lower
	England	2	2015 Gini 33.20	2016 HDI 0.920	HDI higher
15	Colombia	1	2017 Gini 50.8	2015 HDI 0.727	Gini lower
	Japan	2	2011 Gini 37.9	2015 HDI 0.903	HDI higher
16	Poland	1	2014 Gini 32.08	2015 HDI0.855	Gini higher
	Senegal	2	2011 Gini 40.3	2015 HDI 0.494	HDI lower
17	Russia	3	2015 Gini 37.7	2015 HDI 0.804	Gini higher
	Egypt	1	2008 Gini 30.8	2015 HDI 0.691	HDI higher

match number	teams	goals	percentage Gini	HDI	Winners
18	Portugal	1	2016 Gini 33.5	2015 HDI 0.843	Gini lower
	Morocco	0	2007 Gini 40.9	2015 HDI 0.647	HDI higher
19	Uruguay	1	2013 Gini 38.2	2015 HDI 0.795	Gini lower
	Saudi Arabia	0	2013 Gini 45.9	2015 HDI 0.847	HDI lower
20	Iran	0	2013 Gini 37.4	2014 HDI 0.766	Gini lower
	Spain	1	2016 Gini 34.5	2015 HDI 0.884	HDI higher
21	Denmark	1	2015 Gini 28.8	2015 HDI 0.925	
	Australia	1	2012 Gini 33.6	2015 HDI 0.939	
22	France	1	2013 Gini 30.1	2015 HDI 0.897	Gini lower
	Peru	0	2015 Gini 44.3	2015 HDI 0.740	HDI higher
23	Argentina	0	2014 Gini 42.7	2015 HDI 0.827	Gini lower
	Croatia	3	2018 Gini 29.7	2015 HDI 0.827	HDI same
24	Brazil	2	2015 Gini 51.3	2015 HDI 0.754	Gini higher
	Costa Rica	0	2015 Gini 48.2	2015 HDI 0.776	HDI lower
25	Nigeria	2	2010 Gini 43.0	2015 HDI 0.514	Gini higher
	Iceland	0	2013 Gini 24.0	2015 HDI 0.921	HDI lower
26	Serbia	1	2013 Gini 29.6	2015 HDI 0.776	Gini lower
	Switzerland	2	2015 Gini 29.5	2015 HDI 0.939	HDI higher
27	Belgium	5	2011 Gini 26.3	2015 HDI 0.896	Gini lower
	Tunisia	2	2010 Gini 36.1	2016 HDI 0.725	HDI higher
28	South Korea	1	2015 Gini 29.5	2015 HDI 0.901	Gini higher
	Mexico	2	2014 Gini 48.2	2015 HDI 0.762	HDI lower
29	Germany	2	2016 Gini 29.5	2015 HDI 0.926	Gini higher
	Sweden	1	2015 Gini 25.4	2015 HDI 0.913	HDI higher
30	England	6	2015 Gini 33.20	2015 HDI 0.920	Gini lower
	Panama	1	2015 Gini 51.0	2015 HDI 0.788	HDI higher
31	Japan	2	2011 Gini 37.9	2015 HDI 0.903	
	Senegal	2	2011 Gini 40.3	2015 HDI 0.494	
32	Poland	0	2014 Gini 32.08	2015 HDI 0.855	Gini higher
	Colombia	3	2017 Gini 50.8	2015 HDI 0.727	HDI lower
33	Uruguay	3	2013 Gini 38.2	2015 HDI 0.795	Gini higher
	Russia	0	2015 Gini 37.7	2015 HDI 0.804	HDI lower
34	Saudi Arabia	2	2013 Gini 45.9	2015 HDI 0.782	Gini higher
	Egypt	1	2008 Gini 30.8	2015 HDI 0.691	HDI higher
35	Spain	2			
	Morocco	2			
36	Iran	1			
	Portugal	1			
37	Australia	0	2012 Gini 33.6	2015 HDI 0.939	Gini higher
	Peru	2	2015 Gini 44.3	2015 HDI 0.740	HDI lower
38	Denmark	0			
	France	0			

match number	teams	goals	percentage Gini	HDI	Winners
39	Nigeria	1	2010 Gini 43.0	2015 HDI 0.514	Gini lower
	Argentina	2	2014 Gini 42.7	2015 HDI 0.827	HDI higher
40	Iceland	1	2013 Gini 24.0	2015 HDI 0.921	Gini higher
	Croatia	2	2018 Gini 29.7	2015 HDI 0.827	HDI lower
41	South Korea	2	2015 Gini 29.5	2015 HDI 0.901	Gini same
	Germany	0	2016 Gini 29.5	2015 HDI 0.926	HDI lower
42	Mexico	0	2014 Gini 48.2	2015 HDI 0.762	Gini lower
	Sweden	3	2015 Gini 25.4	2015 HDI 0.913	HDI higher
43	Serbia	0	2013 Gini 29.6	2015 HDI 0.776	Gini higher
	Brazil	2	2015 Gini 51.3	2015 HDI 0.754	HDI lower
44	Switzerland	2			
	Costa Rica	2			
45	Japan	0	2011 Gini 37.9	2015 HDI 0.903	Gini lower
	Poland	1	2014 Gini 32.1	2015 HDI 0.855	HDI lower
46	Senegal	0	2011 Gini 40.3	2015 HDI 0.494	Gini higher
	Colombia	1	2017 Gini 50.8	2015 HDI 0.727	HDI higher
47	Panama	1	2015 Gini 51.0	2015 HDI 0.788	Gini lower
	Tunisia	2	2010 Gini 36.1	2016 HDI 0.725	HDI lower
48	England	0	2015 Gini 33.20	2015 HDI 0.920	Gini lower
	Belgium	1	2011 Gini 26.3	2015 HDI 0.896	HDI lower

In the Group Stage, for the decided matches probability [9] for a team with lower relative Gini coefficient to win is $\frac{23}{35}$ i.e.$\sim \frac{2}{3}$, probability for a team with lower relative HDI to win is $\frac{1}{2.06}$ i.e.$\sim \frac{1}{2}-$.

B. Round of sixteen

match number	teams	goals	percentage Gini	HDI	Winners
1	Uruguay	2	2013 Gini 38.2	2015 HDI 0.795	Gini higher
	Portugal	1	2016 Gini 33.5	2015 HDI 0.843	HDI lower
2	Russia	1(4)	2015 Gini 37.7	2015 HDI 0.804	Gini higher
	Spain	1(3)	2016 Gini 34.5	2015 HDI 0.884	HDI lower
3	France	4	2013 Gini 30.1	2015 HDI 0.897	Gini lower
	Argentina	3	2014 Gini 42.7	2015 HDI 0.827	HDI higher
4	Denmark	1(2)	2015 Gini 28.8	2015 HDI 0.925	Gini higher
	Croatia	1(3)	2018 Gini 29.7	2015 HDI 0.827	HDI lower
5	Brazil	2	2015 Gini 51.3	2015 HDI 0.754	Gini higher
	Mexico	0	2014 Gini 48.2	2015 HDI 0.762	HDI lower
6	Switzerland	0	2015 Gini 29.5	2015 HDI 0.939	Gini lower
	Sweden	1	2015 Gini 25.4	2015 HDI 0.913	HDI lower
7	Belgium	3	2011 Gini 26.3	2015 HDI 0.896	Gini lower
	Japan	2	2011 Gini 37.9	2015 HDI 0.903	HDI lower
8	England	1(4)	2015 Gini 33.20	2015 HDI	Gini lower
	Colombia	1(3)	2017 Gini 50.8	2015 HDI 0.727	HDI higher

In the Round of sixteen stage, probability for a team with lower relative Gini coefficient to win is $\frac{1}{2}$, probability for a team with lower relative HDI to win is $\frac{3}{4}$ i.e. $\frac{1}{2}+$.

C. Quarter-Final

match number	teams	goals	percentage Gini	HDI	Winners
1	Brazil	1	2015 Gini 51.3	2015 HDI 0.754	Gini lower
	Belgium	2	2011 Gini 26.3	2015 HDI 0.896	HDI higher
2	France	2	2013 Gini 30.1	2015 HDI 0.897	Gini lower
	Uruguay	0	2013 Gini 38.2	2015 HDI 0.795	HDI higher
3	Russia	2(3)	2015 Gini 37.7	2015 HDI 0.804	Gini lower
	Croatia	2(4)	2018 Gini 29.7	2015 HDI 0.827	HDI higher
4	England	2	2015 Gini 33.20	2015 HDI 0.920	Gini higher
	Sweden	0	2015 Gini 25.4	2015 HDI 0.913	HDI higher

In the Quarter Final stage, probability for a team with lower relative Gini coefficient to win is $\frac{3}{4}$, probability for a team with lower relative HDI to win is zero.

D. Semi-Final

match number	teams	goals	percentage Gini	HDI	Winners
1	France	1	2013 Gini 30.1	2015 HDI 0.897	Gini higher
	Belgium	0	2011 Gini 26.3	2015 HDI 0.896	HDI higher
2	Croatia	2	2018 Gini 29.7	2015 HDI 0.827	Gini lower
	England	1	2015 Gini 33.2	2015 HDI 0.920	HDI lower

In the Semi Final stage, probability for a team with lower relative Gini coefficient to win is $\frac{1}{2}$, probability for a team with lower relative HDI to win is $\frac{1}{2}$.

E. Third Place

match number	teams	goals	percentage Gini	HDI	Winners
1	Belgium	2	2011 Gini 26.3	2015 HDI 0.896	Gini lower
	England	0	2015 Gini 33.2	2015 HDI 0.920	HDI lower

In the Third Place Play-off, the team with lower relative Gini coefficient, lower HDI won.

F. Final

match number	teams	goals	percentage Gini	HDI	Winners
1	France	4	2013 Gini 30.1	2015 HDI 0.897	Gini higher
	Croatia	2	2018 Gini 29.7	2015 HDI 0.827	HDI higher

In the Final, the team with higher relative Gini coefficient, higher HDI won.

III. FIFA WORLD CUP 2014

FIFA WORLD CUP 2014 was held in Brazil from 12th June to 13th July, 2014. Teams qualified to play were host nation Brazil, Croatia, Mexico, Cameroon, Spain, Netherlands, Chile, Australia, Colombia, Greece, Uruguay, Costa Rica, England, Italy, Ivory Coast, Japan, Switzerland, Ecuador, Argentina, France, Honduras, Iran, Germany, Ghana, Nigeria, Bosnia and Herzegovina, Belgium, Russia, Portugal, South Korea, Algeria, USA. 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, Brazil,Mexico,Croatia, Cameroon 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, Brazil with seven points and Mexico with seven points went to the Round of sixteen. From Group B, Netherlands and Chile; from Group C, Colombia and Greece; from Group D, Costa Rica and Uruguay; from Group E, France and Switzerland; from Group F, Argentina and Nigeria; from Group H, Germany and USA 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. In the first bracket, Brazil played with Chile, Mexico played with Netherlands. In the second bracket, Colombia played with Uruguay, Greece played with Costa Rica. In the third bracket, France played with Nigeria, Switzerland played with Argentina. In the last bracket, Germany played with Algeria and USA played with Belgium. If the match was not decided in extra time, it was decided in penalty shoot-out. Brazil-Chile, Costa Rica-Greece matches were decided through penalty shoot-outs.

Eight winners of the Round of sixteen went to the Quarter-Final stage. Quarter-Final stage was also a knockout phase. Round of sixteen winners of first and second brackets, third and fourth brackets played with each others. Brazil played with Colombia, Netherlands played with Costa Rica. France played with Germany, Argentina played with Belgium. Netherlands-Costa Rica match went to penalty times.

Winners of the Quarter-Final stage went to the semi-finals. Germany played with Brazil and Argentina played with Netherlands. Argentina-Netherlands match was concluded in extra-time.

Winners of the semi-final matches met in the final and the losers in the third place play-off. Germany and Argentina took the final stage and Brazil, Netherlands participated for the third place play-off. Germany went back with the cup.

Following is the matches, results and Gini, HDI analysis, in tabular form.

A.   Group Stage

match number	teams	goals	percentage Gini	HDI	Winners
1	Brazil	3	2013 Gini 52.80	2013 HDI 0.747	Gini higher
	Croatia	1	2013 Gini 32.00	2013 HDI 0.818	HDI lower
2	Mexico	1	2014 Gini 45.80	2013 HDI 0.754	Gini lower
	Cameroon	0	2014 Gini 46.60	2013 HDI 0.507	HDI higher
3	Spain	1	2013 Gini 36.20	2013 HDI 0.869	Gini lower
	Netherlands	5	2013 Gini 28.10	2013 HDI 0.915	HDI higher
4	Chile	3	2013 Gini 47.30	2013 HDI 0.822	Gini higher
	Australia	1	2010 Gini 34.70	2013 HDI 0.933	HDI lower
5	Colombia	3	2013 Gini 52.90	2013 HDI 0.720	Gini higher
	Greece	0	2013 Gini 36.10	2013 HDI 0.853	HDI lower
6	Uruguay	1	2013 Gini 40.50	2013 HDI 0.791	Gini higher
	Costa Rica	3	2013 Gini 49.30	2012 HDI 0.773	HDI lower
7	England	1	2013 Gini 33.20	2013 HDI 0.892	Gini higher
	Italy	2	2013 Gini 34.90	2013 HDI 0.872	HDI lower
8	Ivory Coast	2	2008 Gini 41.5	2013 HDI 0.459	Gini higher
	Japan	1	2011 Gini 37.9	2013 HDI 0.890	HDI lower
9	Switzerland	2	2013 Gini 32.50	2013 HDI 0.917	Gini lower
	Ecuador	1	2013 Gini 46.90	2013 HDI 0.737	HDI higher
10	Cameroon	0	2014 Gini 46.60	2013 HDI 0.507	Gini lower
	Croatia	4	2013 Gini 32.00	2013 HDI 0.818	HDI higher
11	Colombia	2	2013 Gini 52.90	2013 HDI 0.720	Gini higher
	Ivory Coast	1	2008 Gini 41.5	2013 HDI 0.459	HDI higher
12	Uruguay	2	2013 Gini 40.50	2013 HDI 0.791	Gini higher
	England	1	2013 Gini 33.20	2013 HDI 0.892	HDI lower
13	Japan	0			
	Greece	0			
14	Italy	0	2013 Gini 34.90	2013 HDI 0.872	Gini higher
	Costa Rica	1	2013 Gini 49.30	2012 HDI 0.773	HDI lower
15	Switzerland	2	2013 Gini 32.50	2013 HDI 0.917	Gini same
	France	5	2013 Gini 32.50	2013 HDI 0.884	HDI lower
16	Honduras	1	2013 Gini 52.60	2014 HDI 0.606	Gini lower
	Ecuador	2	2013 Gini 46.90	2013 HDI 0.737	HDI higher
17	Argentina	1	2013 Gini 41.00	2013 HDI 0.836	Gini higher
	Iran	0	2013 Gini 37.4	2014 HDI 0.766	HDI higher

match number	teams	goals	percentage Gini	HDI	Winners
18	Germany	2			
	Ghana	2			
19	Nigeria	1	2010 Gini 43.0	2013 HDI 0.521	Gini higher
	Bosnia and Herzegovina	0	2011 Gini 33.00	2013 HDI 0.742	HDI lower
20	Belgium	1	2013 Gini 27.70	2013 HDI 0.881	Gini lower
	Russia	0	2013 Gini 40.90	2015 HDI 0.804	HDI higher
21	France	3	2013 Gini 32.50	2013 HDI 0.884	Gini lower
	Honduras	0	2013 Gini 52.60	2014 HDI 0.606	HDI higher
22	Argentina	2	2013 Gini 41.00	2013 HDI 0.836	Gini higher
	Bosnia and Herzegovina	1	2011 Gini 33.00	2013 HDI 0.742	HDI higher
23	Germany	4	2013 Gini 31.10	2013 HDI 0.911	Gini lower
	Portugal	0	2013 Gini 36.20	2013 HDI 0.822	HDI higher
24	Iran	0	2013 Gini 37.4		
	Nigeria	0	2010 gini 43.0	2013 HDI 0.521	
25	Ghana	1	2012 Gini 42.40	2013 HDI 0.576	Gini lower
	USA	2	2013 Gini 41.00	2013 HDI 0.914	HDI higher
26	Belgium	2	2013 Gini 27.70	2013 HDI 0.881	Gini higher
	Algeria	1	2011 Gini 27.60	2013 HDI 0.741	HDI higher
27	Russia	1	2013 Gini 40.90		
	South Korea	1	2012 Gini 31.60	2013 HDI 0.896	
28	Brazil	0	2013 Gini 52.80	2013 HDI 0.747	
	Mexico	0	2014 Gini 45.80	2013 HDI 0.754	
29	Australia	2	2010 Gini 34.70	2013 HDI 0.933	Gini lower
	Netherlands	3	2013 Gini 28.10	2013 HDI 0.915	HDI lower
30	Spain	0	2013 Gini 36.20	2013 HDI 0.869	Gini higher
	Chile	2	2013 Gini 47.30	2013 HDI 0.822	HDI lower
31	South Korea	2	2012 Gini 31.60	2013 HDI 0.896	Gini lower
	Algeria	4	2011 Gini 27.60	2013 HDI 0.741	HDI lower
32	USA	2	2013 Gini 41.00	2013 HDI 0.914	
	Portugal	2	2013 Gini 36.20	2013 HDI 0.822	
33	Australia	0	2010 Gini 34.70	2013 HDI 0.933	Gini higher
	Spain	3	2013 Gini 36.20	2013 HDI 0.869	HDI lower
34	Netherlands	2	2013 Gini 28.10	2013 HDI 0.915	Gini lower
	Chile	0	2013 Gini 47.30	2013 HDI 0.822	HDI higher
35	Cameroon	1	2014 Gini 46.60	2013 HDI 0.507	HDI higher
	Brazil	4	2013 Gini 52.80	2013 HDI 0.747	Gini higher
36	Croatia	1	2013 Gini 32.00	2013 HDI 0.818	HDI lower
	Mexico	3	2014 Gini 45.80	2013 HDI 0.754	Gini higher
37	Italy	0	2013 Gini 34.90	2013 HDI 0.872	Gini higher
	Uruguay	1	2013 Gini 40.50	2013 HDI 0.791	HDI lower

match number	teams	goals	percentage Gini	HDI	Winners
38	Costa Rica	0	2013 Gini 49.30	2012 HDI 0.773	
	England	0	2013 Gini 33.20	2013 HDI 0.892	
39	Japan	1	2011 Gini 37.9	2013 HDI 0.890	HDI lower
	Colombia	4	2013 Gini 52.90	2013 HDI 0.720	Gini higher
40	Greece	2	2013 Gini 36.10	2013 HDI 0.853	HDI higher
	Ivory Coast	1	2008 Gini 41.5	2013 HDI 0.459	Gini lower
41	Bosnia and Herzegovina	3	2011 Gini 33.00	2013 HDI 0.742	HDI lower
	Iran	1	2013 Gini 37.4	2014 HDI 0.766	Gini lower
42	Nigeria	2	2010 gini 43.0	2013 HDI 0.521	Gini lower
	Argentina	3	2013 Gini 41.00	2013 HDI 0.836	HDI higher
43	Ecuador	0	2013 Gini 46.90	2013 HDI 0.737	
	France	0	2013 Gini 32.50	2013 HDI 0.884	
44	Honduras	0	2013 Gini 52.60	2014 HDI 0.606	Gini lower
	Switzerland	3	2013 Gini 32.50	2013 HDI 0.917	HDI higher
45	USA	0	2013 Gini 41.00	2013 HDI 0.914	HDI lower
	Germany	1	2013 Gini 31.10	2013 HDI 0.911	Gini lower
46	Portugal	2	2013 Gini 36.20	2013 HDI 0.822	HDI higher
	Ghana	1	2012 Gini 42.40	2013 HDI 0.576	Gini lower
47	South Korea	0	2012 Gini 31.60	2013 HDI 0.896	HDI lower
	Belgium	1	2013 Gini 27.70	2013 HDI 0.881	Gini lower
48	Algeria	1	2011 Gini 27.60	2013 HDI 0.741	
	Russia	1	2013 Gini 40.90		

In the Group Stage, for the decided matches probability for a team with lower relative Gini coefficient to win is $\frac{1}{2}$, probability for a team with lower relative HDI to win is $\frac{20}{39}$ i.e.$\sim \frac{1}{2}+$.

B. Round of sixteen

match number	teams	goals	percentage Gini	HDI	Winners
1	Brazil	1 (3)	2013 Gini 52.80	2013 HDI 0.747	Gini higher
	Chile	1(2)	2013 Gini 47.30	2013 HDI 0.822	HDI lower
2	Colombia	2	2013 Gini 52.90	2013 HDI 0.720	Gini higher
	Uruguay	0	2013 Gini 40.50	2013 HDI 0.791	HDI lower
3	Netherlands	2	2013 Gini 28.10	2013 HDI 0.915	Gini lower
	Mexico	1	2014 Gini 45.80	2013 HDI 0.754	HDI higher
4	Costa Rica	1(5)	2013 Gini 49.30	2012 HDI 0.773	Gini higher
	Greece	1(3)	2013 Gini 36.10	2013 HDI 0.853	HDI lower
5	France	2	2013 Gini 32.50	2013 HDI 0.884	Gini lower
	Nigeria	0	2010 Gini 43.0	2013 HDI 0.521	HDI higher
6	Germany	2	2013 Gini 31.10	2013 HDI 0.911	Gini higher
	Algeria	1	2011 Gini 27.60	2013 HDI 0.741	HDI higher
7	Argentina	1	2013 Gini 41.00	2013 HDI 0.836	Gini higher
	Switzerland	0	2013 Gini 32.50	2013 HDI 0.917	HDI lower
8	Belgium	2	2013 Gini 27.70	2013 HDI 0.881	Gini lower
	USA	1	2013 Gini 41.00	2013 HDI 0.914	HDI lower

In the Round of sixteen stage, probability for a team with lower relative Gini coefficient to win is $\frac{3}{8}$, probability for a team with lower relative HDI to win is $\frac{5}{8}$ i.e. $\frac{1}{2}+$.

C. Quarter-Finals

match number	teams	goals	percentage Gini	HDI	Winners
1	France	0	2013 Gini 32.50	2013 HDI 0.884	Gini lower
	Germany	1	2013 Gini 31.10	2013 HDI 0.911	HDI higher
2	Brazil	2	2013 Gini 52.80	2013 HDI 0.747	Gini lower
	Colombia	1	2013 Gini 52.90	2013 HDI 0.720	HDI higher
3	Argentina	1	2013 Gini 41.00	2013 HDI 0.836	Gini higher
	Belgium	0	2013 Gini 27.70	2013 HDI 0.881	HDI lower
4	Netherlands	0(4)	2013 Gini 28.10	2013 HDI 0.915	Gini lower
	Costa Rica	0(3)	2013 Gini 49.30	2012 HDI 0.773	HDI higher

In the Quarter Final stage, probability for a team with lower relative Gini coefficient to win is $\frac{3}{4}$, probability for a team with lower relative HDI to win is $\frac{1}{4}$ i.e. $\frac{1}{2}-$.

D. Semi-Final

match number	teams	goals	percentage Gini	HDI	Winners
1	Brazil	1	2013 Gini 52.80	2013 HDI 0.747	Gini lower
	Germany	7	2013 Gini 31.10	2013 HDI 0.911	HDI higher
2	Netherlands	0(2)	2013 Gini 28.10	2013 HDI 0.915	Gini higher
	Argentina	0(4)	2013 Gini 41.00	2013 HDI 0.836	HDI lower

In the Semi-Finals, for the decided matches probability for a team with lower relative Gini coefficient to win is $\frac{1}{2}$, probability for a team with lower relative HDI to win is $\frac{1}{2}$.

E. Third Place Play-off

match number	teams	goals	percentage Gini	HDI	Winners
1	Brazil	0	2013 Gini 52.80	2013 HDI 0.747	Gini lower
	Netherlands	3	2013 Gini 28.10	2013 HDI 0.915	HDI higher

In the Third Place Play-off, the team with lower relative Gini coefficient, higher HDI won.

F. Final

match number	teams	goals	percentage Gini	HDI	Winners
1	Germany	1	2013 Gini 31.10	2013 HDI 0.911	Gini lower
	Argentina	0	2013 Gini 41.00	2013 HDI 0.836	HDI higher

In the Final, the team with lower relative Gini coefficient, higher HDI won.

IV. CONCLUSION

"Oscillatory phenomena are rampant in nature!"
-Quote unknown

It is a recurring theme in the Fifa World Cup 2018, from Group stages to Round of 16, to Quarter-Finals, to Semi-Finals to Final that probability of winning of a team with lower

Gini is always more than $\frac{1}{2}$. In the Group stage, it is $\frac{2}{3}$. In Round of 16, it is $\frac{1}{2}$. In Quarter-Finals, it is $\frac{3}{4}$. In the Semi-Finals it is $\frac{1}{2}$. In Third Place play-off, team with lower Gini won the match. In the Final, the team with higher relative Gini coefficient won.

To put the finding in perspective, we compare with that in the Fifa World Cup 2014. We notice that probability of winning of a team with lower Gini is greater than $\frac{1}{2}$. In the Group stage, it is $\frac{1}{2}$. In Round of 16, it is $\frac{3}{8}$. In Quarter-Finals, it is $\frac{3}{4}$. In the Semi-Finals it is $\frac{1}{2}$. In Third Place play-off and Final both teams with lower Gini won the respective matches.

That's why we conclude that lower Gini team winning a match is becoming more likely with time.

Not only that studying HDI, we see interesting swing. For the 2018 World cup matches, lower HDI team is less probable to win in Group stages with probability to win $\frac{1}{2.06}$. Lower HDI team is more probable to win in Round of 16 with probability $\frac{3}{4}$. Lower HDI team is less probable to win in Quarter-Finals, with probability zero. In Semi-Finals lower HDI team came out to be equally probable as higher HDI team. In Third Place play-off, team with lower HDI won the match. In the Final, team with higher HDI won the match.

For the 2014 World cup matches, lower HDI team is more probable to win in Group stages with probability to win $\frac{20}{39}$. Lower HDI team is more probable to win in Round of 16 with probability $\frac{5}{8}$. Lower HDI team is less probable to win in Quarter-Finals, with probability $\frac{1}{4}$. In Semi-Finals lower HDI team came out to be equally probable as higher HDI team. In Third Place play-off and Final both teams with higher HDI won the respective matches.

V. DISCUSSION

Doing a detailed study considering all World cups, bringing other indicators into consideration are something someone wishes to do in future. Next World Cup is going to be held in Qatar. It will be interesting to see whether the same trend continues or, not. Moreover, the recent improvement on Gini coefficient is Palma Ratio, [10]. Replacing the Gini coefficient by Palma Ratio and the redoing the analysis of the paper will be amusing.

VI. ACKNOWLEDGMENT

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[1] http://WWW.fifa.com/worldcup/matches.

[2] C. Gini, Studi Economico-Giuridici della Facolta di Giurisprudenza della Regia Universita di Cagliari **3(2)** (1912).

[3] http://en.wikipedia.org/wiki//Human_Development_Index (2018).

[4] http://en.wikipedia.org/wiki/Gini_coefficient (2018).

[5] http://knoema.com/atlas/ranks/GINI_index (2018).

[6] A. K. Sen, *On Economic Inequality*, 2nd ed. (Oxford Univ. Press, Oxford, 1977).

[7] http://en.wikipedia.org/wiki/Argentina (2018).

[8] http://hdr.undp.org/sites/themes/hdr_theme/Country_notes (2018).

[9] H. S. Hall and S. R. Knight, *Higher Algebra*, metric ed. (Macmillan India Limited, 1964).

[10] J. G. Palma, Development and Change **42(1)**, 87 (2011).