

# 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. Thirty two countries of different strata 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 here undertake a simple-minded analysis of matches of 2014 Fifa World Cup and 2018 Fifa World Cup.

The Gini coefficient,  $G$ , was conceived by Gini to measure inequality of income in a country. This is defined[4] mathematically as

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

where,  $n$  is the number of people of a country and income of  $j$ -th person is  $x_j$ .

If all the people of a country is the same, Gini coefficient is zero.

The Human Development Index(HDI) is defined [5] 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)=  $\frac{\ln(GNI_{pc})-\ln 100}{\ln(75000)-\ln 100}$  with each entry in dollar.

In the next section, section II, we consider the games of FIFA WORLD CUP 2018. For analysing, we collect the datas from [1], [4], [5], likes of [6]. In the following section, section III, we deal with all matches of FIFA WORLD CUP 2014. All the relevant scores, Gini coefficients, HDI we have gathered from [1], [7], [5], [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 is being held in Russia from 14-th June to 15-th July. This is the 21st FIFA WORLD CUP. Following is the matches, results and Gini, HDI analysis.

## II.1 Group Stage

match number	teams	goals	Gini	HDI	Winning
1	Russia	5	2015 Gini 37.7	2015 HDI 0.804	Gini low
	Saudi Arabia	0	2013 Gini 45.9	2015 HDI 0.847	HDI low
2	Egypt	0	2008 Gini 30.8	2015 HDI 0.691	Gini high
	Uruguay	1	2013 Gini 38.2	2015 HDI 0.795	HDI high
3	Morocco	0	2007 Gini 40.9	2015 HDI 0.647	Gini low
	Iran	1	2013 Gini 37.4	2014 HDI 0.766	HDI high
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 low
	Australia	1	2012 Gini 33.6	2015 HDI 0.939	HDI high
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 low
	Denmark	1	2015 Gini 28.8	2015 HDI 0.925	HDI high
8	Croatia	2	2018 Gini 29.7	2015 HDI 0.827	Gini low
	Nigeria	0	2010 Gini 43.0	2015 HDI 0.514	HDI high
9	Costa Rica	0	2015 Gini 48.2	2015 HDI 0.776	Gini low
	Serbia	1	2013 Gini 29.6	2015 HDI 0.776	HDI same
10	Germany	0	2016 Gini 29.5	2015 HDI 0.926	Gini high
	Mexico	1	2014 Gini 48.2	2015 HDI 0.762	HDI low
11	Brazil	1			
	Switzerland	1			
12	Sweden	1	2015 Gini 25.4	2015 HDI 0.913	Gini low
	South Korea	0	2015 Gini 29.5	2015 HDI 0.901	HDI high
13	Belgium	3	2011 Gini 26.3	2015 HDI 0.896	Gini low
	Panama	0	2015 Gini 51.0	2015 HDI 0.788	HDI high
14	Tunisia	1	2010 Gini 36.1	2015 HDI 0.725	Gini low
	England	2	2015 Gini 33.20	2016 HDI 0.920	HDI high
15	Colombia	1	2017 Gini 50.8	2015 HDI 0.727	Gini low
	Japan	2	2011 Gini 37.9	2015 HDI 0.903	HDI high
16	Poland	1	2014 Gini 32.08	2015 HDI 0.855	Gini high
	Senegal	2	2011 Gini 40.3	2015 HDI 0.494	HDI low
17	Russia	3	2015 Gini 37.7	2015 HDI 0.804	Gini high
	Egypt	1	2008 Gini 30.8	2015 HDI 0.691	HDI high

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

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

In the Group Stage, for the decided matches probability 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.  $\sim \frac{1}{2}$

## II.2 Round of sixteen

match number	teams	goals	Gini	HDI	Winning
1	France	4	30.1	0.897	Gini low
	Argentina	3	42.7	0.827	HDI high
2	Uruguay	2	38.2	0.795	Gini high
	Portugal	1	33.5	0.843	HDI low
3	Spain	1			
	Russia	1			
4	Croatia	1	29.7	0.827	
	Denmark	1	28.8	0.925	
5	Brazil	2	51.3	0.754	Gini high
	Mexico	0	48.2	0.762	HDI low
6	Belgium	3	26.3	0.896	Gini low
	Japan	2	37.9	0.903	HDI low
7	Sweden	1	25.4	0.913	Gini low
	Switzerland	0	29.5	0.939	HDI low
8	Colombia	1	50.8	0.727	
	England	1	33.2	0.920	

In the Round of sixteen stage, probability for a team with lower relative Gini coefficient to win is  $\frac{3}{5}$ , probability for a team with lower relative HDI to win is  $\frac{4}{5}$  i.e.  $\frac{1}{2}+$ .

### II.3 Quarter-Final

match number	teams	goals	Gini	HDI	Winning
1	Brazil	0	51.3	0.754	Gini low
	Belgium	2	26.3	0.896	HDI high
2	France	2	30.1	0.897	Gini low
	Uruguay	1	38.2	0.795	HDI high
3	Russia	5	37.7	0.804	Gini low
	Croatia	6	29.7	0.827	HDI high
4	England	2	33.2	0.920	Gini high
	Sweden	0	25.4	0.913	HDI high

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.

### II.4 Semi-Final

match number	teams	goals	Gini	HDI	Winning
1	France	1	30.1	0.897	Gini high
	Belgium	0	26.3	0.896	HDI high
2	Croatia	2	29.7	0.827	Gini low
	England	1	33.2	0.920	HDI low

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  $\frac{1}{2}$ .

### II.5 Third Place

match number	teams	goals	Gini	HDI	Winning
1	Belgium	2	26.3	0.896	Gini low
	England	0	33.2	0.920	HDI low

### II.6 Final

match number	teams	goals	Gini	HDI	Winning
1	France	4	30.1	0.897	Gini high
	Croatia	2	29.7	0.827	HDI high

## III FIFA WORLD CUP 2014

FIFA WORLD CUP 2014 was held in Brazil from 12th June to 13th July, 2014. Following is the matches, results and Gini, HDI analysis.

### III.1 Group Stage

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

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

match number	teams	goals	Gini	HDI	Winning
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 low
	Colombia	4	2013 Gini 52.90	2013 HDI 0.720	Gini high
40	Greece	2	2013 Gini 36.10	2013 HDI 0.853	HDI high
	Ivory Coast	1	2008 Gini 41.5	2013 HDI 0.459	Gini low
41	Bosnia and Herzegovina	3	2011 Gini 33.00	2013 HDI 0.742	HDI low
	Iran	1	2013 Gini 37.4	2014 HDI 0.766	Gini low
42	Nigeria	2	2010 gini 43.0	2013 HDI 0.521	Gini low
	Argentina	3	2013 Gini 41.00	2013 HDI 0.836	HDI high
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 low
	Switzerland	3	2013 Gini 32.50	2013 HDI 0.917	HDI high
45	USA	0	2013 Gini 41.00	2013 HDI 0.914	HDI low
	Germany	1	2013 Gini 31.10	2013 HDI 0.911	Gini low
46	Portugal	2	2013 Gini 36.20	2013 HDI 0.822	HDI high
	Ghana	1	2012 Gini 42.40	2013 HDI 0.576	Gini low
47	South Korea	0	2012 Gini 31.60	2013 HDI 0.896	HDI low
	Belgium	1	2013 Gini 27.70	2013 HDI 0.881	Gini low
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.  $\sim \frac{1}{2}+$

### III.2 Round of sixteen

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

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.  $\frac{1}{2}+$ .

### III.2.1 Quarter-Finals

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

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.  $\frac{1}{2}-$ .

### III.3 Semi-Final

match number	teams	goals	Gini	HDI	Winning
1	Brazil	1	2013 Gini 52.80	2013 HDI 0.747	Gini low
	Germany	7	2013 Gini 31.10	2013 HDI 0.911	HDI high
2	Netherlands	0(2)	2013 Gini 28.10	2013 HDI 0.915	Gini high
	Argentina	0(4)	2013 Gini 41.00	2013 HDI 0.836	HDI low

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  $\frac{1}{2}$ .

### III.4 Third Place Play-off

match number	teams	goals	Gini	HDI	Winning
1	Brazil	0	2013 Gini 52.80	2013 HDI 0.747	Gini low
	Netherlands	3	2013 Gini 28.10	2013 HDI 0.915	HDI high

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

### III.5 Final

match number	teams	goals	Gini	HDI	Winning
1	Germany	1	2013 Gini 31.10	2013 HDI 0.911	Gini low
	Argentina	0	2013 Gini 41.00	2013 HDI 0.836	HDI high

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

## IV Conclusion

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  $\frac{3}{5}$ . 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.

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  $\frac{4}{5}$ . 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, looking into from the standpoint of dynamical phase transition, are something someone wishes to do in future.

## VI Acknowledgement

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## References

- [1] [WWW.fifa.com/worldcup/matches](http://WWW.fifa.com/worldcup/matches)
- [2] Gini Corrado(1912), Variabilita e mutabilita.
- [3] Mahbub ul Haq created HDI in 1990.
- [4] [en.wikipedia.org/wiki/Gini\\_coefficient](http://en.wikipedia.org/wiki/Gini_coefficient)
  
- [5] [en.wikipedia.org/wiki/Human\\_Development\\_Index](http://en.wikipedia.org/wiki/Human_Development_Index)
  
- [6] [en.wikipedia.org/wiki/Argentina](http://en.wikipedia.org/wiki/Argentina)
  
- [7] [knoema.com/atlas/ranks/GINI\\_index](http://knoema.com/atlas/ranks/GINI_index)
- [8] Human Development Reports-UNDP, [hdr.undp.org/sites/themes/hdr\\_theme/Country\\_notes](http://hdr.undp.org/sites/themes/hdr_theme/Country_notes)