Determinants of aggressiveness on the soccer pitch: evidence from FIFA and UEFA tournaments

Caruso, Raul and Di Domizio, Marco and Savage, David A.

2015

Determinants of aggressiveness on the soccer pitch: evidence from FIFA and UEFA tournaments

Raul Caruso
Catholic University of the Sacred Heart, Milan, Italy

Marco Di Domizio
University of Teramo, Teramo, Italy

David A. Savage
Bond University, Robina, Australia.

ABSTRACT

This paper examines the determinants of aggressiveness on the soccer pitch in 463 matches from FIFA (World Cup) and UEFA (Euro Cup) tournaments spanning from 1994 to 2012. We highlight the role of several measures of international rivalry between countries on the players' aggressive behaviour

Keywords: soccer tournaments; aggressiveness; international rivalry.
JEL Classifications: L83, D74

INTRODUCTION

"Serious sport has nothing to do with fair play. It is bound up with hatred, jealousy, boastfulness, disregard of all rules and sadistic pleasure in witnessing violence: in other words it is war minus the shooting" (Orwell, 1945). Soccer matches often go beyond pure sport competition, particularly when national teams take part in major international tournaments. The idea that soccer is the stylisation of war is often used as a touchstone to interpret the associated violence. Recently the focus has investigated the role that socio-political and economic factors play in determining player aggression. This paper extends previous contributions by examining additional factors that may better explain player aggression, such as the roles of: stadium atmosphere, prize money incentivisation and referees. We generate two proxy variables for player aggressiveness: the weighted number of yellow/red cards issued and the number of fouls sanctioned by referees.

Our reference model estimations show that match variables alone are not exhaustive in determining player aggression and factors such as trade and power gaps, match attendance and prize money are significant. Finally, we attempt to control for the influence that referees' may impose on the match through fixed effects.

Corresponding author Raul Caruso. Contact via Email: *raul.caruso@unicatt.it*.

Violence and soccer

The hypothesis that violence is an innate part of sport is widely accepted, such that Elias and Dunning (1986) claimed that soccer matches stylise and miniaturise war. Where the associated aggression is related to overt masculinity, territorial struggle and excitement. This is one of the reasons that the sporting environment is considered an odd choice for an outlet of nationalistic tensions or as a political instrument for building trust between rival countries. Particularly since the basic nature of sport is one of competition, which can lead to extremely aggressive behaviour, coercion and threats of violence. This is consistent with Caruso (2011), where sport is interpreted as a market and relational good, and an expression of threat, power and coercion. Unfortunately, violence is viewed as a negative but ineluctable component of sport, both on and off the pitch. The latter has been the focus of the hooliganism phenomenon and its counter strategies (Domizio & Caruso, 2014), while the former is being used to empirically disentangle the effect of culture, institutions and poverty in determining violent player behaviour. The Miguel, Saiegh, and Satyanath (2008) analysis of the role of civil conflict in a players home provenance and the number of yellow/red cards awarded by referees, showed a strong relationship between the two. Supporting the idea that culture and identity can influence player's attitudes towards aggressive or violent behaviour. However,Cuesta and Bohórquez (2012) reached different conclusions through the investigation of the Copa Libertadores. Using factors such as dictatorship length, homicides rates and years of armed conflict within each country, the results showed that the violent behaviour of players depended exclusively on soccer characteristics. In this vein, we extend the previous empirical investigations proposed in Caruso and Di Domizio (2013), where we found that the differences in political, diplomatic, education and economic factors between nations significantly affected the sanctions issued by the referees. Specifically, we:

1. extend data set by 147 observations[1]
2. include fouls sanctioned as alternative dependent variable.
3. build innovative measures for the bilateral gap in trade and power.
4. include attendance and prize money as explanatory variables.
5. control for referees' effect.

Data set and empirical strategy

The dataset contains 463 final phase matches from FIFA (World Cup) and UEFA (Euro Cup) tournaments spanning from 1994 to 2012 and includes 61 countries. We investigate players' aggressiveness by means of two variables: (i) WINT - a weighted measure of cards issued per match, (ii) FOULS - the count of sanctioned fouls. We include a set of independent control variables divided into three groups: Tournament, political-economic (Politec), and Match specific variables. From which we estimate a regression equation, by means of negative binomial using maximum likelihood techniques. Table 1 presents the summary statistics for the non-dummies variables and discussed below.

[1]This includes FIFA World Cup 1994 and 1998, and UEFA European Cup 1996 tournaments.

[TABLE 1 ABOUT HERE]

The dependent variable WINT is a weighted measure of the penalties issued on the pitch, calculated as follows:

$$WINT = [1^{st}Yellow] + 2 \times [2^{nd}Yellow] + 3 \times [DirectRed]$$

The weighting process distinguishes between a single direct red card (usually issued after an breach of the rules) and an indirect red card (issued as the sum of two lesser fouls). Eventually we also consider the count of fouls committed, FOULS. Additionally, we use the absolute difference of log2 in FIFA World ranking between teams at the date of the match to estimate relative team closeness (see Krumer, Rosenboim, & Shapir, 2014). The remaining dummies capture match-specific information, such as Knockout Stage, the Hosting Country, Over Time finishes and matches with at least one Penalty[2]. The second group of variables relates to imbalances from international trade and status. Trade Imbalance is defined as:[3]

$$Trade\ Imbalance = 1 - \frac{min[\frac{Import\ A\ from\ B}{Import\ A}; \frac{Import\ B\ from\ A}{Import\ B}]}{max[\frac{Import\ A\ from\ B}{Import\ A}; \frac{Import\ B\ from\ A}{Import\ B}]}$$

where Import A from B are the gross imports (c.i.f.) of country A from B (and vice versa), and Import A (B) are total imports (c.i.f.) of country A (B). The index ranges between 0-1, such that at 0 countries have equal share of trade exchanges and as the index approaches 1 there are asymmetric gains from trade in the bilateral relationship. Power Imbalance, based on the Composite Index of National Capability (CINC)[4], is defined as:

$$Power\ Imbalance = 1 - \frac{min[CINC\ A/B]}{max[CINC\ A/B]}$$

The index ranges between 0-1, such that there is no recognised difference in strength at 0 and at 1 they differ greatly on population, iron/steel production, energy consumption, military personnel/expenditure. The third group refers to match-specific variables: Attendance, used to control for external source of aggression (Savage & Torgler, 2013) since a more passionate environment may induce more aggressive behaviour from players. Additionally, we test the relevance of economic factors in determining player aggression, by including the monetary stakes awarded by UEFA and FIFA[5]. We control for top league players, as their monetary incentives may differ, by generating an index of the proportion of players coming teams in the top five European leagues on national rosters. We then convert

[2]We expect a positive sign for all the associated coefficients.

[3]Trade data from IMF (2013), Direction of Trade Statistics (Edition: June 2013), Mimas, University of Manchester (retrieved on October 2014).

[4]See http://www.correlatesofwar.org/ and Singer, Bremer, and Stuckey (1972).

[5]See FIFA World Cup Statistical Kit 6, 2012. We are grateful to Sara Williams - National Association Development - for data on UEFA competitions.

monetary prizes into Swiss Francs (CHF) at 2012 constant prices and divide this amount by the index to obtain Adjusted Prize Money.

RESULTS

We utilise a Negative Binomial II regression model, as the dependent variables are count data. We build a set of model estimations by adding variable blocks one at a time, beginning with Tournament (1), then successively add Politec (2), Match (3) Interactions (4) and finally a Referee Fixed Effect (5) model. Given the subjectivity of referees issuing cards or recognising fouls - which could potentially distort the WINT and FOULS distribution, we control for the referee role in determining/limiting players' aggressive attitude. We also include estimates with both WINT (Table 2) and FOULS (Table 3) as the dependent variable.

[TABLES 2 & 3 ABOUT HERE]

The results of the Wald test confirm that the sport variables are not exhaustive in explaining the aggressive attitude of players (via WINT and Fouls), while the Politec variables are significant both in the case of WINT and FOULS as dependent. We observe that an increase of one standard deviation of Trade Imbalance results in an increase of 0.207 (WINT) and 0.517 (Fouls) and for Power Imbalance we observe a similar increase of 0.249 (WINT) and 0.451 (Fouls). The introduction of the Match and Interaction variables (3-4, 8-9), have a minor impact in the size of the Politec variables but they remain significant in the WINT regressions, but we observe that Power Imbalance becomes insignificant in the FOULS (9). Furthermore, we see the effect of Attendance and Adjusted Prize Money meets with our expectation, such that both are significant and positive supporting the idea that stadium atmosphere and expected monetary stakes may influence players' behaviour.

As a robustness check we have included some interacted explanatory variables into the regression, Adjusted Prize Money $\times$ Attendance and Adjusted Prize Money $\times$ Ranking Difference. Given that it is possible that that the interaction of these variables may weaken the over all aggression effect and it is possible that the monetary incentive effect is non-linear (Adjusted Prize Money Squared), we include both. Results suggest that the prize money effect on intenseness reduces when attendance and ranking difference increase. This is reasonable since the ranking difference and the crowd effect may have a strong influence on players' intenseness. However, the interactions between dependent variables can be read in the opposite direction; the significance and the negative sign of Adjusted prize money $\times$ Ranking Difference and Adjusted prize money $\times$ Attendance indicate that the ranking difference and the attendance effects are mitigated when prize money increases. The (significant) negative sign of the coefficient associated to Adjusted Prize Money Squared also supports that hypothesis.

Finally, we include the Referee FFX modelling (5 & 10) in order to evaluate their impact on the game, the results of which are very interesting and observe in both models that virtually all significance vanish for the Politec and Matches variables. Only Knockout Stage and Penalty remain significant in WINT (5) and Over Time and Hosting Country in the Fouls (10) model. This result suggests that the referees play a crucial role in keeping the "potential" players' aggressiveness inside the rules.

CONCLUSION

The main purpose of this paper was to extend our previous investigations into the determinants affecting player behaviour on the soccer pitch. We added 147 observations from World (1994 and 1998), and Euro Cup (1996), refined variables summarising commercial and leadership bilateral imbalance. We also included new variables associated with stadium atmosphere (attendance) and incentives (prize money). We used negative binomial estimation techniques to show that trade and power gaps are significant determinants for the number of sanctions and fouls recorded during high-level international tournaments. Moreover, the significance of attendance and prize money suggests that emotional and economic factors directly affect the players' decision-making and aggressive behaviour. Also of relevance is the role of referees that vanish the significance of the majority of political, economic, tournament and match variables. These results enrich the literature and provide additional evidence that both international relations and economic factors are features of all international matches. We capture how bigger crowds or a more passionate context encouraged or influences the players' behaviour on the pitch, and how the latter is also stimulated by the opportunity of additional earnings distributed by FIFA and UEFA.

References

Caruso, R. (2011). Crime and sport participation: Evidence from italian regions over the period 1997–2003. *The Journal of Socio-Economics*, *40*(5), 455–463.

Caruso, R., & Di Domizio, M. (2013). International hostility and aggressiveness on the soccer pitch: Evidence from european championships and world cups for the period 2000–2012. *International Area Studies Review*, *16*(3), 262–273.

Cuesta, J., & Bohórquez, C. (2012). Soccer and national culture: estimating the impact of violence on 22 lads after a ball. *Applied Economics*, *44*(2), 147–161.

Domizio, M. D., & Caruso, R. (2014). Hooliganism and demand for football in italy: Attendance and counterviolence policy evaluation. *German Economic Review*.

Elias, N., & Dunning, E. (1986). *Quest for excitement: sport and leisure in the civilizing process*. Basil Backwell.

Krumer, A., Rosenboim, M., & Shapir, O. M. (2014). Gender, competitiveness, and physical characteristics evidence from professional tennis. *Journal of Sports Economics*.

Miguel, E., Saiegh, S. M., & Satyanath, S. (2008). *National cultures and soccer violence* (Tech. Rep.). National Bureau of Economic Research.

Orwell, G. (1945). The sporting spirit. *The collected essays, journalism and letters of George Orwell*, *4*, 1945–50.

Savage, D. A., & Torgler, B. (2013). Nerves of steel? Stress, work performance and elite athletes. *Applied Economics*, *44*(19), 2423-2435.

Singer, J. D., Bremer, S., & Stuckey, J. (1972). Capability distribution, uncertainty, and major power war, 1820-1965. *Peace, war, and numbers*, *19*.

Table 1
Descriptive Statistics

Variable	**Obs.**	**Mean**	**SD**	**Min**	**Max**
WINT	463	5.052	2.97	0	24
FOULS	285	34.6	8.39	13	62
Ranking Diff.	463	1.648	1.264	0.046	6.714
Trade Imbalance	463	0.763	0.281	0	1
Power Imbalance	463	0.700	0.271	0	0.998
Attendance ('000)	463	46.984	16.638	16.002	94.194
Adjusted Prize Money	463	3.251	4.919	0	44.751

Dummies		**0**	**1**
Knockout Stage	463	348	115
World Cup	463	155	308
Hosting	463	400	63
Overtime	463	425	38
Penalties	463	382	81

Table 2
NEGATIVE BINOMIAL II.

WINT	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**
Ranking Difference	**0.535*** **	**0.085*** **	0.035	**0.057** **	0.005
	(0.029)	(0.024)	(0.025)	(0.028)	(0.024)
Knockout Stage	**0.648*** **	**0.274*** **	0.032	0.059	**0.149** **
	(0.121)	(0.086)	(0.103)	(0.093)	(0.072)
Penalty	**0.783*** **	**0.305*** **	**0.245** **	**0.215*** **	**0.183*** **
	(0.116)	(0.082)	(0.079)	(0.077)	(0.066)
Over time	0.140	0.194	0.137	0.108	0.002
	(0.199)	(0.135)	(0.129)	(0.120)	(0.100)
Hosting Country	**0.628*** **	**0.201** **	-0.031	-0.025	0.104
	(0.124)	(0.101)	(0.094)	(0.081)	(0.076)
Trade Imbalance		**0.737*** **	**0.396*** **	**0.350*** **	-0.170
		(0.102)	(0.130)	(0.116)	(0.101)
Power Imbalance		**0.918*** **	**0.655** **	**0.517*** **	0.081
		(0.109)	(1.168)	(0.128)	(0.098)
Attendance			**0.013*** **	**0.014*** **	-0.001
			(0.002)	(0.002)	(0.002)
Adj. Prize Money			**0.019** **	**0.153*** **	0.018
			(0.007)	(0.026)	(0.021)
Adj. Prize Money				**-0.002*** **	-0.0005
Squared				(0.000)	(0.0004)
Adj. Prize Money ×				**-0.002*** **	-0.000
Attendance				(0.000)	(0.0003)
Adj. Prize Money ×				**-0.014** **	-0.008
Ranking Difference				(0.006)	(0.005)
Referees FE	**NO**	**NO**	**NO**	**NO**	**YES**
S.E. of regression	7.796	3.516	3.407	3.306	2.820
Akaike Info. Criterion	6.138	5.25	5.114	5.045	4.974
Log-pseudolikelihood	-1414.95	-1205.90	-1171.44	-1152.48	-998.68
Likelihood ratio test χ^2	**817.54*** **	**205.16*** **	**163.20*** **	**134.13*** **	0.63
Wald χ^2	**806.84*** **	**520.42*** **	**70.97*** **	**36.17*** **	na
Alpha	**0.766*** **	**0.261*** **	**0.214*** **	**0.186*** **	0.009
Observations	463	462	462	462	462

Standard errors in parenthesis. Statistical significance: ***>99%, **>95%, *>92%.

Table 3
NEGATIVE BINOMIAL II.

FOULS	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**
Ranking Difference	**2.081*** **	**0.338*** **	**0.119*** **	**0.125*** **	**0.0007**
	(0.107)	(0.042)	(0.035)	(0.038)	(0.012)
Knockout Stage	**1.242*** **	**0.556*** **	**-0.219***	-0.132	-0.003
	(0.304)	(0.146)	(0.128)	(0.124)	(0.037)
Penalty	**1.209*** **	**0.775*** **	**0.390*** **	**0.318*** **	0.013
	(0.319)	(0.154)	(0.118)	(0.106)	(0.033)
Over time	0.516	0.529	**0.455** **	0.282	**0.241*** **
	(0.526)	(0.243)	(0.186)	(0.171)	(0.049)
Hosting Country	**1.634*** **	**0.574** **	-0.113	-0.081	**0.096*** **
	(0.124)	(0.158)	(0.129)	(0.116)	(0.035)
Trade Imbalance		**1.907*** **	**1.038*** **	**0.916*** **	0.033
		(0.137)	(0.130)	(0.123)	(0.053)
Power Imbalance		**1.664*** **	**0.938** **	0.769	-0.010
		(0.142)	(0.132)	(0.125)	(0.047)
Attendance			**0.038*** **	**0.041*** **	-0.001
			(0.003)	(0.003)	(0.001)
Adjusted Prize Money			**0.033** **	**0.259*** **	0.009
			(0.010)	(0.026)	(0.009)
Adj. Prize Money				**-0.003*** **	0.0001
Squared				(0.000)	(0.0001)
Adj. Prize Money ×				**-0.003*** **	0.0001
Attendance				(0.000)	(0.0001)
Adj. Prize Money ×				**-0.016** **	-0.001
Ranking Difference				(0.007)	(0.002)
Referees FE	**NO**	**NO**	**NO**	**NO**	**YES**
S.E. of regression	74047.7	59.26	44.67	36.64	Na
Akaike Info. Criterion	12.34	10.11	9.43	9.18	Na
Log-pseudolikelihood	-1752.17	-1427.28	-1329.30	-1290.72	-887.08
Likelihood ratio test χ^2	**1.08e04*** **	**4081.34*** **	**3150.34*** **	**2633.8*** **	4.4e-236
Wald χ^2	**623.80*** **	**1049.85*** **	**220.54*** **	**98.35*** **	na
Alpha	**0.766*** **	**0.827*** **	**0.474*** **	0**.370*** **	1.29e-08
Observations	285	285	285	285	285

Standard errors in parenthesis. Statistical significance: ***>99%, **>95%, *>92%.