

Social pressure and outcomes with supportive and hostile crowds: Evidence from professional football in England

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5 March 2025

Introduction

- Do crowds at football matches make a difference?
- Past research suggests so. Referee social pressure mechanism.
- Past research has:
 - ▶ Assumed crowd homogenous.
 - ▶ Not utilised high-frequency data?
- Our questions:
 - ▶ Do home and away fans exhibit different attendance behaviours?
 - ▶ Do the number of away fans affect outcomes?
 - ▶ Can high-frequency data help identify mechanism?
- It matters? Evidence

Methodology

- Sports production: Product joint (Neale, 1964).
 - ▶ Outcome some function of talent and effort.
- Plus influence of supportive/hostile crowds?
 - ▶ Fans think so: Wolfson et al. (2005).
 - ▶ Home bias a feature of outcomes. Evidence
 - ▶ Dowie (1982); Clarke and Norman (1995); Peeters and van Ours (2021).
- What determines fan attendance?
 - ▶ Uncertainty of outcome hypothesis (Rottenberg, 1956)?
 - ▶ Loss aversion/home-win preference (Coates et al., 2014)?
- Social pressure: Influence by person/group on another person/group.
 - ▶ Garicano et al. (2005): Referees and injury time.
 - ▶ Empty stadiums: Pettersson-Lidbom and Priks (2010); Bryson et al. (2021); McCarrick et al. (2021).

Methodology: Mechanisms

Players Players encouraged/discouraged by crowd size/noise.

- Passes, shots, carries, interceptions, dispossessions?
- Success? Location on the field?

Manager Managerial decisions affected.

- Attacking setup, attacking substitutions?
- Earlier changes?

Referee Officials decisions impacted.

- Injury time, yellow cards, fouls called?
- Is it possible to separate these mechanisms?

Methodology

- Total attendance split: $att_{ijt} = Hatt_{ijt} + Aatt_{ijt}$.
- Step 1: Understand difference between att_{ijt} , $Hatt_{ijt}$, $Aatt_{ijt}$.
- Estimate fairly standard attendance equation (Coates et al., 2014):

$$\begin{aligned} \log(att_{ijt}) = & \gamma_0 + \gamma_1 prob_{ijt} + \gamma_2 prob_{ijt}^2 + \gamma_3 LS_t + \\ & \gamma_4 Q_{it} + \gamma_5 Q_{jt} + \gamma_6 distance_{ij} + \gamma_7 \log(population_i) \\ & + \gamma_8 \log(population_j) + u_{ijt}, \end{aligned} \tag{1}$$

- ▶ $\gamma_2 < 0$ indicates UOH, $\gamma_2 > 0$ implies loss aversion.
- Put $Hatt_{ijt}$ and $Aatt_{ijt}$ on LHS on (2).

Methodology

- Step 2: Consider the impact of crowds on outcomes.
- Regression models, for team i vs team j at time t :

$$outcome_{ijt} = \gamma_0 + \gamma_1 \log(Hatt_{ijt}) + \gamma_2 \log(Aatt_{ijt}) + \gamma_3 elo_{ijt} + u_{ijt}, \quad (2)$$

- Elo ratings to control for relative team strengths. Elo ratings
- Endogeneity issue: Fans want to watch better team?
 - ▶ Distance between teams as instrument.

Data

- Multiple sources:
 - ▶ www.football-data.co.uk:
 - ▶ League matches in top 5 English leagues: Bet365 prices.
 - ▶ www.footballwebpages.co.uk:
 - ▶ Total attendances down to non-league Step 4 in England.
 - ▶ www.worldfootball.net:
 - ▶ Stadium information (location, capacity).
 - ▶ Websites: fanbanter.co.uk, the72.co.uk:
 - ▶ Numbers of away fans since 2013.
 - ▶ Club tweets on away fan attendance collected manually.
 - ▶ Some club fan sites: Wycombe, Barnet, Torquay.
 - ▶ Football clubs:
 - ▶ Reading FC, Oldham Athletic FC, Preston North End FC.

Example 1

Example 2

Team Twitter feed

Fan website

All data

Ratio

By club

Travel network

Cross plot distance vs away fans

Data

Statistic	N	Mean	St. Dev.	Min	Max
Attendance (000s)	137,502	8.453	11.948	0.000	89.874
Home Attendance (000s)	14,745	8.047	7.827	-1.155	71.780
Away Attendance (000s)	14,811	0.868	0.955	0.000	9.500
Crowd Ratio	14,687	0.117	0.103	0.000	1.971
Goal difference	174,690	0.307	1.806	-11	12
Home win (1 if so)	174,690	0.445	0.497	0	1
Home Fouls	54,425	11.323	3.772	0	33
Away Fouls	54,425	11.909	3.905	0	77
Home Yellows	58,536	1.372	1.164	0	11
Away Yellows	58,536	1.704	1.277	0	10
Home Reds	58,536	0.070	0.266	0	3
Away Reds	58,535	0.100	0.320	0	4
Home team pre-match implied probability (bet365)	54,376	0.434	0.125	0.042	0.914
Away team pre-match implied probability (bet365)	54,382	0.298	0.113	0.000	0.866
Home team pre-match implied probability (mean)	88,455	0.431	0.129	0.025	0.935
Away team pre-match implied probability (mean)	88,455	0.307	0.118	0.019	0.929
Home win (1/0)	174,690	0.445	0.497	0	1
Away win (1/0)	174,690	0.311	0.463	0	1
Distance (miles)	161,891	95.663	60.961	0.000	334.141
Population (Home team, hundreds of thousands)	158,398	2.306	1.674	0.518	10.730
Population (Away team, hundreds of thousands)	158,056	2.308	1.673	0.518	10.730
Home team Elo Strength	177,797	1,105.621	161.597	626.245	1,753.911
Away team Elo Strength	177,797	1,106.628	161.883	629.175	1,751.822
Standard Deviation Points	177,797	5.140	5.355	0.000	32.463
Total League Changes	177,797	7.561	7.658	0	48
Absolute League Changes	177,797	7.561	7.658	0	48
Maximum temperature (degrees celcius)	155,454	12.879	5.544	-11.400	36.400
Mean wind speed (mph)	153,671	7.867	4.584	0.000	50.000
Precipitation amount	145,291	2.508	15.396	-99.900	4,302.800

Data

- Analytics/moneyball data revolution in sport:
 - ▶ Huge datasets per match: each action.
 - ▶ Opta/StatsPerform, Statsbomb two of the main providers.
- Allows more in-depth understanding of social pressure.
- www.whoscored.com provide Opta data.
 - ▶ Premier League since 2012, Championship since 2013, L1/L2 since 2019.
- Also use proprietary data from another provider:
 - ▶ League One, League Two, National League since 2020.
 - ▶ [Example 1](#) [Example 2](#) [Example 3](#) [Example 4](#)

Data: Variables for Mechanisms

Players Passes, interceptions, pressures (number and location).

Manager Time of first tactical substitution, attacking nature of first tactical substitution.

Referee Opposition touches per foul conceded.

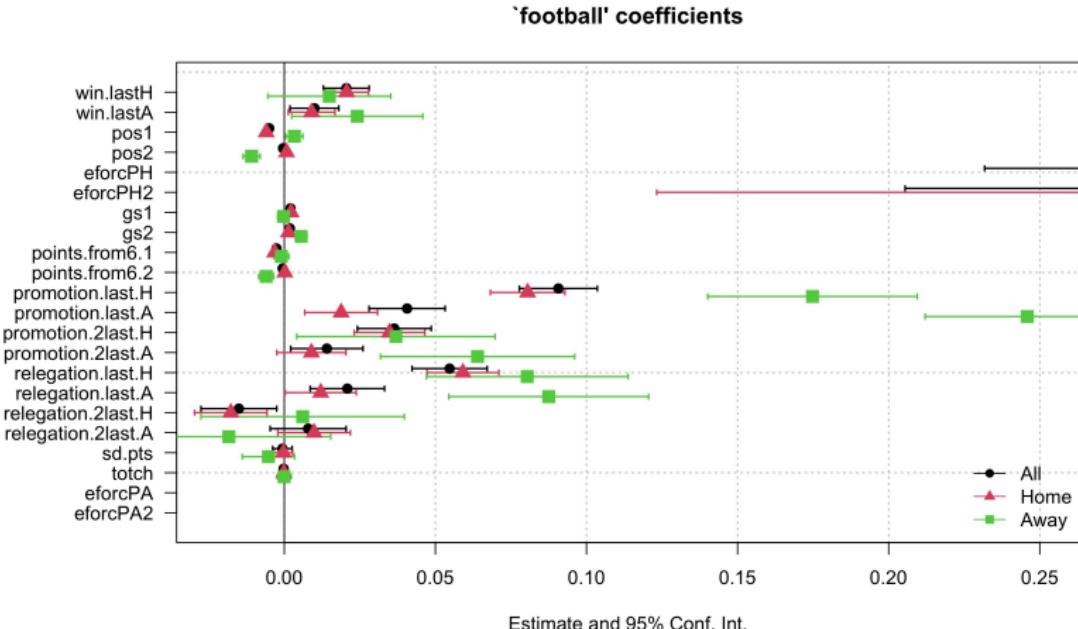
Results: Attendance demand — sporting

	Dependent variable:			
	lattendance	lhomeatt	lawayatt	
	(1)	(2)	(3)	(4)
Won last match (H)	0.026*** (0.002)	0.021*** (0.004)	0.021*** (0.004)	0.015 (0.010)
Won last match (A)	0.009*** (0.002)	0.010** (0.004)	0.009** (0.004)	0.024** (0.011)
League position (H)	-0.010*** (0.0003)	-0.005*** (0.001)	-0.006*** (0.001)	0.003** (0.001)
League position (A)	-0.001*** (0.0003)	-0.0004 (0.001)	0.001 (0.001)	-0.011*** (0.001)
Prob (home win)	0.395*** (0.016)	0.298*** (0.034)	0.406*** (0.032)	
Prob (home win) ²	0.457*** (0.144)	0.783*** (0.295)	0.675** (0.282)	
Prob (away win)			0.547*** (0.106)	
Prob (away win) ²			2.983*** (1.059)	
Goals scored (H)	0.003*** (0.0002)	0.002*** (0.0004)	0.002*** (0.0004)	-0.0003 (0.001)
Goals scored (A)	0.001*** (0.0002)	0.002*** (0.0004)	0.001*** (0.0004)	0.006*** (0.001)
Points from 6th place (H)	-0.003*** (0.0002)	-0.003*** (0.0005)	-0.003*** (0.0005)	-0.001 (0.001)
Points from 6th place (A)	-0.001*** (0.0002)	-0.001 (0.0005)	0.0002 (0.0004)	-0.006*** (0.001)
Observations	82,496	13,512	13,512	13,527
R ²	0.952	0.946	0.954	0.751
Adjusted R ²	0.952	0.944	0.953	0.744

Results: Attendance demand — sporting (2)

	Dependent variable:			
	lattendance		lhomeatt	lawayatt
	(1)	(2)	(3)	(4)
Promotion last season (H)	0.084*** (0.003)	0.091*** (0.007)	0.081*** (0.006)	0.175*** (0.018)
Promotion last season (A)	0.040*** (0.003)	0.041*** (0.006)	0.019*** (0.006)	0.246*** (0.017)
Promotion two seasons ago (H)	0.032*** (0.003)	0.036*** (0.006)	0.035*** (0.006)	0.037** (0.017)
Promotion two seasons ago (A)	0.011*** (0.003)	0.014** (0.006)	0.009 (0.006)	0.064*** (0.016)
Relegation last season (H)	0.072*** (0.003)	0.055*** (0.006)	0.059*** (0.006)	0.080*** (0.017)
Relegation last season (A)	0.022*** (0.003)	0.021*** (0.006)	0.012** (0.006)	0.088*** (0.017)
Relegation two seasons ago (H)	0.015*** (0.003)	-0.015** (0.006)	-0.018** (0.006)	0.006 (0.017)
Relegation two seasons ago (A)	-0.002 (0.003)	0.008 (0.006)	0.010 (0.006)	-0.018 (0.017)
Standard deviation of league points	-0.002** (0.001)	-0.001 (0.002)	-0.0003 (0.002)	-0.005 (0.004)
Total league standing changes	0.0002 (0.0002)	-0.0002 (0.0004)	-0.0001 (0.0004)	-0.0001 (0.001)
Observations	82,496	13,512	13,512	13,527
R ²	0.952	0.946	0.954	0.751
Adjusted R ²	0.952	0.944	0.953	0.744

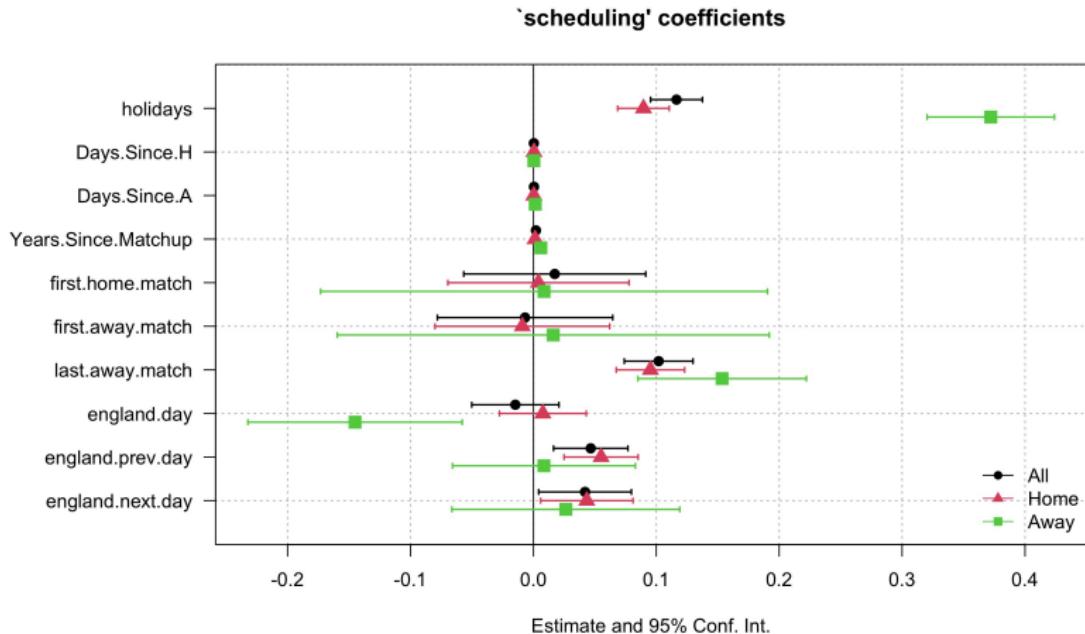
Results: Attendance demand — sporting



Results: Attendance demand — scheduling

	<i>Dependent variable:</i>			
	lattendance	lhomeatt	lawayatt	
	(1)	(2)	(3)	(4)
Holidays	0.189*** (0.004)	0.116*** (0.011)	0.090*** (0.011)	0.372*** (0.026)
Days since last home match	0.00001 (0.00001)	0.0004 (0.0003)	0.0005 (0.0003)	0.0004 (0.001)
Days since last away match	-0.00001** (0.00001)	0.0005 (0.0003)	0.0003 (0.0003)	0.002* (0.001)
Years since matchup	0.002*** (0.0001)	0.002*** (0.0002)	0.001*** (0.0002)	0.006*** (0.0004)
First home match of season	0.068*** (0.007)	0.017 (0.038)	0.004 (0.038)	0.009 (0.093)
First away match of season	0.032*** (0.007)	-0.007 (0.036)	-0.009 (0.036)	0.016 (0.090)
Last away match of season	0.017*** (0.005)	0.102*** (0.014)	0.095*** (0.014)	0.154*** (0.035)
England playing on day	-0.058*** (0.005)	-0.015 (0.018)	0.008 (0.018)	-0.145*** (0.044)
England played previous day	0.012 (0.008)	0.047*** (0.015)	0.055*** (0.015)	0.009 (0.038)
England play next day	-0.014* (0.008)	0.042** (0.019)	0.043** (0.019)	0.026 (0.047)
Observations	241,827	14,640	14,640	14,676
R ²	0.926	0.931	0.937	0.732
Adjusted R ²	0.925	0.928	14	0.935
				0.723

Results: Attendance demand — scheduling



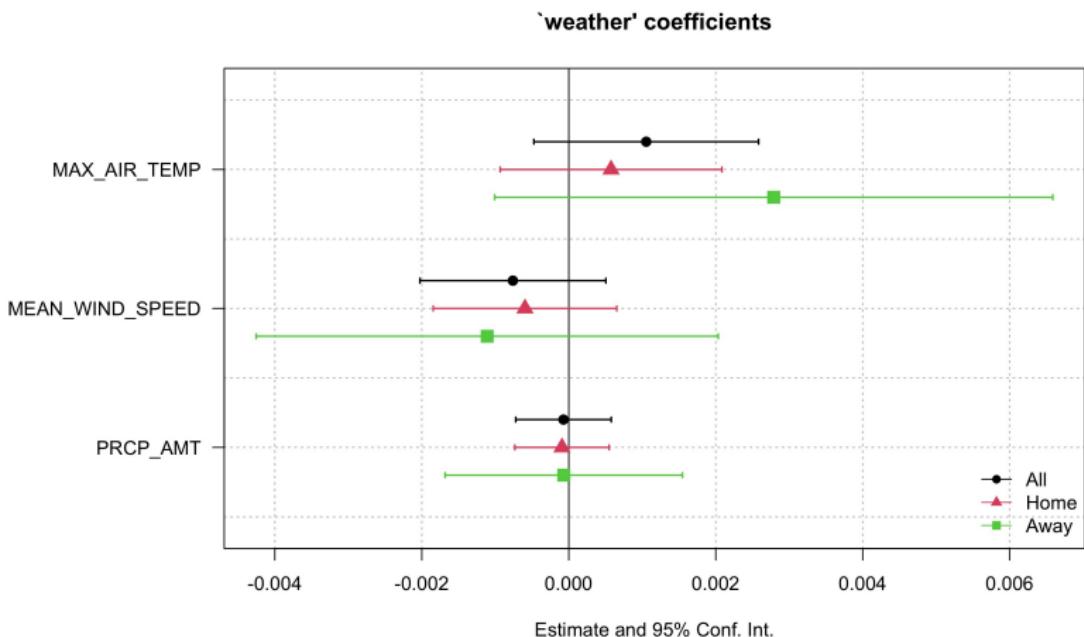
Results: Attendance demand — weather

	<i>Dependent variable:</i>			
	lattendance	lhomeatt	lawayatt	
	(1)	(2)	(3)	(4)
Max air temperature	0.002*** (0.0004)	0.001 (0.001)	0.001 (0.001)	0.003 (0.002)
Mean wind speed	0.001*** (0.0003)	-0.001 (0.001)	-0.001 (0.001)	-0.001 (0.002)
Precipitation amount	-0.0001** (0.0001)	-0.0001 (0.0003)	-0.0001 (0.0003)	-0.0001 (0.001)
Observations	100,205	11,818	11,818	11,830
R ²	0.952	0.929	0.936	0.725
Adjusted R ²	0.951	0.927	0.934	0.714
Residual Std. Error	0.351 (df = 98998)	0.249 (df = 11377)	0.245 (df = 11377)	0.618 (df = 11388)

Note:

*p<0.1; **p<0.05; ***p<0.01

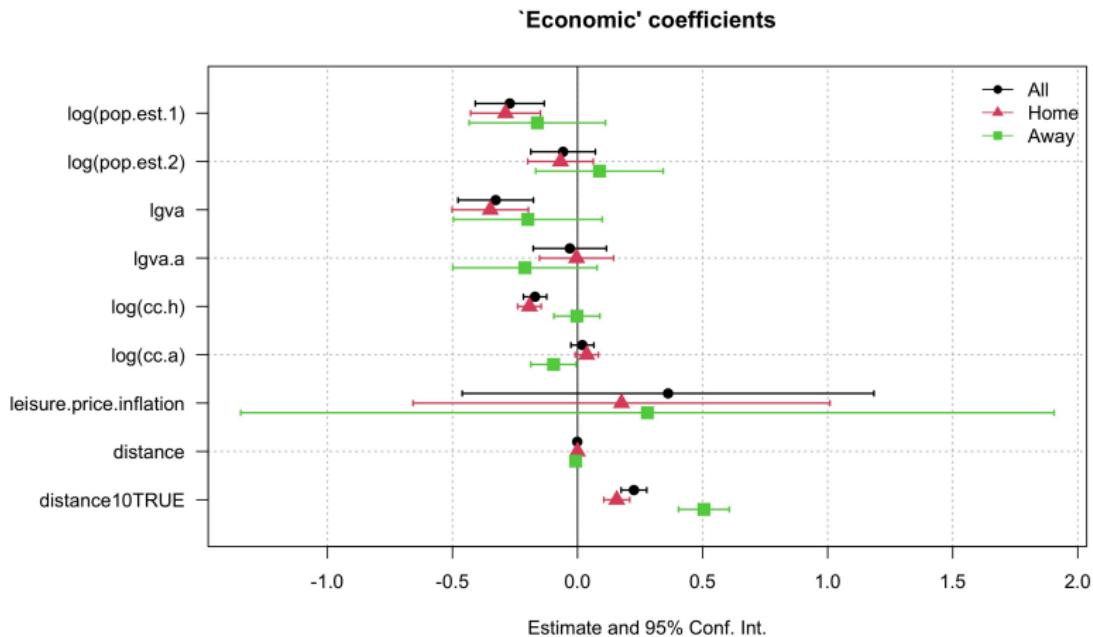
Results: Attendance demand — weather



Results: Attendance demand — economic etc

	Dependent variable:			
	lattendance		lhomeatt	lawayatt
	(1)	(2)	(3)	(4)
Log Population (H)	-0.062* (0.034)	-0.271*** (0.070)	-0.288*** (0.071)	-0.161 (0.139)
Log Population (A)	-0.026 (0.034)	-0.058 (0.066)	-0.068 (0.067)	0.088 (0.130)
Log GVA (H)	-0.010 (0.029)	-0.327*** (0.077)	-0.349*** (0.078)	-0.199 (0.152)
Log GVA (A)	-0.057* (0.029)	-0.031 (0.075)	-0.004 (0.076)	-0.210 (0.147)
Log Claimant count (H)	-0.139*** (0.010)	-0.170*** (0.024)	-0.192*** (0.024)	-0.002 (0.047)
Log Claimant count (A)	-0.013 (0.010)	0.019 (0.023)	0.037 (0.024)	-0.096** (0.046)
Leisure inflation (%)	-0.326** (0.161)	0.362 (0.420)	0.176 (0.425)	0.279 (0.829)
Distance (miles)	-0.001*** (0.00003)	-0.001*** (0.0001)	-0.0003*** (0.0001)	-0.008*** (0.0001)
Distance;10m	0.167*** (0.010)	0.225*** (0.026)	0.157*** (0.026)	0.505*** (0.052)
Observations	43,889	5,288	5,288	5,290
R ²	0.958	0.941	0.944	0.848
Adjusted R ²	0.957	0.937	0.941	0.838
Residual Std. Error	0.322 (df = 43371)	0.240 (df = 4075)	0.243 (df = 4075)	0.474 (df = 4078)
		18		

Results: Attendance demand — economic etc



Basic Results: Outcomes

	Dependent variable															
	goal difference				home win (0/1)				draw (0/1)				away win (0/1)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)				
Elo prediction	3.207*** (0.058)	2.944*** (0.107)	2.067*** (0.154)	0.729*** (0.012)	0.702*** (0.037)	0.488*** (0.047)	-0.075*** (0.010)	-0.093*** (0.034)	-0.077** (0.042)	-0.054*** (0.010)	-0.059*** (0.022)	-0.410*** (0.036)				
Log total attendance	-0.155*** (0.018)	-0.066 (0.032)		-0.042*** (0.004)	-0.035*** (0.013)		0.027*** (0.003)	0.037*** (0.010)	0.016*** (0.004)		-0.002 (0.012)					
Log home attendance		0.264*** (0.057)			0.061*** (0.012)			0.027** (0.012)				-0.078*** (0.014)				
Log away attendance			-0.072*** (0.024)		-0.020*** (0.006)			0.007 (0.005)				0.022*** (0.005)				
Observations	132,606	14,648	14,638	132,606	14,648	14,638	132,606	14,648	14,638	132,606	14,648	14,638				
R-squared	0.038	0.057	0.021	0.061	0.060	0.065	0.013	0.017	0.031	0.061	0.056	0.077				
Adjusted R-squared	0.091	0.074	0.094	0.054	0.047	0.057	0.003	0.003	0.001	0.055	0.042	0.049				
Residual Std. Error	1.693 ($df = 131643$)	1.615 ($df = 14436$)	1.597 ($df = 14202$)	0.484 ($df = 131843$)	0.484 ($df = 14436$)	0.481 ($df = 14202$)	0.431 ($df = 131643$)	0.440 ($df = 14436$)	0.440 ($df = 14202$)	0.447 ($df = 131643$)	0.451 ($df = 14436$)	0.449 ($df = 14202$)				
Final effects	HT, S	HT, S	HT, AT, S	HT, S	HT, S	HT, AT, S	HT, S	HT, AT, S	HT, S	HT, S	HT, AT, S	HT, S				
Clustering	HT, S	HT, S	HT, AT, S	HT, S	HT, S	HT, AT, S	HT, S	HT, AT, S	HT, S	HT, S	HT, AT, S	HT, S				

Note: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$

Basic Results: Yellow cards

	Dependent variable:								
	HY - AY			HY			AY		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Elo prediction	-1.304*** (0.060)	-1.145*** (0.161)	-0.839*** (0.197)	-0.918*** (0.047)	-0.858*** (0.111)	-0.519*** (0.133)	0.386*** (0.063)	0.287** (0.117)	0.321** (0.145)
Log total attendance	0.033 (0.026)	0.067 (0.059)		0.139*** (0.023)	0.184*** (0.062)		0.106*** (0.021)	0.117** (0.055)	
Log home attendance			-0.140** (0.065)			-0.053 (0.053)			0.087 (0.064)
Log away attendance			0.107*** (0.025)			0.124*** (0.012)			0.017 (0.018)
Observations	55,611	12,075	12,074	55,611	12,075	12,074	55,611	12,075	12,074
R ²	0.027	0.032	0.055	0.042	0.060	0.085	0.027	0.043	0.065
Adjusted R ²	0.024	0.018	0.030	0.039	0.047	0.061	0.024	0.029	0.040
Residual Std. Error	1.539 (df = 55427)	1.594 (df = 11906)	1.584 (df = 11763)	1.143 (df = 55427)	1.169 (df = 11906)	1.160 (df = 11763)	1.264 (df = 55427)	1.280 (df = 11906)	1.272 (df = 11763)
Fixed effects	HT, S	HT, S	HT, AT, S	HT, S	HT, S	HT, AT, S	HT, S	HT, S	HT, AT, S
Clustering	HT, S	HT, S	HT, AT, S	HT, S	HT, S	HT, AT, S	HT, S	HT, S	HT, AT, S

Note:

*p<0.1; **p<0.05; ***p<0.01

Basic Results: Fouls

	Dependent variable:								
	HF - AF			HF			AF		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Elo prediction	-3.107*** (0.283)	-3.277*** (0.580)	-2.820*** (0.655)	-2.043*** (0.197)	-2.219*** (0.375)	-1.477*** (0.452)	1.064*** (0.267)	1.058*** (0.349)	1.343*** (0.456)
Log total attendance	-0.445*** (0.118)	-0.337* (0.177)		-0.076 (0.109)	0.024 (0.203)		0.369*** (0.128)	0.362** (0.162)	
Log home attendance			-0.812** (0.305)			-0.482** (0.216)			0.330 (0.250)
Log away attendance			0.283*** (0.089)			0.283*** (0.016)			0.001 (0.075)
Observations	51,940	10,382	10,381	51,940	10,382	10,381	51,940	10,382	10,381
R ²	0.030	0.051	0.096	0.086	0.061	0.097	0.075	0.063	0.099
Adjusted R ²	0.026	0.037	0.070	0.082	0.047	0.072	0.072	0.049	0.073
Residual Std. Error	4.760 (df = 51766)	4.694 (df = 10223)	4.611 (df = 10091)	3.611 (df = 51766)	3.448 (df = 10223)	3.403 (df = 10091)	3.762 (df = 51766)	3.544 (df = 10223)	3.499 (df = 10091)
Fixed effects	HT, S	HT, S	HT, AT, S	HT, S	HT, S	HT, AT, S	HT, S	HT, S	HT, AT, S
Clustering	HT, S	HT, S	HT, AT, S	HT, S	HT, S	HT, AT, S	HT, S	HT, S	HT, AT, S

Note:

*p<0.1; **p<0.05; ***p<0.01

Basic Results: Fouls per yellow card

	Dependent variable:								
	(HF + AF)/(HY + AY)				HF/HY		AF/AY		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Elo prediction	1.269*** (0.236)	1.432** (0.554)	0.957 (0.682)	0.931*** (0.145)	0.780** (0.286)	0.369 (0.396)	-0.277 (0.183)	-0.110 (0.324)	0.131 (0.449)
Log total attendance	-0.728*** (0.101)	-0.579** (0.276)		-0.461*** (0.050)	-0.440*** (0.124)		-0.063 (0.078)	-0.132 (0.165)	
Log home attendance			-0.150 (0.214)			-0.168 (0.136)			-0.175 (0.184)
Log away attendance				-0.269*** (0.081)		-0.121** (0.044)			-0.056 (0.047)
Observations	51,940	10,382	10,381	51,932	10,382	10,381	51,938	10,382	10,381
R ²	0.048	0.063	0.081	0.060	0.048	0.064	0.042	0.050	0.070
Adjusted R ²	0.044	0.049	0.055	0.057	0.033	0.037	0.039	0.035	0.043
Residual Std. Error	6.409 (df = 51766)	5.826 (df = 10223)	5.808 (df = 10091)	3.862 (df = 51758)	3.679 (df = 10223)	3.672 (df = 10091)	3.948 (df = 51764)	3.776 (df = 10223)	3.760 (df = 10091)
Fixed effects	HT, S	HT, S	HT, AT, S	HT, S	HT, S	HT, AT, S	HT, S	HT, S	HT, AT, S
Clustering	HT, S	HT, S	HT, AT, S	HT, S	HT, S	HT, AT, S	HT, S	HT, S	HT, AT, S

Note:

*p<0.1; **p<0.05; ***p<0.01

In-Depth Results

- Player Mechanism:
 - ▶ Passes
 - ▶ Pass location
 - ▶ Interceptions
 - ▶ Interception location
 - ▶ Pressures
 - ▶ Pressure location
- Coach/manager Mechanism:
 - ▶ Sub time
 - ▶ Attacking subs
- Referee Mechanism:
 - ▶ Referee Mechanism: Injury time
 - ▶ Referee Mechanism: Touches per foul

Conclusions

- We use novel data on away fan numbers to separate supportive and hostile crowds.
 - ▶ Short and longer term team quality matter, usually more for away fans.
 - ▶ UOH not supported, rather loss aversion.
 - ▶ Promotions and relegations huge drivers of fan numbers.
 - ▶ Holidays matter, as does England playing.
 - ▶ No obvious impact of the weather.
 - ▶ Population and income have negative impact on attendance.
 - ▶ Unemployment seems to hinder away fan travel.
 - ▶ Local derby effects larger for away crowds.

Conclusions

- Basic match outcomes:
 - ▶ Home and away teams score more with more of their fans in stadium.
 - ▶ Home (away) win more likely with more home (away) fans.
 - ▶ Home (away) win less likely with more away (home) fans.
 - ▶ Home (away) teams get relatively fewer yellow cards/fouls with more home (away) fans.
 - ▶ Strongest effect through more away fans leading to more home yellow cards.
 - ▶ Strongest effect for fouls through home fans decreasing fouls called on home players.
 - ▶ More away fans does still increase number of home fouls called.
 - ▶ More away fans mean home players can get away with fewer fouls before getting a yellow card.

Conclusions

- We investigate impact of social pressure on outcomes.
- We use more detailed data than previous studies.
- We attempt to control for endogeneity in player mechanism.
- We find:
 - ▶ Evidence for a separate impact of home and away fans.
 - ▶ Evidence for a player mechanism (not necessarily causal).
 - ▶ No evidence for a coach/manager mechanism.
 - ▶ Evidence for referee mechanism.

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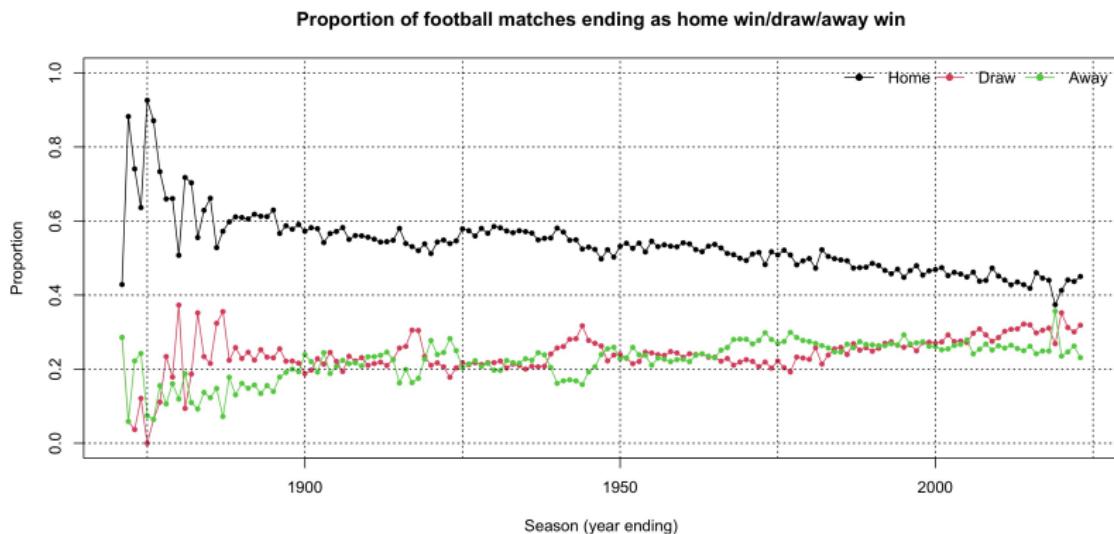
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Historical Match Outcomes



Example I

- Crawley Town 2-2 Oldham Athletic, March 1 2022.
 - ▶ Attendance: 1,927 (248 away fans).



Example II

- Oldham Athletic vs Port Vale, Nov 20 2021.
 - ▶ Attendance: 4,993 (1,913 away fans).



Data

 ← **Tweet**

  **Carlisle United FC** 
@officialcufc 

600 of you here today - thank you for your support ❤️
#cufc

5:37 PM · Apr 23, 2022 · Twitter for iPhone

4 Retweets 2 Quote Tweets 61 Likes 34

Data



FAN banter



HOME

ENGLISH PREMIER LEAGUE

CHAMPIONSHIP

LEAGUE ONE

LEAGUE

Se

These were the top 5 away attendances for League One at the weekend...

1) Sheffield Wednesday fans at Wycombe Wanderers –
1,841

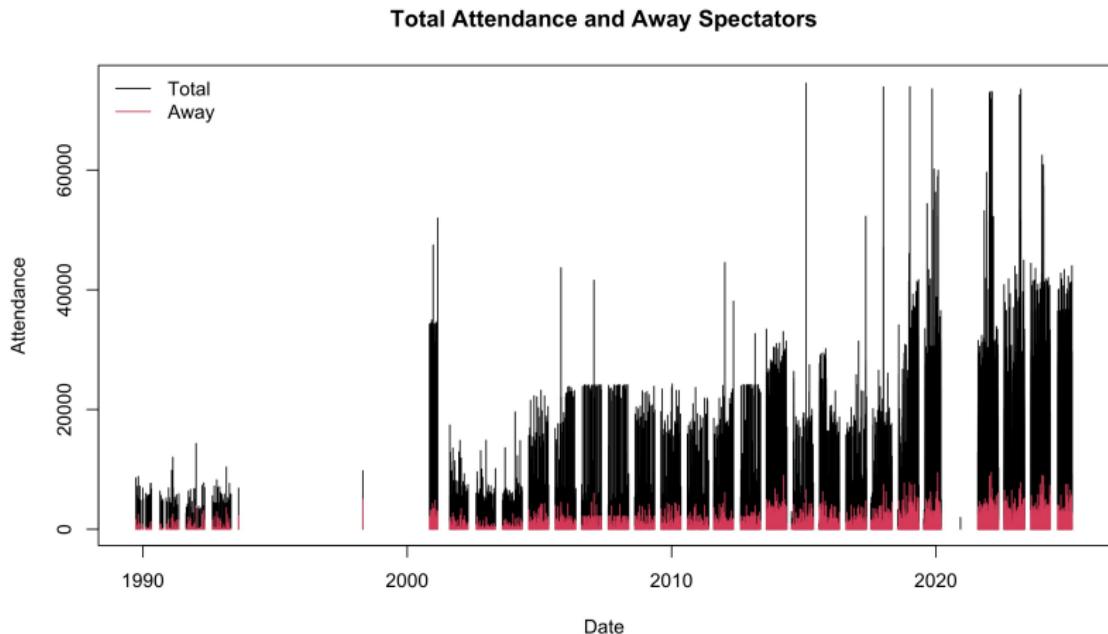
The away end at Adams Park this
afternoon... #SWFC
pic.twitter.com/HGp0cdESPD

– Rob Staton (@robstaton) [April 23, 2022](#)

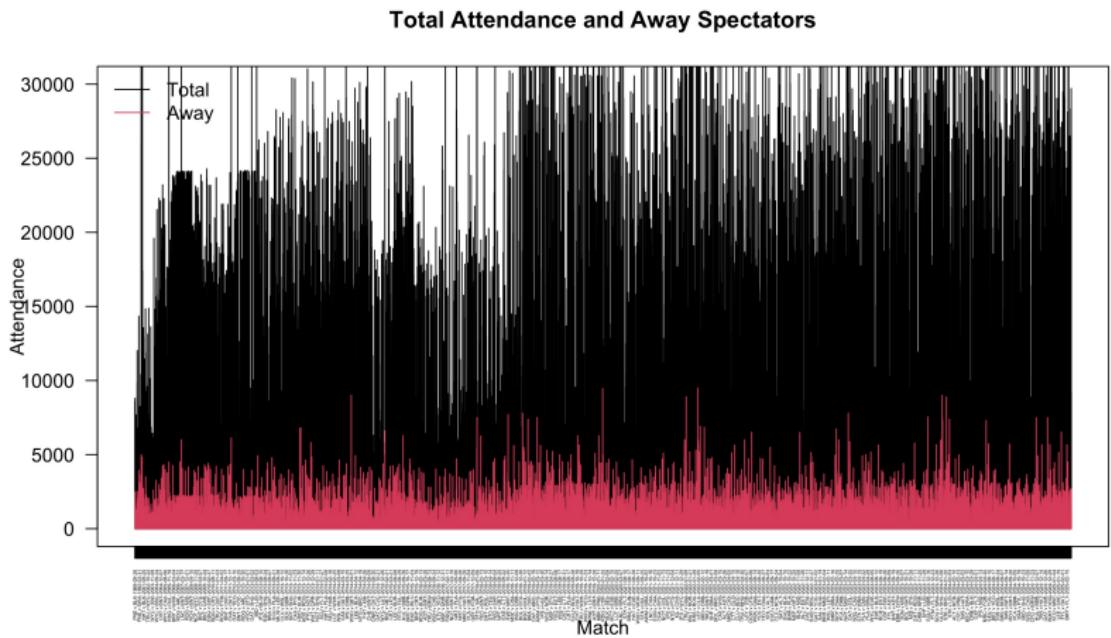
2) Plymouth Argyle fans at Wigan Athletic – 1,700

Wigan Athletic – PLYMOUTH ARGYLE 📸
23/4/22@MrJordanWard 📸#pafc
pic.twitter.com/JcBVtYvHNx

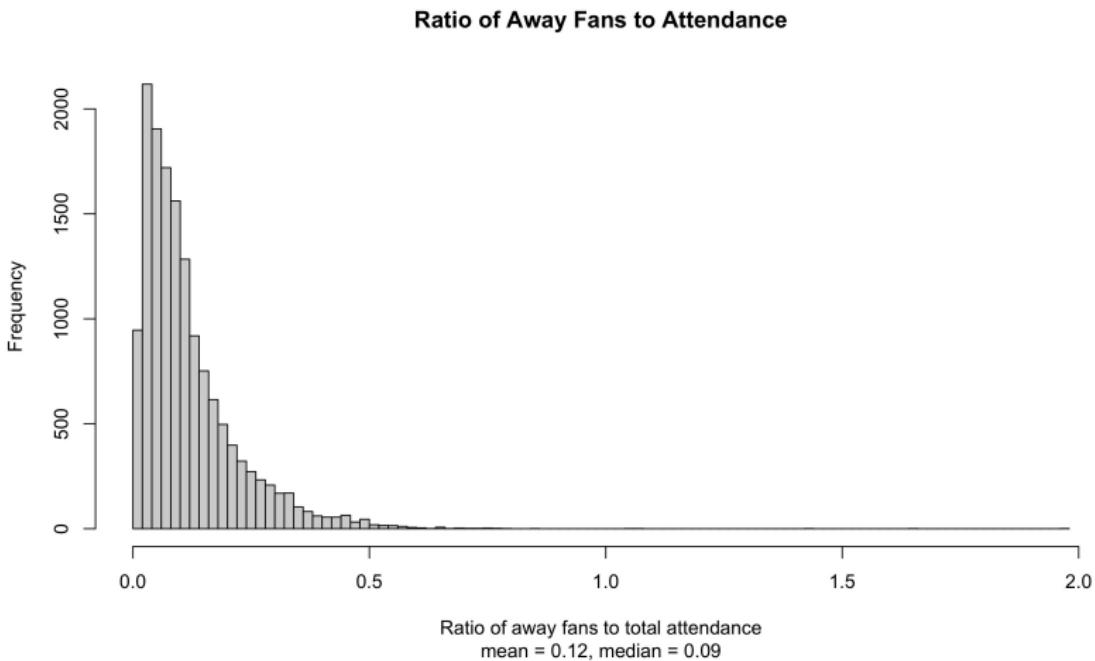
Separating the Crowds



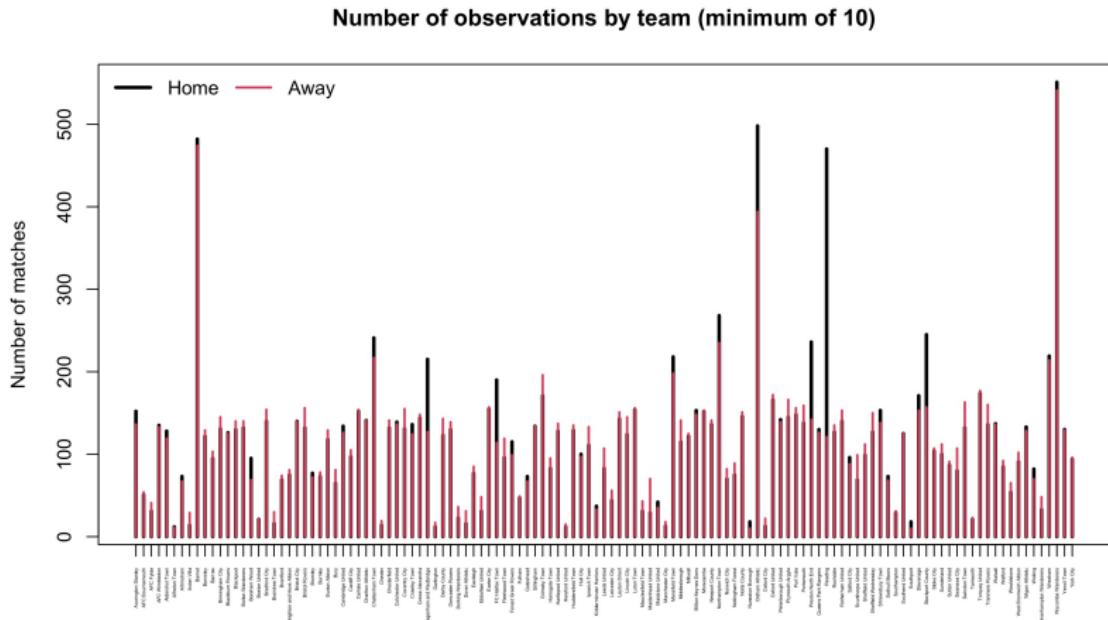
Data



Data II

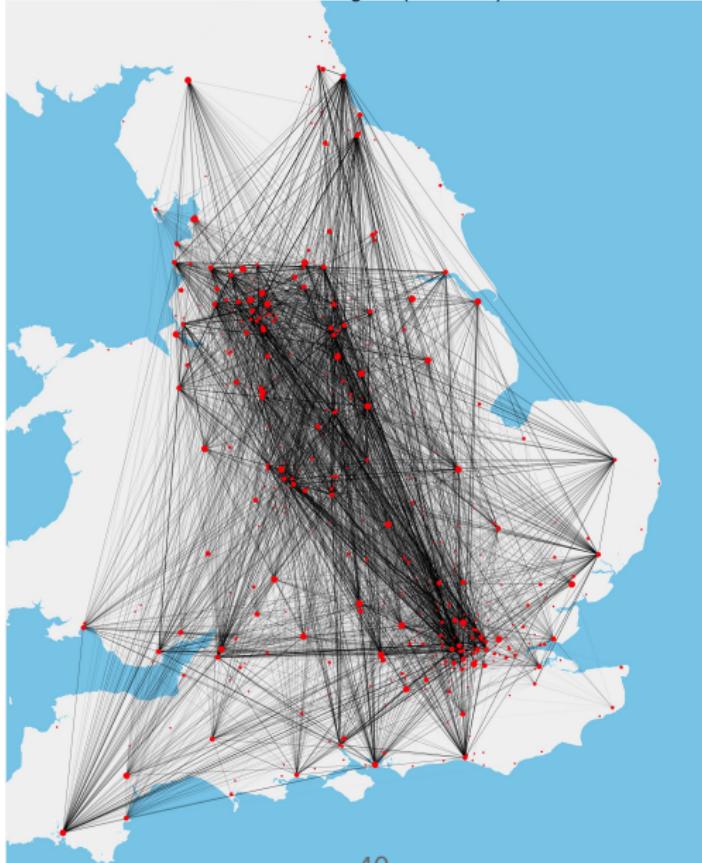


Separating the Crowds

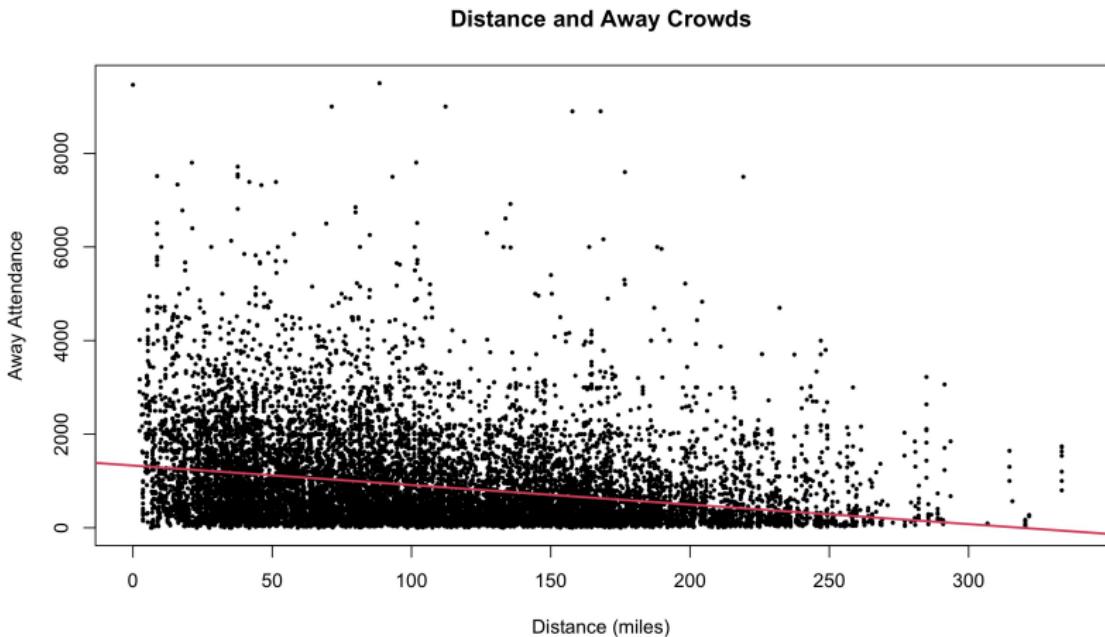


Separating the Crowds

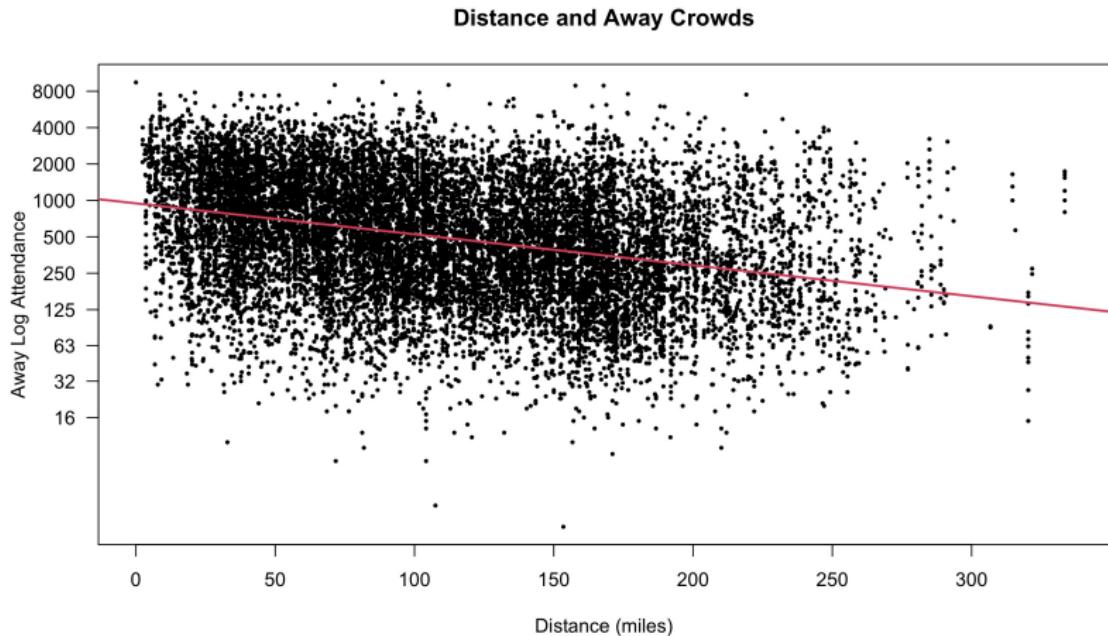
Fan Travel in England (and Wales)



Separating the Crowds



Separating the Crowds



Data

Statistic	N	Mean	St. Dev.	Min	Max
attendance	3,878	7,062.176	5,639.793	658	38,395
homeatt	3,878	6,379.410	5,376.835	434	37,695
awayatt	3,886	681.817	705.810	12	6,850
passH	3,886	440.434	106.670	165	970
passA	3,886	413.291	101.239	170	822
pass.location.xH	3,886	25,336.030	6,696.035	8,524.000	63,658.300
pass.location.xA	3,886	23,152.130	6,083.457	7,320.200	53,113.900
interceptionH	3,886	9.901	5.165	0	37
interceptionA	3,886	10.216	5.313	0	37
interception.location.xH	3,886	417.959	230.732	0.000	1,630.400
interception.location.xA	3,886	416.048	228.076	0.000	1,595.700
pressureH	3,886	140.949	37.320	50	304
pressureA	3,886	144.132	36.899	50	325
pressure.location.xH	3,886	8,089.276	2,386.004	2,821.000	20,509.600
pressure.location.xA	3,886	7,986.271	2,243.460	2,430.500	18,846.200

Data

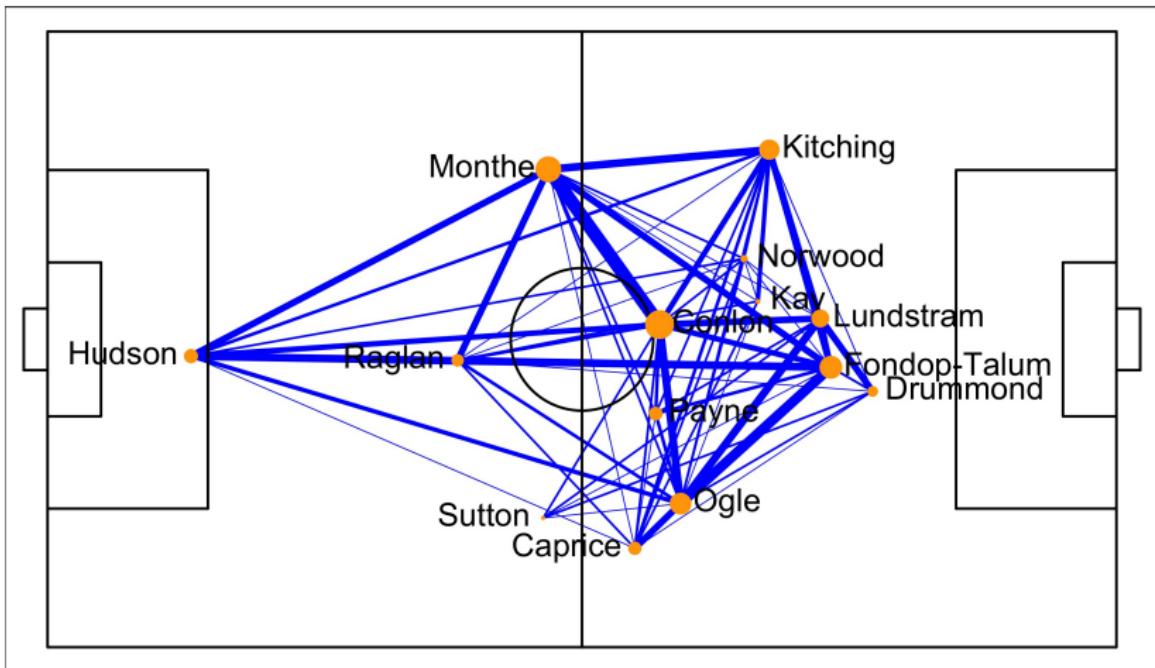
Statistic	N	Mean	St. Dev.	Min	Max
touches.per.foulH	3,886	156.255	85.021	45.250	1,252.500
touches.per.foulA	3,886	141.012	79.563	37.958	2,410.000
first.half.length	3,886	48.158	1.937	42.802	63.796
second.half.length	3,886	51.026	2.045	46.177	72.628
score.diff.45	3,886	0.095	1.086	-4	5
score.diff.45.1	3,886	0.241	0.428	0	1
score.diff.45.m1	3,886	0.207	0.405	0	1
tgoals.45	3,886	1.124	1.014	0	5
score.diff.90	3,886	0.138	1.173	-4	5
score.diff.90.1	3,886	0.247	0.431	0	1
score.diff.90.m1	3,886	0.192	0.394	0	1
tgoals.90	3,886	1.285	1.105	0	7

Data

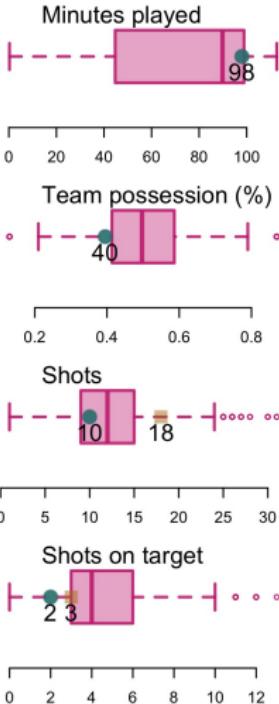
Statistic	N	Mean	St. Dev.	Min	Max
timestampH1	3,866	59.073	15.663	3.050	96.217
timestampA1	3,872	57.675	15.463	2.717	93.700
sub.att.def.H1	3,866	0.193	2.642	-23	22
sub.att.def.A1	3,872	0.229	2.892	-21	21
attackers.H0	3,886	1.766	0.690	1	3
attackers.A0	3,886	1.768	0.701	1	3
defenders.H0	3,886	3.511	0.500	3	4
defenders.A0	3,886	3.501	0.500	3	4

Data

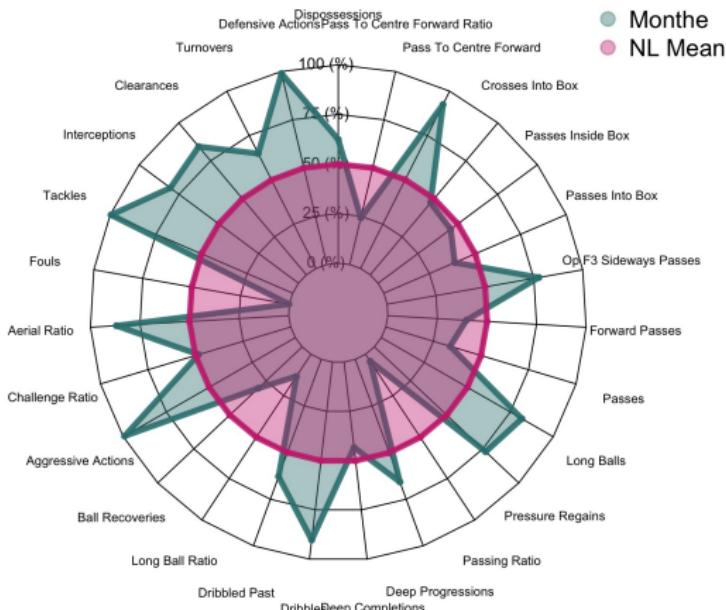
Maidenhead United 2-2 Oldham Athletic, 2024-10-22



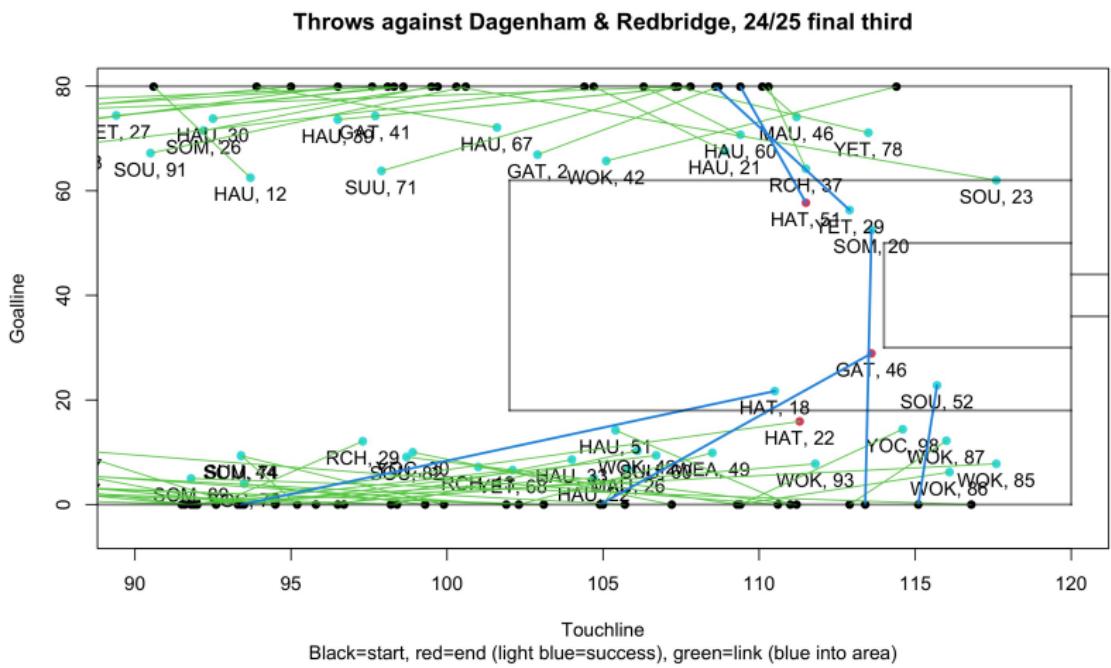
Data



Monthe, vs Forest Green Rovers, 1-0

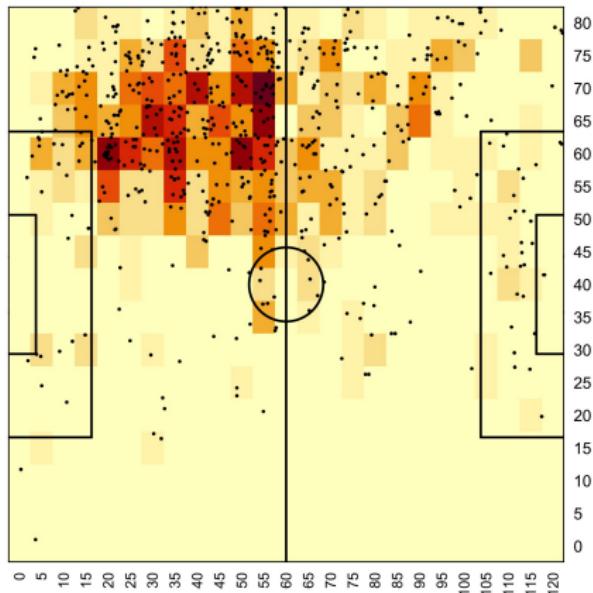


Data



Data

Touches by Jordan Turnbull (Tranmere Rovers)



Elo ratings and predictions

- Elo ratings assign strength rating to each participant.
- For two participants at time t , R_{it} , R_{jt} .
- R_{it} , R_{jt} used to create prediction:

$$elo_{j|t} = \frac{1}{1 + 10^{(R_{jt} - R_{it})/400}}. \quad (3)$$

- By design, $0 \leq elo_{j|t} \leq 1$, for participant j $elo_{j|t} = 1 - elo_{j|t}$.
- Outcome Y_1 , ratings adjust: $R_{t+1,1} = R_{t,1} + K(Y_1 - X_1)$.

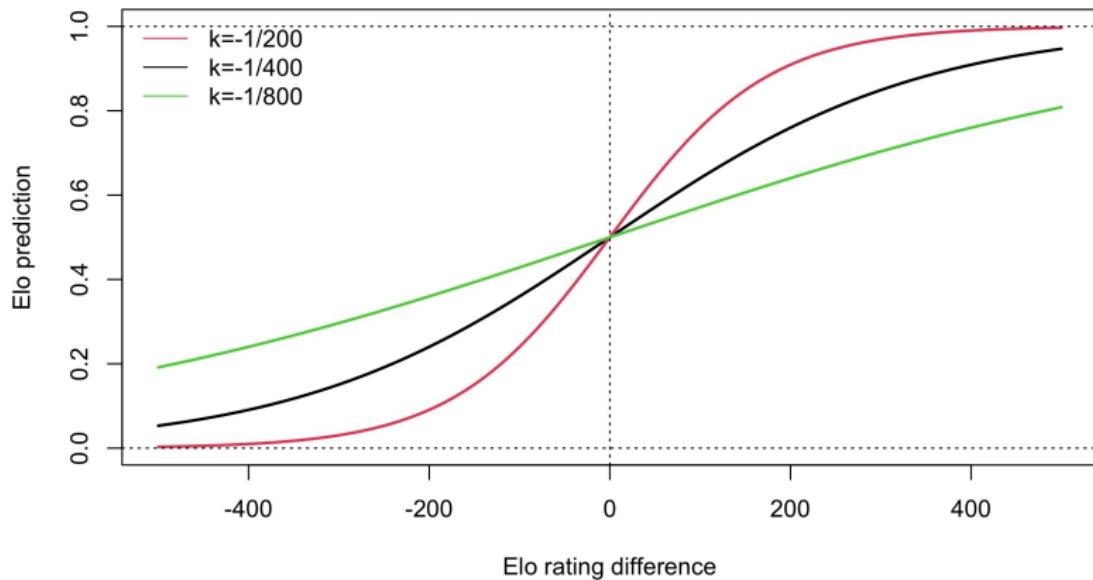
Concept

Example

Back

Elo ratings and predictions

Logarithmic Curves in Elo Ratings



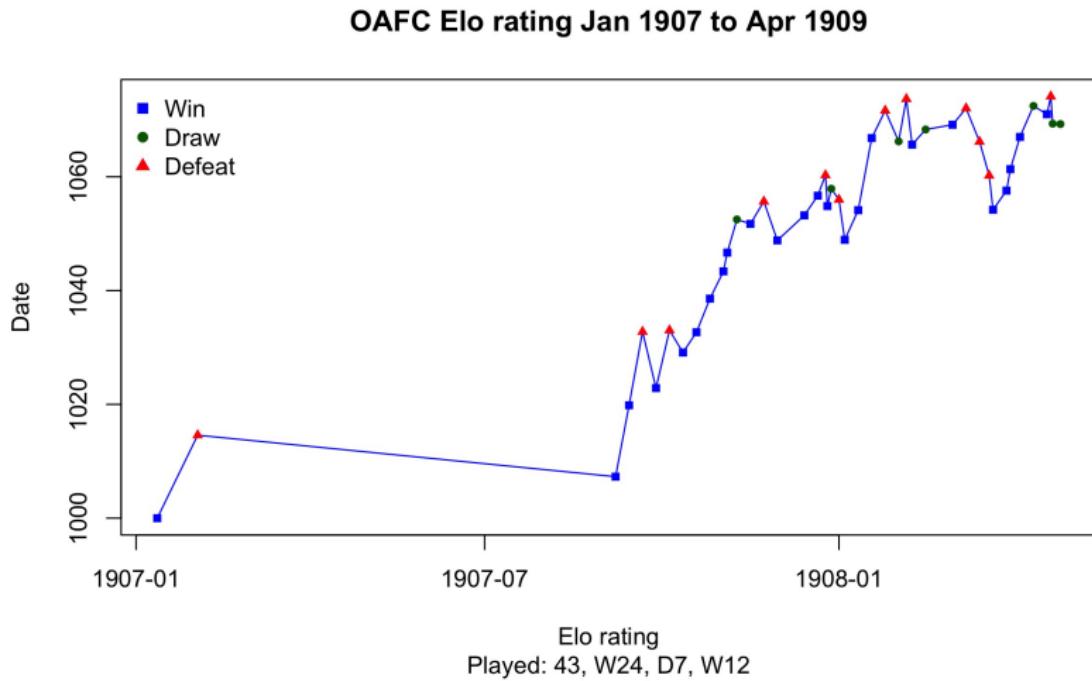
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Elo ratings example: Oldham Athletic

Date	Home		Goals		Away team	Home	Elo ratings		Probabilities		
	Date	team	Home	Away			Prediction	Away	Home	Draw	Away
1907-01-12		Oldham	5	0	Kidderminster	1000.0	0.51	990.5	50.2	24.6	25.3
1907-02-02		Oldham	0	1	Liverpool	1014.6	0.24	1211.8	24.3	24.3	51.4
1907-09-07		Stoke	1	3	Oldham	1097.7	0.63	1007.3	61.9	20.8	17.3
1907-09-14		Oldham	2	1	West Brom	1019.8	0.35	1124.7	33.9	26.2	39.9
1907-09-21		Bradford	1	0	Oldham	1036.1	0.50	1032.8	49.2	24.8	26.0
1907-09-28		Oldham	3	0	Hull	1022.9	0.49	1028.1	47.9	25.1	27.0
1907-10-05		Derby	1	0	Oldham	1110.8	0.61	1033.0	60.2	21.4	18.4
1907-10-12		Oldham	4	0	Lincoln	1029.1	0.64	926.3	63.5	20.1	16.3
1907-10-19		Fulham	1	2	Oldham	1096.2	0.59	1032.7	58.2	22.2	19.7
1907-10-26		Oldham	1	0	Barnsley	1038.6	0.52	1024.5	50.9	24.4	24.7

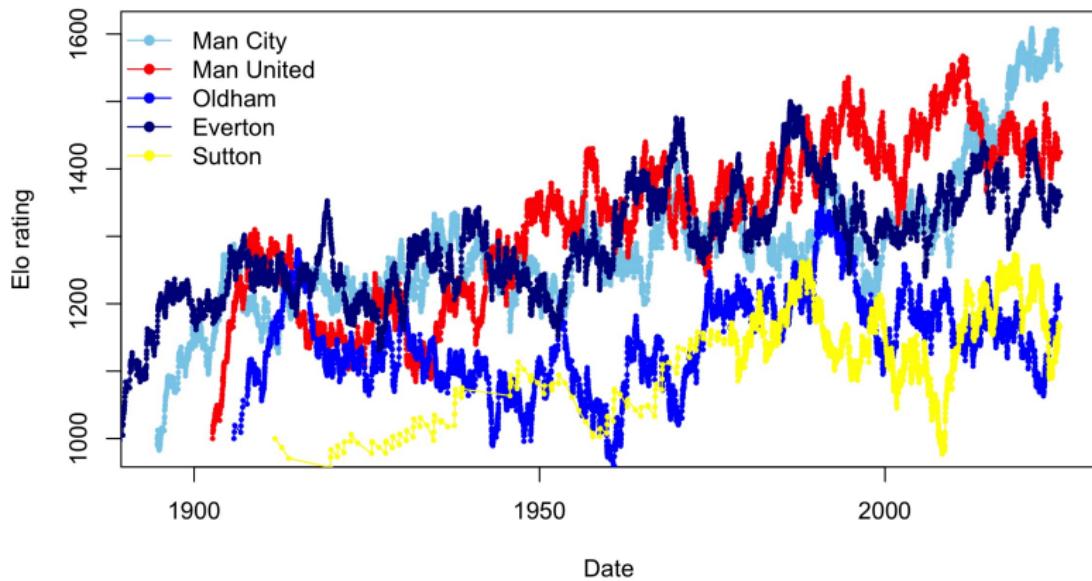
Back

Elo ratings example: Oldham Athletic



Back

Elo ratings example: Oldham Athletic



Back

Elo top 10

Rank	team	elo strength	division	league position
1	Manchester City	1554	English Premier	5
2	Liverpool	1546	English Premier	1
3	Arsenal	1515	English Premier	2
4	Newcastle United	1481	English Premier	6
5	Chelsea	1452	English Premier	4
6	Brighton and Hove Albion	1429	English Premier	10
7	Manchester United	1424	English Premier	13
8	Tottenham Hotspur	1422	English Premier	14
9	Aston Villa	1412	English Premier	8
10	Fulham	1408	English Premier	9

Back

Elo divisional mix

Rank	Team	elostrength	division	league pos
61	Exeter City	1215	Football League One	18
62	Walsall	1215	Football League Two	1
63	Hull City	1214	Football League Championship	20
64	Chorley	1213	Football Conference North	4
65	Doncaster Rovers	1213	Football League Two	5
66	Huddersfield Town	1209	Football League One	6
67	Oldham Athletic	1208	Football Conference	4
68	Cardiff City	1208	Football League Championship	19
69	AFC Wimbledon	1207	Football League Two	4
70	Halifax Town	1207	Football Conference	6

Impact...



Cameron Whitworth @CammyOA95 · 17h

🔗 ...

This is the only good thing about us recently. Should never please away fans. Take the roof off the Chaddy and leave the pylons in the way and keep them in the corner. Fuck em **#oafc**



Mozzy @MozzyCarp · 18h

Replying to @BarnetFC

Congratulations. BTW what a shithouse show from @OfficialOAFC sticking the away fans in that upper tier seating area.... Obstructed view for all Barnet fans and we may as well been sat in the car park due to the toxic fumes drifting up from below. Not stopped coughing all day.

2

17

25

2.8K

Bookmark

Up

Results: Player Mechanism: Passes

	<i>Dependent variable:</i>					
	passes (home team)			passes (away team)		
	(1) OLS	(2) FE-OLS	(3) IV	(4) OLS	(5) FE-OLS	(6) IV
Constant	164.249*** (17.856)			525.544*** (17.562)		
Elo prediction	216.583*** (12.305)	176.365*** (13.931)	329.099* (77.286)	-184.133*** (12.103)	-119.203*** (19.633)	-130.120** (19.399)
Log home attendance	29.244*** (2.232)	19.441* (7.719)	-538.953 (223.685)	-11.290*** (2.196)	-33.745 (16.573)	-29.717 (19.340)
Log away attendance	-13.155*** (1.688)	-13.713*** (1.957)	19.983 (12.596)	12.447*** (1.660)	0.433 (2.642)	-2.492* (0.656)
Observations	3,878	3,851	3,505	3,878	3,851	3,505
Fixed effects	None	H, A, S	H, A, S	None	H, A, S	H, A, S
Clustering	None	H, S	H, S	None	A, S	A, S
R ²	0.164	0.420	-0.343	0.102	0.445	0.457
Adjusted R ²	0.163	0.383	-0.432	0.101	0.397	0.407
Residual Std. Error	97.527 (df = 3874)	83.747 (df = 3621)	126.283 (df = 3286)	95.922 (df = 3874)	78.693 (df = 3540)	77.560 (df = 3209)

Note:

*p<0.1; **p<0.05; ***p<0.01

Results: Player Mechanism: Pass location

	Dependent variable:					
	pass location (home team)			pass location (away team)		
	(1) OLS	(2) FE-OLS	(3) IV	(4) OLS	(5) FE-OLS	(6) IV
Constant	55.635*** (0.863)			64.873*** (0.861)		
Elo prediction	5.336*** (0.595)	3.152* (1.235)	3.340* (0.833)	-6.153*** (0.593)	-3.848** (0.968)	-3.388* (1.141)
Log home attendance	0.203* (0.108)	0.375 (0.379)	0.205 (2.166)	-0.822*** (0.108)	-0.672 (0.474)	-0.971 (0.392)
Log away attendance	-0.426*** (0.082)	-0.219 (0.171)	-0.252 (0.334)	0.189** (0.081)	0.232 (0.155)	0.253 (0.220)
Observations	3,878	3,851	3,505	3,878	3,851	3,505
Fixed effects	None	H, A, S	H, A, S	None	H, A, S	H, A, S
Clustering	None	H, S	H, S	None	A, S	A, S
R ²	0.039	0.327	0.344	0.059	0.311	0.326
Adjusted R ²	0.038	0.268	0.284	0.059	0.251	0.264
Residual Std. Error	4.714 (df = 3874)	4.109 (df = 3540)	4.052 (df = 3209)	4.700 (df = 3874)	4.194 (df = 3540)	4.155 (df = 3209)

Note:

*p<0.1; **p<0.05; ***p<0.01

Results: Player Mechanism: Interceptions

	Dependent variable:					
	interceptions (home team)			interceptions (away team)		
	(1) OLS	(2) FE-OLS	(3) IV	(4) OLS	(5) FE-OLS	(6) IV
Constant	12.287*** (0.944)			6.428*** (0.964)		
Elo prediction	-2.056*** (0.650)	-1.406 (0.650)	-2.475* (0.832)	4.162*** (0.664)	1.922** (0.440)	1.709* (0.494)
Log home attendance	-0.214* (0.118)	-0.2011** (0.599)	0.148 (1.355)	0.343*** (0.121)	-1.649* (0.558)	-1.731* (0.526)
Log away attendance	0.075 (0.089)	-0.032 (0.177)	-0.250 (0.223)	-0.195** (0.091)	0.012 (0.173)	0.072 (0.257)
Observations	3,878	3,851	3,505	3,878	3,851	3,505
Fixed effects	None	H, A, S	H, A, S	None	H, A, S	H, A, S
Clustering	None	H, S	H, S	None	A, S	A, S
R ²	0.005	0.336	0.329	0.018	0.349	0.350
Adjusted R ²	0.004	0.278	0.267	0.018	0.292	0.290
Residual Std. Error	5.156 (df = 3874)	4.395 (df = 3540)	4.484 (df = 3209)	5.265 (df = 3874)	4.466 (df = 3540)	4.528 (df = 3209)

Note:

*p<0.1; **p<0.05; ***p<0.01

Results: Player Mechanism: Interception location

	Dependent variable:					
	interception location (home team)			interception location (away team)		
	(1) OLS	(2) FE-OLS	(3) IV	(4) OLS	(5) FE-OLS	(6) IV
Constant	34.729*** (1.808)			41.996*** (1.722)		
Elo prediction	5.686*** (1.245)	3.292 (1.552)	6.819* (1.698)	-7.616*** (1.187)	-5.076* (1.645)	-5.843* (1.618)
Log home attendance	0.487** (0.226)	-0.209 (0.863)	-7.671 (3.001)	-0.184 (0.215)	-0.908 (0.652)	-0.468 (1.115)
Log away attendance	0.125 (0.171)	0.037 (0.315)	0.990 (0.376)	0.723*** (0.163)	0.490 (0.408)	0.169 (0.386)
Observations	3,868	3,841	3,496	3,873	3,846	3,501
Fixed effects	None	H, A, S	H, A, S	None	H, A, S	H, A, S
Clustering	None	H, S	H, S	None	A, S	A, S
R ²	0.009	0.133	0.116	0.022	0.156	0.164
Adjusted R ²	0.008	0.057	0.034	0.021	0.081	0.087
Residual Std. Error	9.853 (df = 3864)	9.624 (df = 3530)	9.645 (df = 3200)	9.406 (df = 3869)	9.121 (df = 3535)	9.022 (df = 3205)

Note:

*p<0.1; **p<0.05; ***p<0.01

Results: Player Mechanism: Pressures

	<i>Dependent variable:</i>					
	pressures (home team)			pressures (away team)		
	(1) OLS	(2) FE-OLS	(3) IV	(4) OLS	(5) FE-OLS	(6) IV
Constant	167.490*** (6.758)			113.531*** (6.647)		
Elo prediction	-30.696*** (4.657)	-28.918*** (4.055)	-36.525* (8.580)	31.452*** (4.581)	9.951 (9.182)	7.992 (10.928)
Log home attendance	-2.527*** (0.845)	3.617 (8.648)	22.189 (23.578)	4.065*** (0.831)	15.714 (10.760)	16.609 (13.028)
Log away attendance	1.680*** (0.639)	-1.228 (0.700)	-3.306 (1.718)	-3.226*** (0.628)	-3.452 (1.638)	-3.810 (2.770)
Observations	3,878	3,851	3,505	3,878	3,851	3,505
Fixed effects	None	H, A, S	H, A, S	None	H, A, S	H, A, S
Clustering	None	H, S	H, S	None	A, S	A, S
R ²	0.021	0.278	0.269	0.033	0.281	0.280
Adjusted R ²	0.020	0.214	0.202	0.032	0.218	0.214
Residual Std. Error	36.913 (df = 3874)	32.993 (df = 3540)	32.909 (df = 3209)	36.305 (df = 3874)	32.591 (df = 3540)	32.251 (df = 3209)

Note:

*p<0.1; **p<0.05; ***p<0.01

Results: Player Mechanism: Pressure location

	Dependent variable:					
	pressure location (home team)			pressure location (away team)		
	(1) OLS	(2) FE-OLS	(3) IV	(4) OLS	(5) FE-OLS	(6) IV
Constant	46.128*** (1.032)			58.514*** (1.025)		
Elo prediction	6.456*** (0.711)	3.861** (1.003)	6.420 (4.070)	-5.634*** (0.707)	-5.642*** (0.631)	-7.017** (1.332)
Log home attendance	1.203*** (0.129)	1.567*** (0.110)	-7.564 (11.044)	-0.556*** (0.128)	-0.509 (0.387)	-0.058 (0.493)
Log away attendance	-0.374*** (0.098)	-0.523** (0.150)	0.011 (0.815)	0.723*** (0.097)	0.548** (0.113)	0.205 (0.446)
Observations	3,878	3,851	3,505	3,878	3,851	3,505
Fixed effects	None	H, A, S	H, A, S	None	H, A, S	H, A, S
Clustering	None	H, S	H, S	None	A, S	A, S
R ²	0.062	0.181	0.120	0.046	0.227	0.239
Adjusted R ²	0.061	0.129	0.061	0.046	0.178	0.188
Residual Std. Error	5.635 (df = 3874)	5.427 (df = 3621)	5.647 (df = 3286)	5.600 (df = 3874)	5.202 (df = 3621)	5.168 (df = 3286)

Note:

*p<0.1; **p<0.05; ***p<0.01

Results: Manager Mechanism: Sub timing

	<i>Dependent variable:</i>			
	time of first sub (home team)		time of first sub (away team)	
	(1)	(2)	(3)	(4)
Constant	60.368*** (2.423)		61.094*** (2.410)	
Elo prediction	-1.994 (1.687)	-7.438* (2.486)	-1.620 (1.671)	1.697 (1.980)
Log home attendance	0.513* (0.304)	-0.189 (0.796)	-0.056 (0.303)	0.723 (0.569)
Log away attendance	-0.234 (0.230)	0.052 (0.212)	0.171 (0.230)	0.460* (0.166)
Observations	3,233	3,209	3,277	3,254
Fixed effects	None	HM, AM, S, R	None	HM, AM, S, R
Clustering	None	HM, S	None	AM, S
R ²	0.001	0.205	0.001	0.118
Adjusted R ²	0.0001	0.041	-0.0003	0.025
Residual Std. Error	12.179 (df = 3229)	11.923 (df = 2660)	12.158 (df = 3273)	11.988 (df = 2943)

Note:

*p<0.1; **p<0.05; ***p<0.01

Results: Manager Mechanism: Sub attacking?

	<i>Dependent variable:</i>			
	attacking first sub (h)		attacking first sub (a)	
	(1)	(2)	(3)	(4)
Constant	0.439 (0.557)		0.052 (0.605)	
Elo prediction	-0.643* (0.388)	-0.427 (0.515)	0.400 (0.419)	1.499** (0.344)
Log home attendance	0.029 (0.070)	0.190 (0.179)	0.018 (0.076)	0.007 (0.255)
Log away attendance	-0.023 (0.053)	-0.020 (0.038)	-0.023 (0.058)	-0.044 (0.051)
Observations	3,233	3,210	3,277	3,254
Fixed effects	None	HM, AM, S, R	None	HM, AM, S, R
Clustering	None	HM, S	None	AM, S
R ²	0.001	0.133	0.0005	0.099
Adjusted R ²	-0.0001	0.028	-0.0004	0.004
Residual Std. Error	2.800 (df = 3229)	2.753 (df = 2861)	3.050 (df = 3273)	3.046 (df = 2943)

Note:

*p<0.1; **p<0.05; ***p<0.01

Results: Referee Mechanism: Injury time

	Dependent variable:			
	First half		Second half	
	(1)	(2)	(3)	(4)
Constant	47.193*** (0.318)		49.938*** (0.370)	
Score difference at 45/90	0.001 (0.033)	-0.001 (0.044)	-0.038 (0.034)	-0.053 (0.033)
Score difference = +1 at 45/90	0.120 (0.075)	0.121* (0.041)	0.055 (0.084)	0.090 (0.123)
Score difference = -1 at 45/90	0.280*** (0.082)	0.254 (0.155)	0.235** (0.095)	0.250** (0.070)
Total goals in half	0.292*** (0.028)	0.287* (0.105)	0.125*** (0.030)	0.125 (0.081)
Total substitutions in half	1.552*** (0.057)	1.555*** (0.060)	0.091*** (0.020)	-0.014 (0.026)
Log home attendance	0.003 (0.038)	0.028 (0.025)	-0.017 (0.046)	0.041 (0.032)
Log away attendance	0.025 (0.029)	0.035 (0.021)	0.078** (0.034)	0.071 (0.044)
Observations	3,878	3,851	3,878	3,851
Fixed effects	None	S, R	None	S, R
Clustering	None	S	None	S
R ²	0.185	0.257	0.016	0.119

Results: Referee Mechanism: Touches per foul

	<i>Dependent variable:</i>			
	touches per foul (H)		touches per foul (A)	
	(1)	(2)	(3)	(4)
Constant	78.478*** (15.093)		239.303*** (14.379)	
Elo prediction	121.009*** (10.401)	108.130*** (11.646)	-76.803*** (9.909)	-59.170*** (9.882)
Log home attendance	7.640*** (1.887)	8.652 (7.458)	-7.404*** (1.798)	-17.567*** (6.434)
Log away attendance	-7.832*** (1.427)	-6.214*** (1.634)	0.466 (1.359)	3.746*** (1.323)
Observations	3,878	3,851	3,878	3,851
Fixed effects	None	S, R	None	S, R
Clustering	None	S	None	S
R ²	0.062	0.237	0.027	0.199
Adjusted R ²	0.061	0.189	0.026	0.148
Residual Std. Error	82.433 (df = 3874)	76.545 (df = 3621)	78.536 (df = 3874)	73.630 (df = 3621)

Note:

*p<0.1; **p<0.05; ***p<0.01