Home Advantage in Association Football: Evidence from Turkish Super League

Aylin Seçkin[1]

Abstract:
The availability of detailed data on soccer match-play variables in Turkey has given us the opportunity to perform different empirical studies. We use the match-play statistics to estimate a production function for seasonal performances by soccer clubs competing in the Turkish Premier League (Super League) during the 2004-2005 season. We analyze the efficiency of each team with respect to their match plays. We identify efficient and inefficient teams on the basis of computed residuals. We also investigate the home-field and within-match performance by home and away teams. We provide further evidence for the importance of attacking play at home and more defensive and aggressive play when playing away. We provide evidence for short attack combined with cautious defense tactics for teams when playing away games: after scoring goals, away teams as well as home teams stay in defense. Teams are more comfortable with fouls, yellow cards than red cards when they are playing away as well as home matches. We find evidence for agressive tactics in home as well as away games. We find the contrary of what Carmichael and Thomas (1995) found for several tactics. The differences in the sign and sizes of the same variables' coefficients may be an evidence for the differences in the competitive balance, the league teams of the British and Turkish leagues.

Key words: Home advantage, within-match performances, association football.
JEL Classification : L83, C32.

1. Introduction

Home advantage is a well-known fact which is tested many times for different team sports as well as individual sports. However, empirical evidence regarding match-play data and the performances of individual teams playing in field and away is relatively few. Recently, Carmichael and Thomas (2005) examine the home advantage effect using a recent data set provided by Opta-Carling and find the strong evidence for the home effect. More specifically, they confirm the importance of attacking play when playing at home and defensive and aggressive play when a team is playing in outfield. They further emphasize the role of coaching and tactical preparation on the percentage of home wins.

[1] Istanbul Bilgi University, Inonu Cad. No:28 Kustepe Sisli Istanbul Turkey 34387, Phone: ++ 902123116138; Fax: ++ 902162400, E-mail: aseckin@bilgi.edu.tr

Early studies on the major league baseball have initiated a series of studies on sporting production functions mainly concentrating on US-based baseball games. The availability of detailed data on soccer match-play variables in Turkey has given us the opportunity to perform different empirical studies. We use the match-play statistics to estimate a production function for seasonal performances by soccer clubs competing in the Turkish Premier League (Super League) during the 2004-2005 season. We analyze the efficiency of each team with respect to their match plays. We identify efficient and inefficient teams on the basis of computed residuals. We also investigate the home-field and within-match performance by home and away teams. We provide further evidence for the importance of attacking play at home and more defensive and aggressive play when playing away. The is the first academic work on Turkish association football using detailed match-play statistics for each team for each play. Following Carmichael and Thomas (2005), this study aims to investigate home play advantage in soccer in Turkish Super League for the 2004-2005 season. Using the match-play data provided by Fstats, we will estimate match-based production function for home teams and away teams to investigate the effects of home advantage factor on home and host team within-match performances.

Section 2 provides a recent literature review on home advantage. Section 3 presents the characteristics of the football game and its brief starting story in Turkey. Section 4 discusses the data and the model. Section 5 examine the results. Section 6 concludes the paper.

2. Literature Review on Home Advantage in Sports

The very existence of home advantage for the host team is a well-documented fact for many team sports as as individual sports. In a balanced league where each team play twice with ever other team one at home and one away games, the win percentage which is greater than 50 percent (omitting draws) is defined as home-field advantage. Schwartz and Barsky (1977), Pollard (1986), Courneya and Caron (1992) to name a few.

Nevill et al. (1997) undertakes a regression analysis to identify the effect of home advantage in international grand slam tennis and major golf tournaments. Their results provide little evidence of home advantage in both types of competitions held in 1993. They explain these findings partially by the low availability of information concerning the low rankings of the

British tennis players competing at Wimbledon and the selective entry, allowing only the world's top-ranked foreign golfers into US open golf tournament. They explain the lack of evidence for home advantage in tennis and golf by the relatively objective nature of their scoring systems.

Morley and Thomas (2005) examine the cricket matches played in English one-day cricket league. They confirm home advantage with a finding of win percentage of home teams of 57 percent. Using a logistical regression model, they also find evidence for the importance of other factors especially team quality and match importance for the home and away teams in the overall league system. They also find no evidence for crowd effect in explaining home field effect.

Using a generalized linear mixed model with random effects for skaters and fixed effects for skating rinks and seasons Koning (2005) finds a small but significant home advantage in speed skating. He also argues that crowd effect and familiarity with local conditions may have important effects on home advantage in speed skating.

Schwartz and Barsky (1977) investigate the existence of home advantage in various team sports. They find the strongest evidence for the home-field effect in indoor sports: ice hockey and basketball. They argue that home advantage is weaker in outdoor sports such as baseball and football. They explain this finding by the speedy rhythm of indoor sports, permitting short-distanced setup of fans and players. Using the inferences from the data, as well as more direct observations on audience size and its relationship, they attribute the effect of home advantage mainly to the crowd effect. They emphasize the irrational role of home audience on the failure of the visiting team.

Pollard (1986) quantifies home advantage in the major professional team sports in North America and England between 1981 and 1984. He confirms the importance of home advantage in soccer in both division 1 and division 2. Moreover, Pollard finds a less pronounced home effect in local derbies, in the FA Cup and in non-professional competitions. Furthermore, he also detects a fall in home advantage in the GM Vauxhall Conference where an away win gains more points than a home win.

Courneya and Carron (1992) defined the home advantage as the winning percentage of home team being greater than 50 percent. They build a conceptual framework for home advantage with five major components: "game location, game location factors, critical psychological states and performance outcomes". The game location factors can be summarized under four categories: 1. *crowd effect*; 2. *familiarity with the venue*; 3. *travel fatigue*; 4. *referee bias* (rule factor). Using this conceptual framework they present the direction for future research on home advantage.

Clarke and Norman (1995) try to disentangle the performance effect from home advantage. In a competition, the win percentage of home team may exceed 50 percent may also signify the home team ability as well as factors affecting home-field bias. They use least squares to estimate team and home advantage effects. Using ten years' data they calculate gola and win difference for all 94 clubs in English soccer. They obtain no division but significant year effects. Moreover, they find some evidence for higher home advantage for clubs with special facilities.

Courneya and Carron (1992) provide a quantitative synthesis of results from major team sports. The mean percentage of home advantage and effect sizes (excluding draw games), are as follows: baseball 53.5 percent, ES=0.07; American football, 57.3 percent, ES=0.15; ice hockey, 61.1 percent, ES=0.22; basketball, 64.4, ES=0.29; and soccer, 69 percent, ES=0.38.

Carron and Hausenblas (1998) present also several general findings about home bias: the existence of home advantage in both professional and amateur, team or individual sports, across genders. Furthermore, they also emphasize the benefits of being a host country in international competitions. They conclude that the home advantage is a very old fact which has not been changed much examining historical data.

Nevill and Holder (1999) provide a literature review on the most likely causes of home advantage.They conclude that travel fatigue and rule factors (referee bias) have only minor role in shaping home advantage. Travel fatigue can be influential on home advantage if the travel distance involves different time zones. Observing the fact that home advantage exists even between teams with close distance, fatigue can no longer be considered as a critical factor influencing win percentage of home teams. Regarding familiarity with the local venue does not seem to provide much support for explaining home bias. Studies on home advantage

mostly conclude the considerable importance of crowd effect on the win percentage of home teams. Furthermore, Nevill and Holder summarize studies providing evidence for crowd effect. Recent work propose two major channels for fans to influence the match outcome: Firstly, fans are able to raise the performance of home team with their constructive support. Secondly, crowd effect may influence the referees by intimidating them so that they subconsciously take the decisions favoring the home team. More research still must be run to clarify this point.

Neave and Wolfson (2003) try to explain home advantage with hormonal factors. They show that salivary testosterone levels in soccer players were significantly higher before a home game than an away game. The perceived strong ability of the competitor also increases the hormone level of the players signifying the importance of rivalry factor. Their results are in conformity with earlier studies on the territoriality, testosterone and dominating behavior in various comptetitions. They define territoriality as "the protective response to an invasion of one's perceived territory." The motivation of their argument lies on the previous studies concluding the linkage of testosterone levels with the dominance and competitiveness in humans. They basically investigate whether the testosterone levels of soccer players change as the playing ground changes. They find evidence for the possible links between the hormones, perceived territoriality and changes in competitive performance in humans.

Nevill, Balmer and Williams (2002) undertake a quantitative study to examine the influence of crowd noise upon referee decisions in soccer. They also address the years of experience and the inconsistencies between referee decisions. They use binary logistic regression to estimate the effect of crowd noise and years' of experience on refereeing process. They find strong evidence for the presence of crowd noise on referees' decisions. The referees with background crowd noise awarded fewer fauls (15.5%) against to home teams compared to the referees who watch the game in silence. They conclude that crowd noise influences referees' decisions to favor home team.

Pollard (2002) examines familiarity with the local playing facility as a plausible cause of home advantage. Each stadium has its own specificities: the dimensions, day and night lightning, pitch size, or the natural or atificial surfaces may all affect home advantage. Clarke and Norman (1995) and Barnett and Hilditch (1993) study the effects of pitch size and the

artificial surfaces during the 1980's for the English professional soccer teams and find their positive effect on home-field effect.

Pollard (2002) investigates the effect of moving to a new stadium on the home advantage. He studies four main professional sports in North America: football, basketball, ice hockey and baseball. He specifically examines all the stadium changes between October 1987 and April 2001 inclusive. Pollard finds that among 37 teams changing stadium, 26 have a lower home advantage, home advantage decrease being the highest immediate after the move to a new stadium.

Few studies examine the home advantage in terms of within-match performances by home and away teams. With the availability of Opta Index data for England, Carmichael, Thomas and Ward (2000, 2001) test match-based production functions for the 1997-1998 FA Carling Premiership season. In their 2000 article, Carmichael, Thomas and Ward estimate a production function over individual matches in the English Premier League for the 1997-1998 season, each team performance identified as the unit of observation. Their team production function is linear involving various in put variables in terms of match-play team details. Carmichael, Thomas and Ward (2000) provide support for the key attacking and defensive tactics as well as some intentional unfair or illegal strategies of playing teams to succeed the games.

Carmichael, Thomas and Ward (2001) use Opta Index to estimate team production functions for the team competing in the English Premier League during 1997-1998 playing season. They aim to investigate the efficiency of the teams with respect to their aggregate match play variables. They find that accurate passing is particularly important relative to dribbles and runs. They emphasize the importance of winning regardless of margins and examine the relative efficiency of each team. They conclude that the performance and cooperation of the overall play squad is the key to success.

3. Association Football and It's Brief History in Turkey

An association football match is played between two teams of 11 players and 3 substitutes who can enter the game at any time during the match according to the decision of the technical manager of the team. The destructive play and technical offences are penalized by

the referee. The referee may give yellow and red cards. If a player receives two yellow cards, this will be transformed to the highest sanction, receiving a red card. The player who receives a red card is sent off the game and his team has to continue the match with one missing player. This is a major penalty. Sometimes the referee may accord free kicks, fouls to the players according to the outcome of the game.

The goalkeeper of each team has to defend the net during 90 minutes game, consisting of two half-times of 45 minutes. The remaining squad of 10 players have different roles as defenders, midfielders, stoppers and attackers.

British cotton and tabac traders working and leaving in the Ottoman land were the one who introduced football to Turkish people. Mostly residing in the two major port cities of the Empire, Selanik and Izmir, they ended up by forming teams among themselves and with interested youngsters from Greek minority. The first soccer game was played in Izmir in 1877 and the first soccer club was established in Izmir under the name of Football Club Smyrna. In Istanbul, Galatasaray was then founded in 1905, followed two years after by Fenerbahce 1907. Besiktas indeed was founded much earlier, in 1903, but as a gymnastics club not a football club. It took more than seven years for the football section to become active.

The national Turkish league matches started only in 1959. Currently, there are 18 teams competing in the Turkish Super League. The league fixture is designed by random drawing before the league starts. Each team meets twice with the competitor one at home and once away[2]. The winning team receives 3 points no matter where the game is played. If the match result is a draw, each team obtains 1 point. The loosing team earns zero point. The game is an active nonstop play except for corners, free kicks, throw-ins and penalties. The attacking play consists of passing the ball to teammates, retaining possession of the ball, running or dribbling with the ball, shots aiming to score a goal. The defensive play includes outfield players tackling opponents with or without winning the ball, blocking or intercepting opposition passes and shots, and keeping the ball away from pressure poisitions. Some players have specific playing skills therefore they be located at precise points. However, all the outfield players are equally attached to the game through various positions. When the season ends, the accumulated match points, three for a win and one for a draw, determine the final league

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[2] This scheme is described as a balanced league.

poisitions of each team. The teams finishing at the last three levels move to a lower league: League 2, Categorie A and three new teams are upgraded to Super League.

Moving to the Turkish Super League implies higher revenue, audience and popularity for upgraded teams. The pooling system of TV broadcasting revenues represents the largest share in team revenue basket.

4. Data and the Model to be Estimated

The association football in Turkish Super League has not been quantified in detailed match-play statistics until FSTATS initiated its mission on the subject. FSTATS attends regularly each weekly game played in the Turkish Super League: 18 teams play matches in 13 different cities. The data teams of FSTATS register the details of games live to mobile recording machines. They quantify and qualify every touch of the ball by each player during active play based on live- and off-tape analysis. The recorded information is then transfered into a custom designed data base to its data center located in Istanbul. All the data is assorted and extracted for each match online in the data bases: the data registration occurs with two separate computers: one computer records all the passes, fauls and touches while the other registers the shots only. The database for all the games of the first league then becomes ready for evaluation of each game.

Following Carmichael and Thomas (2005), we measure a team's sporting output in terms of its overall match performances throughout the league. The data set is the match-play statistics gathered by FSTATS for the 2004-2005 season of the Turkish Super League involving all 18 teams. The data consists of within-match performance details of each team during 34-match league fixture.

There are 23 independent variables. We estimate two sets of equations for SHOTS and GOALS for home and away equations.

SHOTS = f(touch of ball possession, defensive play of the opponent team)   (1)
GOALS = f(shots attempts on opposition goal, defensive play of the opponent team)   (2)

We expect the defensive play variables of the opponent team to be positively related to goals. Furthermore shot attempts are also expected to be positively related to goals.

Table 1: Final League Table for the 2004-2005 Season

				HOME					AWAY				
		POINTS	AVERAGE	WON	DRAW	LOST	POINTS	AVERAGE	WON	DRAW	LOST	POINTS	AVERAGE
1	FENERBAHÇE	80	53	16	0	1	48	42	10	2	5	32	11
2	TRABZONSPOR	77	44	12	3	2	39	22	12	2	3	38	22
3	GALATASARAY	76	39	14	1	2	43	26	10	3	4	33	13
4	BEŞİKTAŞ	69	31	12	3	2	39	21	8	6	3	30	10
5	GENÇLERBİRLİĞİ	51	11	8	5	4	29	7	6	4	7	22	4
6	DENİZLİSPOR	49	1	10	6	1	36	19	3	4	10	13	-18
7	ANKARASPOR	48	4	9	2	6	29	4	4	7	6	19	0
8	KONYASPOR	45	0	8	6	3	30	10	3	6	8	15	-10
9	G.ANTEPSPOR	44	-6	10	1	6	31	7	3	4	10	13	-13
10	Ç.RİZESPOR	43	-1	7	5	5	26	5	4	5	8	17	-6
11	MALATYASPOR	43	-6	7	3	7	24	4	5	4	8	19	-10
12	SAMSUNSPOR	38	-15	5	6	6	21	0	5	2	10	17	-15
13	ANKARAGÜCÜ	38	-24	6	5	6	23	-5	4	3	10	15	-19
14	DIYARBAKIRSPOR	34	-22	8	3	6	27	5	1	4	12	7	-27
15	KAYSERİSPOR	34	-23	6	6	5	24	1	2	4	11	10	-24
16	SAKARYASPOR	32	-21	7	3	7	24	0	2	2	13	8	-21
17	İSTANBULSPOR	27	-27	3	6	8	15	-15	2	6	9	12	-12
18	A.SEBATSPOR	19	-38	3	7	7	16	-10	0	3	14	3	-28

From the Table 1 we can calculate home and away advantage. Out of 306 games played between 18 teams for the 2004-2005 season, home teams won 151 matches, implying a home advantage of 49.35 percent. Away teams won only 88 games, resulting with a 28.75 percent of away adtantage. Calculating home advantage in terms of points won, with 3 points for each win, 0 for loss and 1 for draw, home teams obtained 847 points whereas away teams gathered only 524 points, implying a definite home advantage of 61.77 percent.

Following Carmichael and Thomas (2005), we group the variables under four categories with 1) attack play: GO: goals scored, SHONT: shots at goals, SHOFT: shots off target, HTWOOD: shots that hit woodwork, PASSZ: passes to own team player in scoring zone, PASS: passes to own team player outside scoring zone, PO: goal positions entered, RMON: reach to middle in zone; 2) agressive play: TACKLE: tackles, F: fouls, YC: yellow cards, RC: red cards; 3) defensive play: GKSTOP: goalkeeper saves, GC: own goals conceded, GKD:

goalkeeper distribution to own player, GKDO: goalkeeper distribution to opponent player, OPO: Opponent goal position, RMOF: reach to middle off zone; 4) less constructive plays: OPASS: passes to opponent team player outside scoring zone.

Since we examine separately home teams' equation and away team's equation the same variable is used in each equation. We do not give a different name to goals scored by home and away team.

GC is goals conceded in a game by the opponent team. PO is the goal positions home team undertake during the match. OPO is the goal positions the host team creates. PASSZ are passes of the home team towards scoring a goal. They also include assists of home team players before a goal. PASS stand for passes which do not lead to goals. TACKLES occur when home team players to steal ball from opponent players. OTACKLES are ball losses or wrong passes of home team players. RMON measures the number of times home team reaches to middle in zone. RMOF stands for the home team reaching to middle off zone. SHONT represent the shots on targets of the home team. SHOFT measures shots off targets of the home team. F measures the fouls committed by the home team. OF stands for fouls played by the awy team. YC is the number of yellow cards a team receives during the match. RC is the number of red cards a team obtains. GKSTOP: goalkeeper saves, GC: own goals conceded, GKD: goalkeeper distribution to own player, GKDO: goalkeeper distribution to opponent player, OG: own goals conceded. All the variables are also defined for the opponent team with a letter O in front of each variable for the opponent.

The model consists of estimating four separate equations for home and away teams, dependent variables being shots in the first set of equations and goals in the second one. The first equation's dependent variable is the shots of home team. The independent variables are GS goals scored, GC goals conceded, PO position of goals, OPO opponent's position of goals, PASSZ passes to own team player in scoring zone, PASS passes to own team player outside scoring zone, TACKLE, stealing balls from the opponent, OTACKLE, opponent player stealing home team's ball, RMON reach to middle in zone, RMOF reach to middle off zone, F fouls, OF fouls committed by the opponent team, YC yellow cards and YR red cards received by the home team, GKSTOP goalkeeper saves, GKD goalkeeper distribution to own player, GKDO goalkeeper distribution to opponent player, OGKSTOP opponent goalkeeper

saves, OOG opponent own goals conceded, OGKD opponent goalkeeper distribution to own player, OGKDO opponent goalkeeper distribution to other team player.

The SHOTS equation is estimated twice separately. One for the home team, one for the away team.

Similarly the GOALS equation is also estimated one for the home and one for the opponent team. The independent variables are GC, goals conceded, PO position of goals, OPO opponent's position of goals, PASSZ passes to own team player in the scoring zone, PASS passes to own player team outside the scoring zone, TACKLE, OTACKLE tackles of the opponent team, RMON reach to middle in zone, reach to middle off zone, SHONT, SHOFT shots on targets and shots off targets, HTWOOD shots that hit the woodwork, F fouls, OF fouls committed by the opponent team, YC yellow cards and RC red cards received, GKD goalkeeper distribution to own player, GKDO goalkeeper distribution to opponent player, OGKSTOP opponent goalkeeper saves, OOG opponent own goals conceded, OGKD opponent goalkeeper distribution to own player, OGKDO opponent goalkeeper distribution to other team player.

Table 2: Model Estimates (Dependent Variable is SHOTS)

	Shots by Home Team		Shots by Away Team	
Independent Variable	Coefficient	t Statistic	Coefficient	t Statistic
GS	-0.350002	-1.567888*	-0.429167	-2.223089**
GC	0.356985	1.577065*	0.325423	1.8*
PO	0.796690	5.866861***	0.872360	6.51***
OPO	0.103306	0.661009	-0.125645	-1.1138
PASSZ	0.002708	0.737843	0.001443	0.5079
PASS	-0.015445	-1.594473*	-0.006523	-0.9638
TACKLE	0.054749	1.661628*	0.020218	0.775552
RMON	0.411900	4.762473***	0.337036	4.739575***
RMOF	-0.003548	-0.079575	0.003674	0.096
F	0.444054	2.183575**	0.294920	6.779613***
OF	0.087970	1.555257*	0.255785	5.64***
YC	0.3422223	1.798544*	0.365653	2.369***
RC	-2.067678	1.814457*	-1.325732	-2.95***
GKD	-0.046756	-1.045361	0.018704	0.580910
GKDO	0.054520	1.010833	-0.019518	-0.584884
OGKSTOP	0.036907	0.520939	-0.010193	-0.174267
OOG	-0.126914	-0.658659	0.410033	1.55*
OGKD	-0.008301	-0.215284	-0.041980	-1.100284
OGKDO	-0.025485	-0.634975	0.017849	0.396902
OTACKLE	-0.017780	-0.522250	0.007780	0.363277
F statistic	23.98687***		28.57***	
N. of observations	306		306	

Standard error of regression	0.993911		3.13	
Adjusted R^2	0.613588		0.668830	

*t satistic significant at 10 percent. **t statistic significant at 5 percent level. ***t statistic significant at 1 percent level.

GS: Goals Scored, **GC:** Goals Conceded, **PO:** Position of Goals, **OPO:** Opponent Position of Goals, **PASSZ:** Pass to in Scoring, **PASS:** Pass to out Scoring, **TACKLE:** Steal Ball, **OTACKLE:** Lose Ball, **RMON:** Reach to Middle in Zone, **RMOF:** Reach to Middle off Zone, **F:** Fouls, **OF:** From Fouls, **YC:** Yellow Card, **RC:** Red Card. **GKSTOP:** goalkeeper saves, **GKD:** goalkeeper distribution to own player, **GKDO** goalkeeper distribution to opponent player, **OGKSTOP:** opponent goalkeeper saves, **OOG** opponent own goals conceded, **OGKD** opponent goalkeeper distribution to own player, **OGKDO:** opponent goalkeeper distribution to other team player.

In the Table 2, the dependent variable is SHOTS, and the independent variables constitute those that indicate different kinds of possession by the observed team in terms of the four games strategies, constructive, less constructive, aggressive, and defensive plays by the opponent team. The overall significance of the home equation is lower than the away equation, contrary to Carmichael and Thomas. The signifant variables common to both equations are GS, GC, PO, RMON, F, OF, YC and RC, goals scored, goals conceded, goal position entered, reach to the middle zones, fauls, opponent fouls, yellow cards and red cards respectively. PASS, passes to own team player outside scoring zone is the variable which is significant only in home equation, at 10 percent.conceeded are significant for the home equation. On the other hand, OOG, opponent own goals conceded is significant for the away equation at 10 percent.

The significance of GS, PO, RMON in both home and away equations shows the attack play of Turkish teams at home and away.

GS, goals scored has a negative coefficient in both home and away equations implying that scoring a goal affects negatively home and away teams. After having scored a goal teams loose their compactness and give chances to the opponent to start a counter attack. The coefficients of GS are significant at 10 percent for home teams and 5 percent when playing away. This is an important playing tactic of Turkish teams when playing away. After a goal scoring, away teams change tactics to be in defense. This is captured by the regression for shots. The effect of less constructive play on own team shots in relationship to (1) then may be considered to be negative and therefore a negative relationship is assumed to exist between

the aggregated SHOTS variable PASS, which signify total passes to teammates outside the scoring zone.

PO has a positive and significant at 1 percent coefficient in both home and away equations mplying that goal positions and strategies for socring goals lead teams to perform better shots at home and away. This futher emphasizes the importance of intelligent design and play strategies within a team and better coordination among teammates. Although it is not significant, the positive sign of PASSZ in both equations also shows the critical effect of targeted passes for efficient use of playing time.

Finally, the positive coefficient of RMON, reaches to middle in scoring zone, in both equations and its significance at 1 percent shows how crucial it is to have good passing probabilities in generating higher number of shots towards the scoring zone.

OPO has insignificant but positive coefficient in the home and a negativeone in the away equation. This is the evidence of attack play of home teams such that when playing home, the opponent teams goal positions lead to more counter attack positions from the part of home teams. However, when playing away, teams' shots are negatively affected by the opponent teams goal positions, implying a defensive strategy for away teams as it is confirmed in Carmichael and Thomas as well.

PASS, passes to own team player outside the scoring zone has a negative coefficient both in home and away equation but only significant at 10 percent in the home equation. This negative sign can be considered as a slight evidence for the losses of ball of home teams when playing both at home and away. This is also a persisten problem of many teams playing in the Super League.

TACKLE has a positive coefficient both in home and away equations with a significance level of 10 percent only in home equation. The positive sign is consistent with the fact that the higher the number of times own teammates steal ball from the opponent team players, the shots of home team will increase.

Similarly, the fact that OTACKLE has a negative coefficient both in home and but a positive one in away equations is little difficult to interpret. The opponent teammates' tackles show the

agressive play of the opponent on the home team. This effect is negative only when playing home but not when playing away matches.

F, OF, YC and RC coefficients are all significant both equations, significance level being all 1 percent for all four of them in the away equation. F, OF, YC all have positive sign at home and away. Foul playing and yellow cards imply agressive playing. This gives ambiguous evidence in the sense that when playing home a team is considered to play more attack oriented and agressive play. However, this result confirms also certain degree of agressive when playing away. Two yellow cards in one game for the same player turn out to be equal to have a red card and the player is sent off the game and his team has to play with 10 teammates only.

On the other hand RC, red cards affect shots negatively for home and away teams. An agreesive play to the extent of receiving red cards is not in the advantage of the teams no matter the field they play.

GKDO, which is a defensive play variable is positively related in home and negativeley related in away equation, although not significant, is not an evidence in line with our expectations. This finding clearly tells us that certain kind of defensive play may occur during home games and short periods of more agressive play tactics may come out when playing an away game.

OGKD, OOG, OGKDO, OGKSTOP are the defensive variables of the opponent teams. When playing a home game we expect them to have a negative sign, that is the defensive tactics of the opponent to disturb home team. However we only obtain negative signs for OGKDO, OOG and OGKD. OGKSTOP, the opponent goalkeeper's saves are positively related with the shots of home team when playing home and negatively when playing away games.

The higher overall significance of the home team estimation implies that shots are likely to the result of breakaway attacks from a defensice position than consulted and constructive possession when a team is playing in its own field. This result is just the opposite of what Carmichael and Thomas obtain for the British Premier League. This may also be a clear sign of differences of competitive balance and teams between the two ends of European leagues.

Table 3: Model Estimates (Dependent Variable is GOALS)

Independent Variable	Goals by Home Team		Goals by Away Team	
	Coefficient	t Statistic	Coefficient	t Statistic
GC	0.270856	4.619468***	0.251379	4.646525***
PO	0.414413	15.57878***	0.445380	13.98241***
OPO	-0.199861	-4.695312***	-0.186016	-5.117873***
PASSZ	0.000815	0.819366	-0.001771	-1.964848**
PASS	0.000815	-0.425840	-0.001170	-0.556631
TACKLE	-0.001899	-0.213663	-0.002718	-0.334335
RMON	-0.009156	-0.396569	-0.02791	-1.258968
RMOF	-0.004624	-0.383569	0.014959	1.274510
SHONT	0.041927	1.253411	0.042065	1.391747
SHOFT	-0.002064	-0.077909	0.064876	0.765263
HTWOOD	-0.002268	-0.023404	0.064876	0.765263
F	-0.044372	-3.083466***	-0.045474	-3.331762***
OF	0.030738	2.015823**	0.027579	1.907859**
YC	0.073396	1.451460	0.064662	1.338149
RC	0.057486	0.446090	-0.217464	-1.568761*
GKD	0.023008	1.930399**	0.003959	0.399571
GKDO	0.011285	0.787984	0.002094	0.204157
OGKSTOP	0.011196	0.588005	0.005301	0.294721
OOG	-0.047378	-0.919191	-0.092585	-1.136654
OGKD	-0.018244	-1.787540*	-0.019819	-1.694115*
OGKDO	0.007653	0.712224	-0.004052	-0.289610
OTACKLE	-0.003902	-0.429970	0.006417	0.971573
Adjusted R^2	0.537130		0.423253	
F	14.87***		11.10730***	
N. of observations	306		306	
Standard error of regression	0.996293		0.961498	

*t satistic significant at 10 percent. **t statistic significant at 5 percent level. ***t statistic significant at 1 percent level.

GS: Goals Scored, **GC:** Goals Conceded, **PO:** Position of Goals, **OPO:** Opponent Position of Goals, **PASSZ:** Pass to in Scoring, **PASS:** Pass to out Scoring, **TACKLE:** Steal Ball, **OTACKLE:** Lose Ball, **RMON:** Reach to Middle in Zone, **RMOF:** Reach to Middle off Zone, **F:** Fouls, **OF:** From Fouls, **YC:** Yellow Card, **RC:** Red Card. **GKSTOP:** Goalkeeper saves, **GKD:** Goalkeeper distribution to own player, **GKDO:** Goalkeeper distribution to opponent player, **OGKSTOP:** Opponent goalkeeper saves, **OOG:** Opponent own goals conceded, **OGKD**: Opponent goalkeeper distribution to own player, **OGKDO**: Opponent goalkeeper distribution to other team player. **HTWOOD**: Shots that hit the woodwork.

In Table 4, the dependent variable is GOALS, and the independent variables differentiate between types of shots by the observed team and defensive aspects of the opponent team. The overall significance of the home equation is higher than the one of the away equation both significant at 1 percent level. This finding is similar to Carmichael and Thomas.

SHONT, shots on target and HTWOOD shots that hit the woodwork can be taken to reflect more accurate shooting while shots off target, SHOFT are less so. SHONT is positively signed in both equations, while HTWOOD is signed negatively in home equation and positively in the away equation. However SHONT and HTWOOD are not significant. OF, OTACKLE, OGKD reflect the defensive play tactics of the opponent team. Among three variables, only OF and OGKD are significant both in home and away equations. OF has positive sign in both equations and significant at 5 percent in each model. OGKD is negatively signed and significant at 10 percent in both home and away equations. OOG is negatively signed in both equations contrary to Carmichael and Thomas' results and it is not significant even at 10 percent. RC is positively signed in the home and negatively signed in the away equation negative sign implying the costly red card decisions for home teams when playing away games. This further strengthens the argument of defensive play when playing away. YC, a positively signed but not significant both in home and away equations, implies attack play of home teams when playing at home as well as away.

Similar to Carmichael and Thomas, we find positive coefficients for SHONT although they are not significant in both equations. Whereas SHOFT is negatively signed in home and positively signed in away equation, both coefficients are obtained to be not significant at any level. [3] On the other hand the coefficient of OF is turns out to be positive in both equations and significant at 5 percent, similar but more powerful results than theirs.[4] OGKSTOP, opponent goalkeeper saves turn out to be positively related to goals both in home and away equation, a result difficult to interpret. OOG, opponent own goals conceded is negatively related to goals for both home and away equation. OGKDO, opponent goalkeeper distribution to other team player has the same positive sign but insignificant t ratios.

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[3] Contrary to Carmichael and Thomas we find negative coefficient for OTACKLE for home and a positive one for away equation.
[4] Carmichael and Thomas find insignificant but positive coefficient for OF in away equation.

On the other hand PASSZ, targeted passes of home squad in scoring zone, has a negative sign and significant at 5 percent in the away equation implying that in Turkish league during the 2004-2005 season home teams when playing away have difficulties in scoring goals due the negative relationship of good in scoring zone passes and goals scoring. This may be a sign of opponent teams' foul playing defensive tactics to stop home team players especially only in scoring zone, rather than well before in middle zone.

TACKLE, tackles of home team show the attacking play of home team. The higher the number tackles committed by home team the lower is the number of home goals. The negative relationship of tackles and shots shows us also the unsuccessful attacking play tactics of home team. OTACKLE, the variable signifying the number of tackles of away team has a negative coefficient in the home equation implying a lower home goals due to low ball possession and ball losses. This is the main weakness of Turkish soccer teams when playing home and away games.

RMON, the reach to middle in zone and RMOF, the reach to middle off zone have both negative but insignificant coefficients in home equation. The negative sign again tells us the failure of home teams to score goals through successful reaches to middle and off middle zones. Fouls committed by home team and yellow cards it receives both affect home shots positively in the sense that they show attacking play tactics of home team. In the home field, if home team follows more agressive play by committing fouls and being penalized by yellow cards may further trigger higher number of shots, fortifying the attacking game profile.
On the other hand, fouls committed by away team also influence positively the home shots. This can be explained by the fact that when away team commits more fouls that may give a new opportunity for the home team to design a new attack towards scoring goals, thus generating more shots.

Finally, red card has a positive impact on goals when playing home. The red card penalty implying one of the 11 home squad members to be sent off the game does promote more goals from the part of home team. On the contrary, it has a very bad impact on home team, being committed such an infringement in front of its own audience, in its own "castle". However, home team playing with 10 players may be more in a search for further goals, thus supporting the positive coefficient. However, home team when playing away is not under the same crowd

and fan pressure to score goal, thus a red card will discourage the team to score against the opponent team.

From the same perspective, GC, goals conceded variable is positively related to goals in the home equation as well as in the away equation. This can be interpreted as the challenge of the home team to win the game as a result of a goal scored by the opponent team.

PO, the number times home team enters a goal position increases the number of goals scored by the home team. This shows the attacking tactics of the home team.

OPO, the number times away team enters a goal position decreases the number of goals scored by the home team. Although this variable has a positive effect on shots by the home team, it negatively affects goals scoring of the home team. This contradiction can be explained as follows: Home team attempts many shots but they do not lead to goal scoring. The frequency of shots showing an attacking play of the home team. The away team's goal positions disturb the success of shots. All these three variables are significant at 1 percent, with GC and PO having both positive signs, more goals conceded lead to more goals scored when playing at home and awy whereas OPO, has negative coefficients implying that opponent attack play tactics may deter home teams from searching new goals.

PASSZ, well targeted passes of home players also have a positive effect on the goals of the home team. The higher the number of targeted passes the higher is the ball possession percentage of home team relative to away team. The attacking play has its fruits as higher goals scoring from the part of the home team.

Fouls committed by home team and yellow cards it receives both affect home goals positively in the sense that they show attacking play tactics of home team leading to scoring more goals. In the home field, if home team follows more agressive play by committing fouls and being penalized by yellow cards may further trigger higher number of goals, fortifying the attacking game profile.

On the other hand, fouls committed by away team also influence negatively goals both at home and when playing away, home teams' foul playing may risk of scoring goals or sometimes the opponent team may turn the possibility to a positive score.This can be explained by the fact that when away team commits more fouls that may give a new opportunity for the home team to design a new attack towards scoring goals, thus generating more shots. This is captured by the positive coefficient of OF for home as well as away equation, at a significance level of 5 percent.

Goalkeeper distribution to own player, GKDO, OGKSTOP and OGKDO do have all positive coefficients when playing home matches. Among these variables, only GKD and OGKD are significant at 5 percent and 10 percent levels respectively. The positive OGKSTOP and OGKDO show the defensive play tactics of the away teams. Moreover, OGKDO may also be a sign of the sluggish and ineffective play by and between the opposing goalkeeper and its teammates and OGKSTOP implying Home team's goalkeeper saves more when playing away matches.

5. Conclusion

This paper find strong evidence for home advantage during the 2004-2005 season in Turkish super league using within match-play statistics for various variables for 18 teams playing for 34 weeks. We provide evidence for short attack combined with cautious defense tactics for teams when playing away games: after scoring goals, away teams as well as home teams stay in defense. Teams are much more comfortable with fouls, yellow cards rather red cards case they are playing home as well as away matches. Agressive tactics may well be apparent in away games as well. We find the contrary of what Carmichael and Thomas found for several tactics. The differences in the sign and sizes of the same variables' coefficients may be a sign of differences in the competitive balance and the league and team styles of the British and Turkish leagues. This is left for future work.

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